Classification of the Approaches to Learning Adopted by Students of Architecture in Their Design Coursework

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Summary

Students' approaches to learning has been classified through their experiences in the design coursework within the larger context of architectural education. What are the learning approaches being adopted by students in architectural design and how does the introduction of the first year design coursework impact on their approaches to learning in the subsequent years are key to this classification. This research reflects on why learning approaches evolve from the first to the final year of the architecture program. Approaches to learning is well-understood in other disciplines including engineering, information technology, mathematics and sciences to name a few, but less-researched in architectural education. This research endeavours to fill this gap.

The students are introduced to design theory as a part of their architectural design coursework. This research vehicle of the architectural design is identified as a more appropriate way of classifying learning approaches instead of history, critical theory and technology as design coursework plays a central role in the studio-based program. The academic context has been reviewed through existing literature with a focus on learning approaches within pedagogical research in architectural education, in addition to other fields and disciplines including established research on 'surface and deep' approaches in text-based fields through the qualitative research method of phenomenography. This classification is the further consolidation of the pilot study on students' learning comparing the first and fourth year of the architecture program through phenomenography. The learning context for this classification includes four architectural institutions from the United States of America, United Kingdom and India.

The intention of this research is to present the phenomenographic results as meta-categories by depicting the evolution of the learning approaches in architectural design. This research currently intends to further represent these findings and interpret these meta-categories within real world examples of architectural pedagogy and education through an illustrative account of nine students of architecture and their learning approaches in evolution.

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Chapter 1: Introduction

Learning as defined by Ramsden (1988) from the learners' perspective is the qualitative change in their visualization, experience and conceptualization of something specific to the worldwide learning context (Brockbank & McGill, 2007c). *Approaches to learning* are described as actions taken by learners while undertaking specific learning tasks, within particular learning contexts.

Students in Higher Education are seen to adopt a range of approaches to their learning. Marton and Saljo (1976) have identified approaches to learning falling in the broad categories of *surface and deep* approaches (Marton & Säljö, 1976), as-well-as *strategic* approaches (J. Biggs, 1979). Students' approaches to learning are directly correlative to their prior experiences of studying and understanding the key concepts of the subject matter, which is vital to the subsequent approaches to studying and learning outcomes (Prosser & Trigwell, 1999).

Marton and Saljo (1976) used *Phenomenography* (Marton, 1981) to identify these two broad categories, namely *Deep learners*, who actively engage with their learning in a search for meaning, as opposed to *Surface learning* where students aim to reproduce material without critical engagement and often through memorization. Prior research makes the assumption that the categories apply to learners in general; this thesis investigates how approaches to learning are manifested within design-based coursework, specifically within architecture. The focus of this research is to classify the architecture students' learning approaches using the qualitative research methodology of phenomenography.

The earlier research conducted by Marton and Säljö has focused on studying how students approached the study of text-based materials (Marton & Säljö, 1976). Whilst there will be elements of architectural education where this remains relevant, little has been written on how concepts of deep and surface learning might manifest themselves in the design studio-based activities. As an anecdote, most design faculty would be able to recognize students who actively engage with the architectural design coursework and the related project work, and those who adopt a more passive approach to their studies.

The students of architecture are constantly exposed to learning as an experience through varied teaching and learning strategies including 'learning-by-doing,' 'self-learning,' 'reflecting on prior experiences' and 'reflection-in-action' representing these

approaches in the deeper dimension (Bradley, 2000; Brown & Yates, 2000; Schon, 1983; Webster, 2000). Deep approaches to learning may be considered to be the norm in the design studio within architectural education leading towards a relook at the simplified concepts of deep and surface learning as defined by Marton et al. There is a further requirement of defining surface approaches within the learning context of the design studio in architectural education.

In this research, Students' approaches to learning are classified through their experiences in design coursework in the larger context of architectural education. Approaches to learning are well-understood in other disciplines including engineering, information technology, mathematics and sciences to name a few (Kebaetse, 2010), but less-researched in architectural education. This research endeavors to fill this gap through the pilot study (Chapter 5) and final study (Chapters 6 to 10).Whereas the pilot has charted the variations and explored the reasons for the differences encountered in the students' learning approaches in two specific years of the design coursework (Iyer & Roberts, 2014) based on earlier fashion design studies (Bailey, 2002; Drew et al., 2001). The final study is a consolidation of this earlier study through a cross-sectional phenomenographic analysis from the first to the fifth year of the architecture program across four institutions based on an international perspective.

1.1 Aim of the Research

The research aims to compare the students' learning approaches in their first year architectural design coursework to the subsequent years of their program.

1.2 Objectives of the Research

1. To identify the students' approaches to learning adopted by looking at the first year architectural design coursework and using that as the research vehicle to evaluate their learning approaches in subsequent years of their design coursework.
2. To classify these learning approaches, to understand how they actually manifest themselves in architectural education through data collection and analysis using phenomenography.
3. To categorize the students' approaches to learning in the first year and subsequent years of their architectural design coursework within the outcome space of the phenomenographic research method.
4. To present the outcome of the categories of approaches to learning based on the introduction of the first year design coursework in the subsequent years of their five-year program through the coursework of architectural design.

1.3 Research Questions & Brief

This thesis poses a series of questions related to the approaches to learning adopted by architecture students, the central one being

- *What are the approaches to learning being adopted by the students in the architectural design coursework from the first year to the subsequent years of the program?*

The main question embedded in this research is related to the approaches to learning being adopted by the students in their architectural design coursework from the first year to the subsequent years of the program.

- *How does the introduction of the first year design coursework impact on their learning approaches within architectural design in the subsequent years of their program?*

The follow-up question further clarifies by looking at the evolution of the students' learning approaches from the first-to-final year of the architecture program.

- *How do approaches to learning evolve in the design coursework from the first to the final year of the program?*

These direct and evolving research questions endeavour to represent the classification of students' approaches to learning in the coursework of architectural design within this research.

The students are introduced to various theoretical constructs as a part of their design coursework in the architecture curriculum. Some examples representing the theoretical constructs include the foundation coursework in design (Abel, 1995; *Basic Design* 2013; Broadbent, 1995), contextual studies in the 'making of Architecture' (Welsh School of Architecture., 2015) and visually communicating design (Registrar, 2016; School of Architecture, 2010). This research-vehicle of the design coursework-based model has been identified as a more appropriate way of classifying learning approaches instead of history, critical theory and technology, since architectural design has played a central role in this studio-based program. The academic context has been reviewed through existing literature within pedagogical research in architectural education and the design studio, focusing on students' learning approaches in the undergraduate curriculum (A. Iyer, 2015).

This research is built on the identified learning approaches in other disciplines through the qualitative research methodology of phenomenography. These identified approaches are a consolidation of the pilot study conducted in the early stages of this

research on students' learning by comparing the first and fourth year of the architecture program. This earlier study has identified six categories of learning approaches ranging from product-based, unidirectional and multidirectional approaches; to the dependent and product-focused, strategic approach; evolving into the independent and process-focused approach; progressing to experiential and practical, perceptual and conceptual, process-focused, schema-based approaches to learning (Chapter 5, Table 13) (Iyer & Roberts, 2014). These categories represent a broader spectrum in line with the recognized 'deep,' and 'surface' as-well-as 'strategic' approaches to learning (J. Biggs, 1979; Iyer & Roberts, 2014; Marton & Säljö, 1976). The physical domain for this classification includes undergraduate architecture programs offered at four institutions from an international perspective including the United States of America, United Kingdom and India (Appendix I).

1.4 Structure of the Dissertation

- Chapter 2 provides the literature review pertaining to *students' approaches to learning* in contemporary educational research. This chapter further reviews learning as an experience, as phenomena, and meaning, as well as the philosophical backdrop of learning theories and models. Learning approaches are also discussed in relation to established references including *'deep'* and *'surface'* as-well-as *'strategic'* approaches to learning.

- Chapter 3 reviews the research on learning theory and pedagogy establishing the gap in the existing research on the approaches to learning and its classification in architectural education (A. Iyer, 2015) (Appendix II).

- *Phenomenography*, the research methodology adopted for this research is reviewed in Chapter 4. This review includes the origins of this methodology, its comparison with *phenomenology* and other qualitative research, as well as the various stages of conducting phenomenographic analysis and presenting the findings.

- Chapter 5 explains the earlier pilot study conducted through phenomenographic analysis of first and fourth year students' learning approaches in their design coursework to chart the variations and explore the reasons for the differences encountered (Iyer & Roberts, 2014) (Appendix III).

- Chapter 6 introduces the overall classification of learning approaches in the five-year undergraduate program. This includes the research context and hypothesis,

aim and objectives, the contribution of knowledge as well as the phenomenographic research framework for the proposed data collection and analysis (Appendix IV). This chapter gives further insight on the data collection and analysis, using phenomenography conducted at the four institutions, focusing on semi-structured interviews and the steps undertaken in analyzing the collected data.

- Chapters 7, 8, 9 and 10 presents the phenomenographic analysis of the learning approaches classification through the identified *meta-categories* in the *outcome space* for Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ), University of Mumbai, India (Chapter 7), School of Architecture, Oklahoma State University (OSU), Stillwater, USA (Chapter 8), School of Architecture, University of Texas at Austin (UTA), Texas, USA (Chapter 9) and Welsh School of Architecture (WSA), Cardiff University, Wales, UK (Chapter 10). The details of the phenomenographic analysis conducted at the four institutions is further explained in Appendix V (Chapter 7), Appendix VI (Chapter 8), Appendix VII (Chapter 9) and Appendix VIII (Chapter 10).

- Chapter 11 provides the summarized analysis and results from the four institutions. This chapter includes an illustrative account of a number of students and the evolution of their learning approaches in the design coursework through the five years of their architecture program based on the identified *classification of learning approaches*.

- Chapter 12 provides the conclusions with further explanation on the implications as-well-as future directions for this research on the classification of students' learning approaches in architectural education.

1.5 Scope of This Research

The research classifies approaches to learning in architectural design using the research method of phenomenography to present development in the student's learning in his or her coursework. This classification of students' learning approaches endeavours to fill the gap within pedagogical research in architectural education by looking at the larger context of design education (Bailey, 2002; Drew et al., 2001; Kleiman, 2008; Trigwell, 2002) as well as other disciplines in university education (Kebaetse, 2010; Sharma, 1997) and higher education (J. B. Biggs, 1994; Marton & Säljö, 1976). This research using 'discursive (pure) phenomenography' (Chapter 4,

Section 4.4) is conducted using the research vehicle of architectural design coursework to evaluate the students' learning approaches and its manifestation in the five-year program. The intention of this study is to present the results of the phenomenographic analysis as meta-categories by depicting the overall evolution of the learning approaches in architectural design through the identified learning context. The research represents these findings and interpret these meta-categories within real world examples of architectural work performed by nine architecture students through an illustrative account (Chapter 11, Section11.2). This research does not intend to map these meta-categories using the pedagogical language used in the design studio by faculty. These specific areas will be pursued as part of further research after these findings are ratified as a part of the current doctoral studies.

Chapter 2: Learning: Philosophy, Theories, Conceptions & Approaches

The approaches to learning adopted by students of architecture in their undergraduate degree program are the central denominators of this research. The architecture professional degree program across various parts of the world has a general span of five years of university education, where the students experience their learning through the core coursework of design, in addition to the other courses of the program.

This chapter has reviewed the research and analysis of the thematic underpinnings relevant to students' approaches to learning. This review addresses the central question, "What are the approaches to learning being adopted by the students in the architectural design coursework?" by looking into the theoretical and philosophical context of 'learning' and breaking it down to its roots. This hypothesis has been explored through the fundamental question of "what is *learning*?" and further breaking it down by looking at learning as a meaning, or as an experience, within the educational space or in a conventional environment.

A further connected question to the hypothesis, on how the students' learning approaches progress from the first year architectural design coursework to subsequent years, is explored by differentiating learning conceptions from approaches to learning in this chapter. Learning is further studied as strategies and styles, with an exploration of various theoretical models within learning and teaching. This includes the study of the research framework presented within constructivism (Section 2.7) and phenomenography (Section 2.8), focusing on some of the identified approaches to learning and conceptions in these theoretical models. Chapter 4 presents an in-depth review of the research framework through the identified phenomenographic methodology for this research.

The final research question, namely how do approaches to learning evolve in the architectural design coursework from the first-to-fifth year of the program, is explored through the available research in reflective practice, with both the experiential and reflective nature of learning being put into perspective. The outcomes of various studies is further reviewed in Section 2.9, in addition to a brief summary on research into students' learning within architectural education (Section 2.10). Chapter 3 presents a detailed review of the existing literature within pedagogical research in architectural education focusing on students' approaches to learning.

2.1 What is Learning?

The definition of 'learning' ascribed as noun is illustrated as "knowledge, skills, attitudes or values acquired through study, experience or by being taught," thus being prescribed as a product. Whereas when learning has been presented as a verb, it is defined as "the process of acquiring of knowledge, skill, etc.; becoming aware of something, or memorizing something" (Brockbank & McGill, 2007c). This presents the dichotomy between understanding learning as an integral process within the university and higher education system rather than focusing on the product of learning or the educational outcome, for example, a report, an examination, a presentation or an assignment. The current definitions of learning by the leading research scientists have their focus on the innate process, with the learner being the central point of this emerging doctrine.

"Learning should be seen as a qualitative change in a person's way of seeing, experiencing, understanding, conceptualizing something in the real world" (from Ramsden, 1988) (Brockbank & McGill, 2007c; *Improving learning: new perspectives*, 1988). Ramsden (1988) has concentrated on the learner's experience in the conceptualization process within the learning context; or what is termed as the 'real world.' "*Learning* is a way of interacting with the world. As we learn our conceptions of phenomena change, and we see the world differently. The acquisition of information in itself does not bring about such change, but the way we structure that information and think with it does. Thus education is about conceptual change, not just the acquisition of information" (from Biggs 1999) (J. B. Biggs, 1999; Brockbank & McGill, 2007c). Brockbank et al. have presented a series of perspectives that delve into these changing conceptions through student's learning experiences by focusing on their approaches to learning through reflective practice (Brockbank & McGill, 2007a).

Biggs, (1999) has also discussed the issue of qualitative change in comparison to quantitative change that has been the focus of research in learning. He quotes Ralph A. Tyler (1949) stating, "Learning takes place through the active behavior of the student: it is what he does that he learns, not what the teacher does" (J. B. Biggs, 2011). Teaching and learning have been understood as distinctive activities; but the instructional parameters are seen to overlap when the process is happening in tandem with a situation, where the learner by his or her own accord is going through the learning process (Moon, 2004). The role of learners within the learning situation has been magnified by the introduction of information technology; thus creating a new thrust for active learning by assuming the teacher's role to have a focus upon actively formulating and achieving one's learning goals (Broberg, 2001). The facet of experience again comes into picture with Prosser and Trigwell arguing "that in any act of learning and

teaching, prior experiences, perceptions, approaches and outcomes are simultaneously present, although in some contexts, one or other aspects may be more to the foreground of awareness, while the other aspects may be more to the background" (Prosser & Trigwell, 1999).

Thus learning as a 'noun' or as a 'verb' needs to be readdressed to clarify the inbuilt facet of learning experience, in contrast to the portrait of learning as accumulation of knowledge. "*Learning* knowledge and learning to learn" have been presented as two facets of understanding the process of learning. The statement, "we learn through the assimilation of the material of learning" has focused on the content or knowledge base acquired by the learner, which is a reflection of his or her cognitive fabric. The learner's progression and efficiency has been elevated when (s)he moves beyond the content of learning to understanding or learning more about the learning process in itself (Moon, 2004).

2.1.1 Learning Experience, Phenomena and Meaning

"Learning from a lecture is still a matter of experiencing the lecturer's words, and many other things about being in the lecture theatre. Learning is learning from experience" (Moon, 2004). The *learning experience* has been presented as the life-long process of exploring and try to understand or gain an awareness of the constitution and reconstitution of the world around the learner. The experience of learning is in understanding the nature of the world in its reality, by learning through differentiation and integration; both through the learner's "experience of the world," or his or her "experienced world" (Marton & Booth, 1997).

A correlation between learning, experience and meaning has been worked out through the learner's approach of constructing meanings through experience; this includes a connection within the learning process of the learner's current and prior experience. This prior experience represents the actual condition of the learner's cognitive structure and would determine the learner's response to the current experience (Moon, 2004). Marton and Tsui have presented the key role played by language in the interpretation of experience, not only in the representation of experience but also in understanding what constitutes an 'experience'. This has been the key in connecting the constitution of the learning experience through language and obtaining a perspective of understanding the *object of learning* with respect to various types of learning experiences within the classroom (Marton & Tsui, 2004).

Marton and his research team (1970) have presented the relation between the learner's learning experience and awareness of the change in the phenomenon (learning)

experienced. Learning is said to have occurred when there has been a development in the learner's experience with reference to the phenomenon, thus changing the relationship between the learner and the phenomenon. Learning is said to have occurred, when the learner's awareness of the phenomenon changes with a new appearance in comparison to the past (learning) (Marton & Booth, 1997). Thus *learning experience* is an amalgamation of the learner's various ways of experiencing the phenomenon in question, i.e. learning from the learner's past, to the present day, and into the distant future. The learner's awareness of the learning situation and the associated learning process is represented as the *structure of awareness* and ways of experiencing learning.

2.1.2 Ways of Experiencing & Structure of Awareness

Knowledge as the *object of learning* has been projected as a 'complete experience' for the learner even at the level of abstraction. The variation of the learning experiences is said to occur as the experience in which the learner is interested is captured through the variation in the structure of knowledge and its meaning, ranging from concrete to the abstract.

Orientation to Learning (before the course)	Conception of Learning (before the course)	Approach to Learning (during the course)	Orientation to Learning (end of the course)	Conception of Learning (end of the course)
STRATEGIC		TO	DEEP	
Primary – personal intrinsic, seen in terms of self-development and gain in confidence Secondary – personal extrinsic, as proof of capability	Learning as "gaining rules and procedures" (Level 3)	Deep Approach: Strategic	Personal intrinsic with perceptions of gains seen as changing learner's approach to life	Learning as "being critical and relating ideas to one's own experience" (Level 5)
Primary – academic extrinsic, based on academic progress, looking for good grades with minimum effort Secondary – vocational intrinsic	Learning as "gaining new knowledge" (Level 1)	Surface, although appeared to be attempting a more active approach	Academic extrinsic, combined with clearly emerging vocational and academic intrinsic orientations	Learning as "understanding and relating ideas together" (Level 4)
SURFACE		TO	STRATEGIC	

Table 1: Two Distinctive Approaches to Learning reflected through Learners' Orientation, adapted from Learner's Case Studies following Deep and Surface Approach to learning (Morgan & Beaty, 1997) based on 'John Williams: A Case Study' (Table 14.1) and 'Sally Brown: A Case Study' (Table 14.2)

Entwistle et al. (1994) conducted an investigation on the learning experience of students during the course of their final examinations. The seemingly concrete-to-abstract experiences of these 'knowledge objects' ranged from a 'sensory experience' to the 'quasi-sensory mode'. The four categories identified included the first set of two experiences which focused on the concrete or the accurate nature of the knowledge object presented. This included "contents of specific books and lectures" and "the logical structuring of a field of knowledge." The two other categories of experiences had a

tendency to move towards the abstract or were more transformational including, "a personal restructuring of a field of knowledge" and "the phenomena to be learned about through knowledge restructuring", erasing the difference between concrete and abstract notions of these knowledge objects (Marton & Booth, 1997). The learner's experience of learning has been correlated to the relationship with the course in the context of the educational institution. Table 1 is a representation of the two distinctive approaches to learning charted by the learners and its reflection on the learners' orientation to learning at various stages of the course. This has further been connected to the concepts of learning adopted by the learner, and charting distinctly different directions based on the learning approach taken (Morgan & Beaty, 1997).

The variations within the learner's learning experience have been presented as the concurrent awareness of the various facets of the same phenomenon. From the learner's perspective, awareness has been described as the total sum of the learning experiences with changes in the *structure of awareness* based on the variations in perceiving the identified phenomenon (Marton & Tsui, 2004). *'Appresentation,'* a phenomenological term, has been described as an important facet of awareness within the learner's experience and is tantamount to his or her consciousness. The learner's sensory experience of the phenomenon; even in its partial form, through his or her perceptual consciousness is experienced in its totality or 'appresented' within the structure of awareness (Marton & Booth, 1997). Thus ways of experiencing learning and structure of awareness have played a key role in educational research about students' learning and is further elaborated in the two complementary learning models; constructivism and phenomenography.

2.1.3 Object of Learning: Space, Situation, Context, Environment

The space of learning is encompassed by "any number of dimensions of variation and denotes the aspects of a situation, or the phenomena embedded in that situation, that can be discerned due to the variation present in the situation" (Marton & Tsui, 2004). As per Marton et al. (2004) within the learning situation, variation is either present or absent from the learner's prior experience through his or her object of learning. These dimensions of variation include the learner's experience from that individual's memories or learning situations that cannot be distinguished in the present situation.

The *object of learning* is examined at the collective and the individual level. This phenomenon is presented from a second-order perspective by the '*experiencer*' and his or her experience, but not as the subjective representation of the researcher (Marton & Booth, 1997). The *object of learning* has been defined through the pedagogical perspective of teaching and learning. Here, teaching is presented as the human action

of an entity giving another entity the experience of a specific thing. Within this emerging situation, the entity who has been teaching is acknowledged as a teacher, whereas the

Figure 1: 'How' and 'What' aspect of learning based on the analysis of the act of learning with the quality or the indirect object of learning; in reference to the content or the direct object of learning (Marton & Booth, 1997) based on Fig 5.2
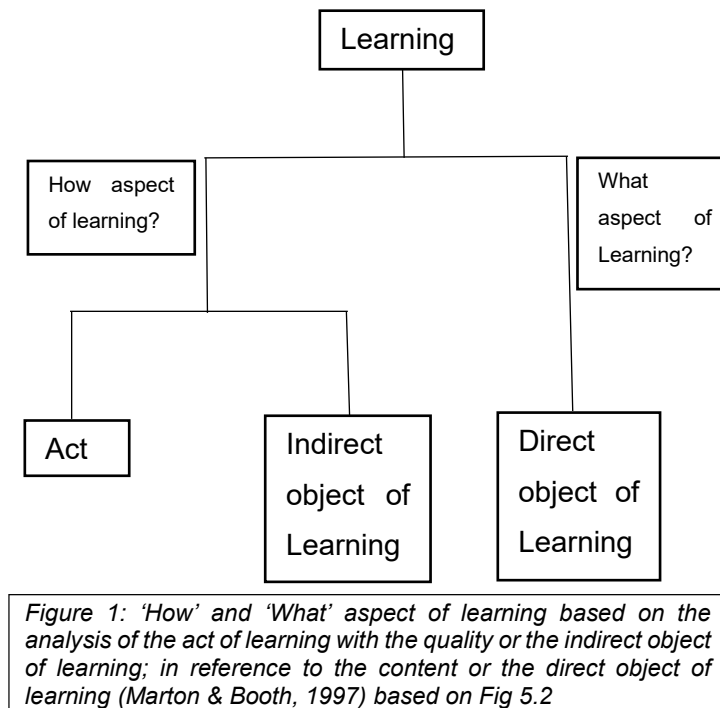
entity being taught is the learner or the indirect object of learning. The specific thing that was being taught, or the content, is the direct object of learning (Marton & Tsui, 2004), as depicted in Figure 1.

The *element of learning* has been distinguished at the individual and collective level. Here the learner is being prepared at the individual level to understand the indirect object of learning or the notion of the ever changing world, and the future, which is still unknown. This has been the case at an incremental level in collective learning as the learner transitions from school to university (Bowden & Marton, 1998). The impact of the social context on learning has included the nature of the learner's construction of his or her understanding within the social situations in the past, the tools and the
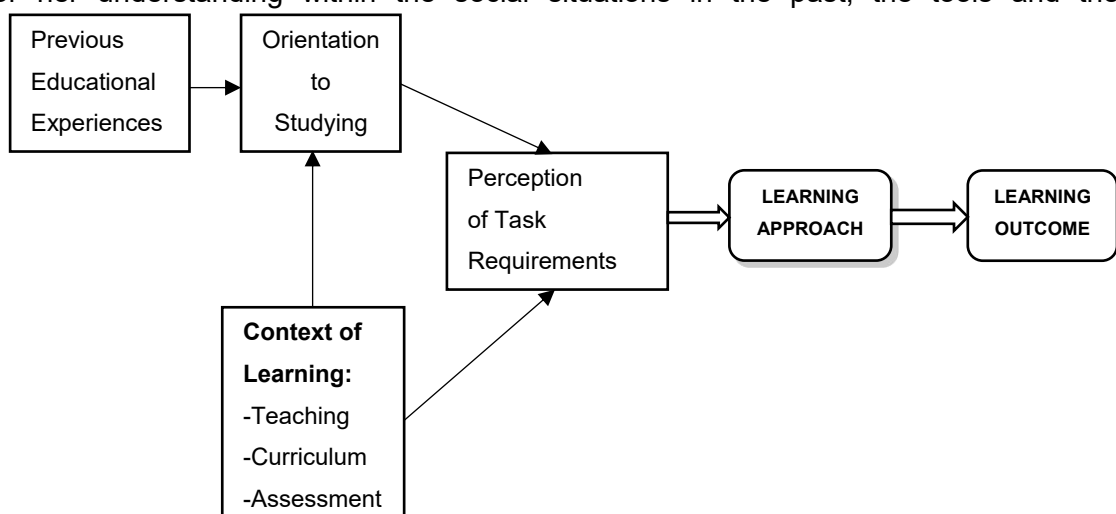
Figure 2: 'Student learning in context', presenting the context of learning with reference to learning approach and outcome (Ramsden, 1992) based on Fig 5.1

conventions that have been used in the development and working of those understandings; and the approach used in expressing the learner's learning process (Moon, 2004).

The learning occurs within the educational environment that includes the curriculum, teaching methods, assessment and physical facilities. Thus a consolidation of this learning context is essential, as this is important both from the perspective of the learner and the phenomenon in question; *learning* in context of the student depicted in Figure 2 (Ramsden, 1992). This figure is presented as an analytical representation of the ever-changing relationship of various facets of teaching and learning. This is reflected within the learning environment in educational institutions, that amalgamate various distinctive contexts of learning, from procedural framework of teaching and assessment, to its influence in direct and indirect ways on the students' experiences and approaches to learning (Ramsden, 1992, 1997). The object of learning in both, the learning context as well as the environment, represent the frame of reference; within this the students' approaches to learning develop and are presented as the learning outcomes.

2.2 Learning Philosophy, Theories & Models

"Progressivism" or learner-focused education has been the focus to which university education within the western world has subscribed in the 20th century. The learner as being central, with the amalgamation of teaching around the learning process, has been in stark contrast to the "traditionalist approach". Under this approach, the focal point was on the process of teaching and the quality of the content being delivered to the learner by the teacher (Marton & Tsui, 2004). Modern educational research has seen the "Now-at-last-the-One-Correct-Theory-of Learning" approach missing the point of both the learner and the learning process, by focusing on the context of the classroom and the institutional framework (J. B. Biggs, 1994).

The critical review of literature concerning the traditionalist approach and a series of research studies on learner-centric approaches are attributed to the tendency to changing the focus from the teacher and teaching, to the learner or the indirect object, and the content or the direct object of learning (Marton & Tsui, 2004). From implicit-to-explicit theories of learning, to the long debates on the quantitative-vs-qualitative assumptions of acquiring knowledge, learning models have blamed the teacher or the student cohort. Further models have included the process-based, constructivist classroom-based, institutional and phenomenographic model, with research into learning having come a full circle (J. B. Biggs, 1994, 2011).

Bowden and Marton (1998) have presented some influential factors in educational research which has been moving towards a 'student-centered' approach within the

framework of learning and teaching in the direction of effective learning outcomes. As a result of the transparency factor in sharing the learning goals to providing the differentiation between memorization or acquiring information, and meaningful learning, the learner is given the awareness of the process of discrimination. The learner's skills are further reinforced by the understanding required of the information being provided and through the existing knowledge drawn from prior experience. These factors are further emphasized in the responsibility borne by the learner leading to self-learning and active espousal in the learning context of dealing with content-related problems. The key factors required from the teaching perspective includes qualitative feedback being provided at regular intervals to the learners. This further includes a balanced approach towards the scope of both the content and curriculum in respect of the conflict of interest posed in attaining learning skills and understanding. Teachers are also expected to take the student through the learning experience of the key facets of the world through the integration of their learning competencies with a focus on "observable practice, discipline-based knowledge and; skills and generic attributes" (Bowden & Marton, 1998).

Learning as a philosophy has been studied through all the three schools of philosophical discourse from the moral, natural and metaphysical perspective. So the philosophy of learning as a doctrine is viewed with stark variations depending on the field or the area of specialization. From the biological to the scientific frame, the behaviorist to the cognitive perspective, the social and organizational theorists to the constructivist theoretical perspective, the philosophy of learning has come a long way. From the schism of learning being advocated as a noun and a verb, three schools of thought have emerged in the study of the philosophy of learning. The first school has included duality and the traditional conceptual doctrines in the work of Plato and Aristotle, to the second focusing on the progressive movements led by the French revolutionary ideas of Jean Jacques Rousseau, and John Dewey's innovative work (1916). The third school has focused on the modern-day process of clarifying the traditional and progressive standpoints. Dewey's articulation on the total disconnect between the mental and the practical paradigm within traditional education is an essential reflective starting point (Brockbank & McGill, 2007c). John Dewey's philosophical chord had paved the way in rejecting the earlier dualistic, value-centric and emotion-based educational doctrine towards learning theories, based on scientific principles (Brockbank & McGill, 2007c).

Table 2 (below) depicts the comparative theoretical standpoints of influential research in the educational context from Dewey(1916) through William Perry (1970) to the contemporary period, and the basic dualist perspective presents the developmental stages that incorporate the epistemological perspective throughout. This includes the

four stages of learning put forward by Piaget (1971) from accommodation to assimilation. Marton et al. (1976) have presented learning from a non-dualist phenomenographic perspective paving the way for the classroom-based *constructivist* approach towards studying, learning and teaching (Brockbank & McGill, 2007c; Dawson-Tunik, 2004).

	Dewey (1916) the essentials of learning	Piaget (1971-&1977) stages	Commons (1993) general stages	Fischer & Bidell (1998) skill levels	Marton et al. (1976, 1993, 1997) Conceptions of learning	William Perry (1970; 1988) epistemological perspective	King et al. (1989) reflective judgement	Loevinger (1987) education	Black & Ammon (1992) pedagogy	
SURFACE	A genuine situation of experience	(sensorimotor)	Preoperational	Single representations	Learning as facts					ATOMISTIC
	A genuine problem in that situation	(preoperational)	Primary	Representational mappings	Learning as memorization					
	Information and observation about the situation	Concrete operations (concrete operational)	Concrete	Representational systems	Learning for application	Basic duality	Knowledge resides in authorities	Education as a thing to get	Teaching by show and tell	
	Suggested solutions for which the learner will be responsible		Abstract	Single abstractions	Learning as insight	Multiplicity prelegitimate	Some knowledge certain	Education as presentation for job/career	Teaching by getting students to practice	
			Formal	Abstract mappings		Multiplicity subordinate; multiplicity coordinate or relativism subordinate	Knowledge uncertain: lack of information	Education as a part of inner life	Teaching for understanding	
DEEP	Opportunity and occasion to test ideas by application, to make the meaning clear and discover for self their validity	Formal operations (formal operational)	Systematic	Abstract systems	Learning as personal development	Relativism generalized; commitment foreseen; initial commitment	Interpretation and context figure in all understanding	Education as intrinsically valuable	Teaching for construction	HOLISTIC
			Metasystematic	Single principles	Learning as personal transformation	Orientation in commitments; evolving commitments	Truth is relative to evidence / context		Teaching for integration	

Table 2: Comparative Theoretical Standpoints in Learning within Influential Educational Research (1910's to 1090's), based on Comparison of Developmental sequences seven educational scientist's work with Dewey (1916) adapted from Table 1 (Dawson-Tunik, 2004)

2.3 Structure of Knowledge, Approaches to Learning & Learning Conceptions

The formulation of the learning process is considered as a specialization with respect to all the spheres of knowledge. The questions that have been the focus for educational research in the formation of knowledge include "how knowledge is formed within different fields, how new ways of seeing different phenomena are brought about, (and) how critical aspects are discerned and focused on simultaneously" (Bowden & Marton, 1998).

Moon (2004) has termed the conception of knowledge and its development from the learner's perspective as a modification of that person's view of knowledge. A

progression in this viewpoint will enable the learner to raise understanding of the knowledge conceptions to more sophisticated levels. The learner is going through the process of "conscious or unconscious decision about how to frame knowledge, means that a learner is working with internal experience as opposed to the material of learning," i.e. the learner's external experience (Moon, 2004). *Conceptions of learning* is the learner's experience of modifying the structure of knowledge and its progression within the learning context. The studies into the learner's conceptions of learning depicted in Table 3 have derived six distinctive classifications with the structure of knowledge being central towards understanding the learning experience (Ramsden, 1992; Sharma, 1997; van Rossum et al., 1985; Van Rossum & Schenk, 1984).

	Learning Conceptions Biggs (1979) & Van Rossum et al. (1984 & 85)	Analysis on Learning Conceptions Ramsden (1992)	Six-year longitudinal study on Learning Conceptions Marton et al. (1993)	
SURFACE —————————————— DEEP	Learning as (*qualitative increase in*) acquiring knowledge. *Learning is acquiring information or 'knowing a lot'* **(1)**	'conceptions (1), (2) and (3) are external to the student'	'Marton et al. found through a phenomenographic study, a sixth conception to add to Saljo's five. This conception was observed in only a few cases and was hierarchically related to conceptions (4) and (5)'	SURFACE —————————————— DEEP
	Learning as memorizing. *Learning is storing information that can be reproduced* **(2)**	*Perry's (1970-88) view of students' conceptions as 'the absolutistic view of knowledge'*		
	Learning as application of knowledge. *Learning as acquiring facts, skills, and methods that can be retained and used as necessary* **(3)**			
	Learning as making connections between parts of a subject and between subjects. *Learning as making sense or abstract meaning. Learning involves relating parts of the subject matter to each other and to the real world* **(4)**	'while (4) and (5) are internal and emphasize the personal aspect of learning'		
	Learning as interpreting and understanding reality in a different way. Learning involves comprehending the world by reinterpreting knowledge **(5)**	*Perry's (1970-88) view of students' conceptions as 'learning towards a relativistic conception'*	**'learning as changing as a person' (6)**	

Table 3: Comparative analysis of Studies on Learning Conceptions and their correlation to structure of Knowledge (Ramsden, 1992; Sharma, 1997; van Rossum et al., 1985; Van Rossum & Schenk, 1984)

The studies on learning conceptions have revealed the changes that can be brought within the learner going through the process of the learning experience. This is a
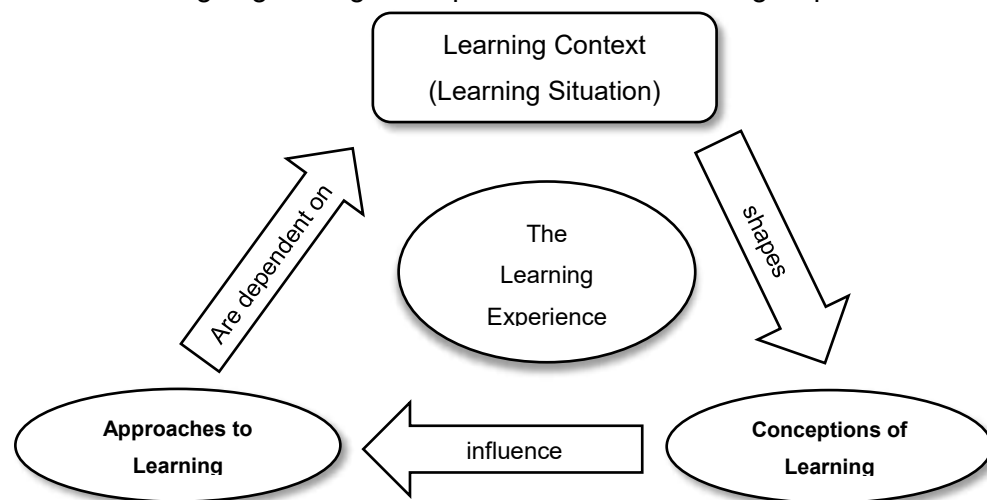
Figure 3: The Learning Experience - 'The relationship between conceptions of learning, learning context and learning approaches' (Hou, 2009) based on Figure 1

progression in the development of the learner's personality, profile, and the understanding of the world as a learning situation or the learning context is constantly being evolved through his or her approaches to learning.

Figure 3 has depicted the learning experience of the learner with the clarity of the learning triangle where the context or the learning situation holds the key in shaping the conceptions of learning, which in turn has a direct influence on the approaches to learning. The importance in this triangle is looking at the learning experience in its entirety and its dependence on the learning context, with the approaches to learning being taken by the learner in achieving a higher level learning conception.
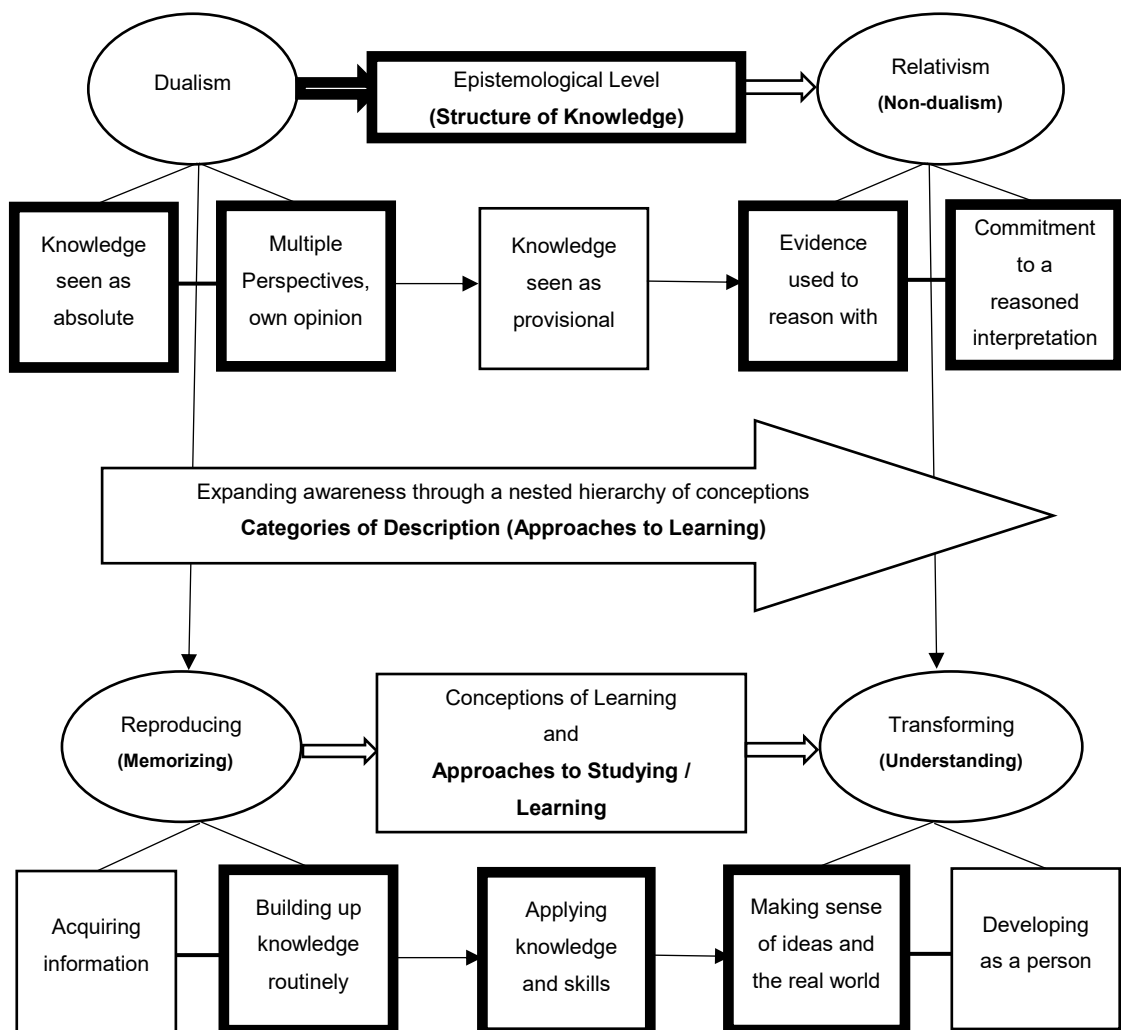
Figure 4: Epistemological Reflection of the Structure of Knowledge, adaptation of 'Conceptions of Learning and Epistemological Levels' identified by Perry (1970) reflecting the role of 'Structure of Knowledge,' 'Approaches to Learning,' and 'Conceptions of Learning' based on (Entwistle, 2000)

Thus *'conceptions of learning'* and *'approaches to learning'* have been described as the same side of the same coin by educational researchers with teaching being the other side. This includes the transformational facet of self-learning where the learner embodies the role of the teacher going through the process of learning. Based on the fundamental question of "What do you mean by learning?" research into conceptions of

learning was identified by Perry (1970) as aspects of memorization and reproduction by the learners. This was deemed to be sufficient by the teaching community in comparison to the transformative facet of understanding and conceptualizing from prior understanding and knowledge. These conceptions were formally identified through research into text-based learning process and presented as learning conceptions upon which the learners embark, termed as approaches to learning (Entwistle, 2000; Marton & Saljo, 1997; Marton & Säljö, 1976).

Figure 4 depicts the epistemological reflection of the structure of knowledge that would eventually play a key role in the constructivist and phenomenographic models with the discussion moving towards approaches to learning and conceptions through the identified *categories of description* (Entwistle, 2000). "The approach that a learner adopts will be influenced both by the individual's conceptions of knowledge and his or her personal ability to manage learning" as a definition was put to it test as a text-based research problem to Swedish university students (Moon, 2004).
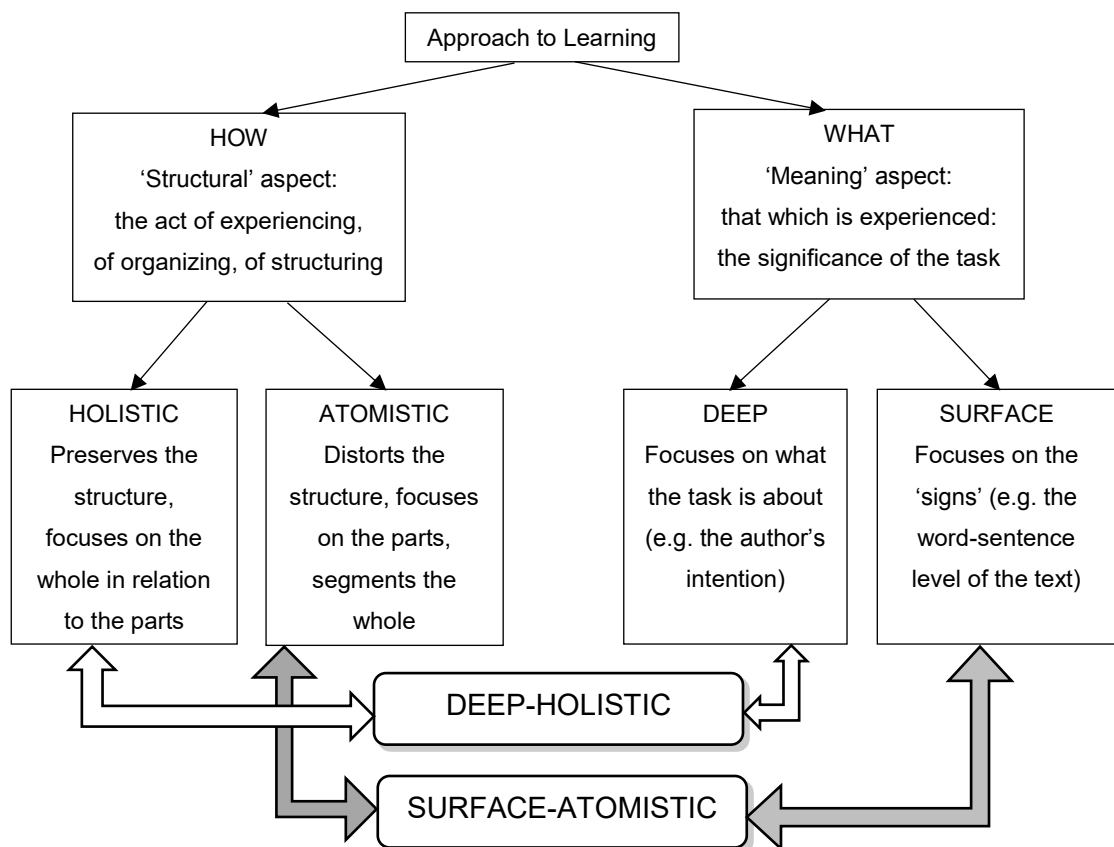
Figure 5: 'How' and 'What' Aspect of the Learning Task, adapted from 'The logical structure of approaches to learning' by Marton (1988) based on Figure 4.1 (Ramsden, 1992)

The theory on approaches to learning, both deep and surface, emerged from this pioneering research and is considered as the basis for understanding shortcomings within the learning situation and the recommendation for the required solutions for the improvement in student learning (Ramsden, 1992; Sharma, 1997). The pioneering research by Marton and Saljo in 1976 into approaches to learning with the identification

of the *'surface'* and *'deep'* approaches has led to a series of further studies including the third dimension of the '*achieving*' (Biggs, 1987) or '*strategic*' approach (J. Biggs, 1979). Approaches to learning have emerged as the connecting thread between the learning environment and the learner's cognitive and learning styles (J. B. Biggs, 2011; Serife, 2008).

The approach to learning has been described as the action taken when undertaking a specific learning task, within a particular learning context. It is also the reference to the level of thinking undertaken as well as the action. The approaches to learning as a concept had its original research focus based on text-based studies by Marton & Saljo (1976) involving the students' key task of reading the text. These studies on learning approaches focused on 'what' was experienced, thus looking into the meaning of the learning task. The text-based studies helped in deriving 'deep' and 'surface' approaches to learning extrapolated in Sub-section 2.5. Learning approaches were also studied from the aspect of structuring and organizing the learning task, thus focusing on 'how' the learner organizes the learning task or the structural facet described in the work of Lennart Svensson (Marton & Svensson, 1979; L. Svensson, 1997). This led to a parallel set of learning dimensions including the *'holistic'* and the *'atomistic'*, in line with the deep and surface level of processing the learning task. Figure 5 has depicted what educational researchers have further studied, combining the 'how' and 'what' of the learning task and amalgamating the learning approaches as 'deep-holistic' and 'surface-atomistic' (Ramsden, 1992).

2.4 Teaching Theories & Approaches to Learning

The original Gothenburg studies conducted by Marton and his team in the 1970's had their focus on the deep and surface approaches to learning, which had a functional correlation to the learning outcomes. The research was undertaken at the level of identifying, differentiating and categorizing the conceptions including the approaches to learning through qualitative research methodologies rooted to grounded theory including *Phenomenography*, the research method that emerged from these studies (Marton, 1981). This classroom-based, constructivist and theoretical model in parallel with other models including 3-P (Presage – Process – Product) model and SOLO (Structure of the Observed Learning Outcome) taxonomy have helped in the further integration of research into students' learning approaches together with teaching and learning outcomes (J. B. Biggs, 1994, 2011; Ramsden, 1992). Approaches to learning has been referred to as the reaction to the learner's experiences within the learning environment, both as visualization and in action. The relationship of the student' approaches to learning is extended not only to the demands of the learning situation as they perceive it, but also in the requirements represented by the institutional context in which they are

learning. The learning situation that has been experienced by the learner is not in abstraction and is termed as the object of learning (Bowden & Marton, 1998). The object of learning is also referred to as acquiring the 'knowledge-base' of an existent substance or abstract feature. This has a prominence within the process of learning as "the aspect refers to acts or the indirect object of learning, whereas the specific aspect refers to what is acted upon or the direct object of learning" (Marton & Tsui, 2004) (Figure 1).
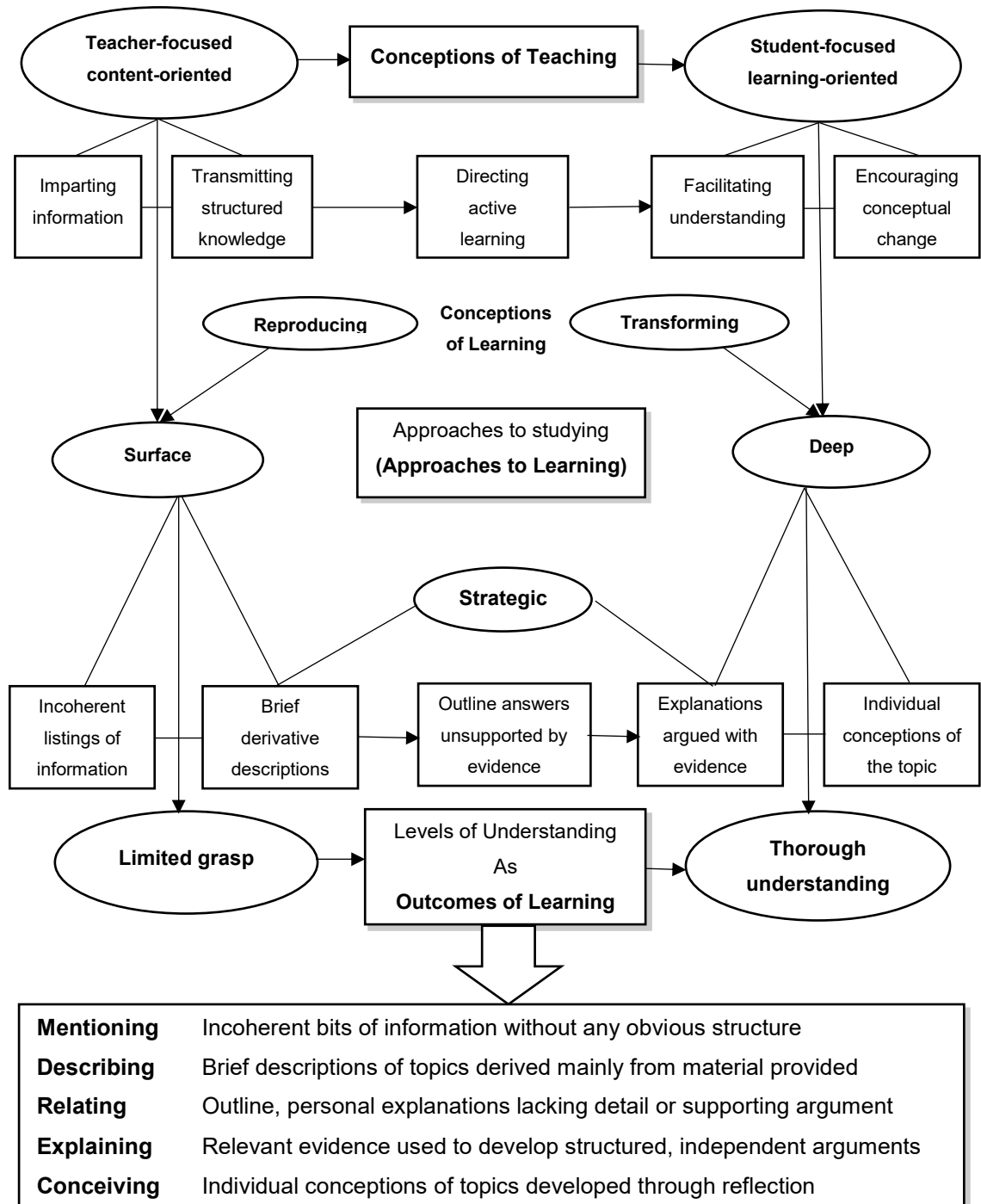
Figure 6: Levels of Understanding and Learning Outcomes, adapted from 'Influences of conceptions of teaching & learning on approaches to studying (learning),' (Figure 3) and (levels of understanding as) outcomes of learning (Table 1) (Entwistle, 2000)

The importance given to the object of learning is due to the learner's area of focus on the direct object or acquiring this knowledge base; whereas the teacher is required to focus on both the former, the indirect and the latter, the direct object of learning. The teacher's due diligence is required in not only ensuring that the learner is fully acquiring this *knowledge*, but also by focusing on what the learners "are trying to learn" (Marton & Tsui, 2004). *Knowledge base* has been further classified from its traditional framework or "mode 1" within educational research towards a 'context-driven, problem-focused and interdisciplinary' perspective, labelled as "mode 2" knowledge (Gibbons et al., 2010). Knowledge has further been connected to students' engagement within the learning process through the dynamics of curriculum construction as 'active knowledge' or the "act of knowing" (Barnett, 2007).

In Figure 6, the levels of understanding portrayed by the final year students at the University of Edinburgh have been identified as the outcomes of learning in five categories depicting the approaches to studying or learning taken by the learner from surface learning to the deep, as well as the strategic, dimension (J. Biggs, 1979; Marton & Saljo, 1997; Marton & Säljö, 1976). These categories have been derived through pedagogical research using the conceptions of teaching and learning and practically implemented through the SOLO taxonomy (J. B. Biggs, 2011) with the distinctive scenarios of teacher-focused content-oriented classrooms versus student-focused learning-oriented classrooms (Entwistle, 2000). The importance of imparting knowledge in its dynamic form vis-à-vis its static form is brought to prominence in the identified categories from 'conceiving-to-explaining' at a deeper level or 'the act of knowing' moving towards 'relating' with 'describing' and 'mentioning' at the surface level of the learning outcomes (Barnett, 2007; Entwistle, 2000)

2.5 Deep, Surface & Strategic Approaches to Learning

'*Student learning research*,' a body of educational theory has been developed since the 1970's with *phenomenography* and *constructivism* as important research frameworks working in tandem within educational practice. Deep and surface approaches to learning identified as a part of the original studies at Gothenburg have particularly been influential at looking into the learner's creation of meaning in the learning activities and outcomes achieved by students (J. B. Biggs, 2011; Marton & Säljö, 1976). The defining features of the deep and surface approaches to learning have been compared to the original studies done using phenomenography; and later using constructivism by looking at "learning within its nature setting" in connection with teaching and learning outcomes through assessment (J. B. Biggs, 2011). Assessment has been the key factor that has led to an intermediate category of learning approach, strategic or achieving approach

being identified; here the learner has a focus on grades with the experience of learning being taken up as an organized framework (J. Biggs, 1979; J. B. Biggs, 2011).

Table 4 gives a complete picture of the learner's perspective of how his or her approach to learning would evolve within the learning situation or the context in question based on the learning conceptions. So does the learner want to understand the hidden meaning of the learning context that has been presented in the learning conception? Why do the approaches to learning evolve once the teaching approaches and learning outcomes become connected to the assessment criteria? The answer to these questions should be based on the understanding of surface and deep approaches to learning.

Defining features of approaches to learning (Table 1.1) (N. J. Entwistle, 1997) 'Structural Aspect' - 'How?'		Different Approaches to learning (Table 4.1) (Ramsden, 1992) 'Meaning Aspect' - 'What?'
Deep Approach *Intention* – to understand ideas for yourself	*Transforming* **by**	**Deep Approach** *Intention to understand. Student maintains structure of task*
		Focus on 'what is signified' (e.g. the author's argument, or the concepts applicable to solving the problem)
Relating ideas to previous knowledge and experience		Relate previous knowledge to new knowledge
Looking for patterns and underlying principles		Relate knowledge from different courses
		Relate theoretical ideas to everyday experience
Checking evidence and relating it to conclusions		Relate and distinguish evidence and argument
Examining logic and argument cautiously and critically		Organize and structure content into a coherent whole
		Internal emphasis: 'A window through which aspects of reality
Becoming actively interested in the course content		become visible, and more intelligible' (Entwistle & Marton, 1984)
Surface Approach *Intention* – to cope with course requirements	*Reproducing* **by**	**Surface Approach** Intention only to complete task requirements.
		Student distorts structure of task
Studying without reflecting on either purpose or strategy		Focus on 'the signs' (e.g. the words and sentences of the text, or
Treating the course as unrelated bits of knowledge		unthinkingly on the formula needed to solve the problem)
Memorizing facts and procedures routinely		Focus on unrelated parts of the task
		Memorize information for assessments
Finding difficulty in making sense of new ideas presented		Associate facts and concepts unreflectively
Feeling undue pressure and worry about work		Fail to distinguish principles from examples
		Treat the task as an external imposition
Strategic (Achieving) Approach *Intention* – to achieve the highest possible grades	*Organizing* **by**	External emphasis: demands of assessments, knowledge cut off from everyday reality
Putting consistent effort into studying		
		Strategic (Achieving) Approach has not been identified as the above research on approaches to learning was based on the 'Meaning Aspect' (Marton & Säljö, 1976)
Finding the right conditions and materials for studying		
Managing time and effort effectively		
Being alert to assessment requirements and criteria		
Gearing work to the perceived preferences of lecturers		
Table 4: Comparative analysis of the 'How' and 'What' with reference to the approaches to learning based on (Table 1.1) (N. J. Entwistle, 1997) and (Table 4.1) (Ramsden, 1992)		

2.5.1 Surface Approaches to Learning

Surface approaches to learning have been articulated as the signifiers of fragmented forms of learning, for instance, treating facts in isolation, treating items as independent entities, absorption of the content instead of the underlying context and a negative emotional strategy towards the learning experience. Memorization or the act of rote-learning have stereotypically been connected to surface approaches to learning, which has been the case in western culture. But this form of learning has been attributed to deep approaches within Asian Culture especially in Chinese students (J. B. Biggs, 2011;

Marton & Booth, 1997; Moon, 2004). The studies on Chinese students has pointed to use on learning conceptions at an external level including memorization with a focus on acquiring and retaining knowledge that has led to deep approaches to learning. The studies have pointed to the influence of the learning context or situation for this form of learning experience to emerge from these studies (Marton & Tsui, 2004). These studies on students from the Asian culture is relevant in this research as an Indian institution is amongst four architectural institutions being studied.

2.5.2 Deep Approaches to Learning

Deep approaches to learning have been signified by the meaningful engagement of the learners in conducting the tasks with preference given to connecting the key themes, concepts and ideas within the learning situation. The learner following a deep approach has naturally been trying to focus on both, upon the details and upon the learning task as a whole. The emotional chord of the learner includes being in a positive frame of mind, with a high level of self-motivation; and developing the learning experience into a pleasure by articulating beyond the learning context (J. B. Biggs, 2011; Moon, 2004). Research has shown that students with the tendency to approach learning at a deeper level are not necessarily at the highest point when it comes to assessment and grades (Moon, 2004; Ramsden, 1992).

A study by Trigwell et al. into deep and surface approaches to learning that were adopted by first year university students was found to be correlative to their emotional learning experience and learning outcomes (Trigwell, Ellis, & Han, 2012). Students with positive learning experience were found to be adopting the deeper approach to learning and were correlated to the higher achievement spectrum, in comparison to weak and negative emotions leading towards the surface approach. This study has suggested that enhancement of the students' learning experience through the design of new learning environments had a considerable effect on their emotional range within the complete spectrum (Trigwell et al., 2012). 'Intrinsic motivation' is a key feature that has its association with deep approach to learning, where the students do not feel threatened and in a state of constant anxiety. Students following the surface approach on the other hand, had to use the feature of 'extrinsic motivation' or feeling threatened constantly in the learning context, with a high level of anxiety. This situation could evolve based on the encouragement provided within the learning context to motivate the students and help them in transforming their learning experience toward a deep approach to learning (Marton & Saljo, 1997).

2.5.3 Strategic Approaches to Learning

The third approach to learning that has been identified, i.e. the strategic learner or a learning approach which has its focus on *'achievement'* or *'strategy.'* The strategic learner has been identified as taking an approach that is very different from the deep and surface approaches to learning. The learner is seen to be adopting aspects of the deep and surface approaches in order to be successful in the assessment criteria set, which includes achieving high grades. Since the motivation is towards a successful conclusion in the learning situation based on the teaching and assessment criteria set within its organizational framework, this approach has also been termed as an achieving approach (J. Biggs, 1979; J. B. Biggs, 1987a; Moon, 2004). Learners who have been adopting this approach have been characterized as students with ambition and organizational capabilities, and who put in maximum effort towards the criteria of assessment (J. B. Biggs, 2011; Prosser & Trigwell, 1999).

2.6 Learning Strategies & Styles

Learning strategies have been identified as an overlap to the 'strategic' approach of learning taken by students whose focus is on scenarios where they can achieve maximum grades. Research into learning strategies have examined the learning path traversed by students from surface and deep approaches (Marton, 1975), to the holistic and atomistic model (Svensson, 1975 & Saljo, 1979) and the question of learning styles by correlating learning dimensions to the learning context and content (Ramsden, 1988) (Brockbank & McGill, 2007c). This has further led to further discussion on the difference between learning styles and approaches to learning, as the latter has a close resemblance to "student's personality typology" (Sharma, 1997).

There has been an interchangeable use of cognitive and learning styles with reference to research into student's learning. Whereas learning styles have been used to assign a range of attributes and differences within the students' cohort; cognitive styles have been focused on students at an individual level. Duff (2000) has stated that "a *learning style* is the composite of cognitive, affective, and psychological factors that serve as an indicator of how an individual interacts with and responds to the learning environment" (Serife, 2008). Figure 7 depicts the amalgamated picture of the position of learning and cognitive styles within the learning context as studied from the perspective of Curry's (1983) original Onion Model presented in the backdrop of the 3-P (Presage – Process – Product) model from a constructivist perspective, linked to Duff's (2000) indicators and based on Price's(2004) interpretation of cognitive and learning styles (Serife, 2008). This is based on the domains proposed by Bloom (1956) including the cognitive, affective and psychomotor domains.

Product Output

P3(Product)

3 *Instructional Preferences*
Learning Strategies
APPROACHING TO LEARNING
Approaches to Studying
3

P2(Process)

2
Information Processing Styles
Learning Styles
Cognitive Styles   **Learning Skills**

PSYCHOLOGICAL FACTOR
Psychomotor domain
(about doing)

LEARNING
CONTEXT

1
Cognitive Personality Styles
Characteristics of
Personality

AFFECTIVE FACTOR
Affective domain (about attitudes, feelings)

P1(Presage)

COGNITIVE FACTOR
Cognitive domain (about knowing)

*Figure 7: Learning and Cognitive Styles within the Learning Context, based on Curry's (1983) Onion Model (Figure 1) by Price (2004) with **Duff's (2000) indicators based on the three domains by Bloom (1956)** and overlapped with Individual Differences and Learning Environment (Figure 3) (Serife, 2008) indicating the role of Learning & Cognitive Styles within the overall Learning Context using the 3-P Model*

Learning skills have been studied as a separate facet of the learner's knowledge of one specific aspect within the process of learning, which is termed in an array of broadly used terms including 'cognitive skill,' 'presentation skill,' 'study skill,' 'physical' and 'practical skill' (Moon, 2004). *Learning skills* as an attribute falls in the domain of learning and cognitive styles with reference to the learner. *Learning styles* have been distinguished as the positions taken by the students, independent of the learning task or the teaching context in hand; whereas *approaches to learning* has its basis in the learning context and the student's learning experience within this learning situation. The constructivist model has taken the path by looking at both the learning and teaching context in determining the learning conceptions and students' approaches to learning (J. B. Biggs, 2011).

2.7 Constructivism: Learning & Teaching Models

Constructivism and phenomenography have played a key role in the research on students' approaches to learning with the focus of these research methodologies directed at the creation of meaning by the learner. Constructivism has also focused "particularly on the nature of learning activities the student uses and on this account more readily leads to enhanced teaching" (J. B. Biggs, 2011).

2.7.1 Learning & Teaching Models

Understanding the learning and teaching models that have emerged requires a renewed focus on students' learning and the teacher's role as facilitator in providing the learning context for the learners in achieving their intended learning. Investigation into classroom learning have pointed to maximizing or minimizing the student's learning opportunities based on the discourse between the teacher and students. This is because of the dual role of the teacher in focusing on the direct and indirect objects of the learners' learning (Marton & Tsui, 2004).

Teaching should aim to be the cause for students' learning. Research in education has presented detailed connections between learning and teaching. This connection has been the area of focus for Biggs and Collis (1982) showing the application of the SOLO (Structure of the Observed Learning Outcome) taxonomy to the outcomes of learning, design of curriculum and criteria for assessment.

Levels of Biggs's SOLO Taxonomy (Table 4.4) (Ramsden, 1992)			Teachers' response to questions on teaching and learning from Chapter 2 (Ramsden, 1992)	
1	**Prestructural**	Use of irrelevant information, or no meaningful response	**Case 1**	Teaching is about transmitting knowledge from academic staff to students
				Student learning is separate from teaching
				Student learning is a process of acquiring new knowledge
				Problems in learning are not to do with teaching
2	**Unistructural**	Answer focuses on one relevant aspect only	**Case 2**	Teaching is about managing student activity
3	**Multistructural**	Answer focuses on several relevant structures. But they are not coordinated together		Student learning is associated with teaching
				Problems in learning can be fixed by adopting the right teaching strategy
4	**Relational**	The several parts are integrated into a coherent whole; details are linked to conclusions; meaning is understood	**Case 3**	Teaching is about making it possible for students to learn subject content
				Student learning is a long and uncertain process of changes in understanding
5	**Extended abstract**	Answer generalizes the structure beyond the information given; higher order principles are used to bring in a new and broader set of issues		Teaching and student learning are parts of the same whole; understanding students' ways of thinking about the subject matter is essential to effective instruction
				The activity of teaching and the process of reflecting on it are inextricably linked
				Problems in learning may be addressed by changing teaching, but with no certainty of success. Constant monitoring is needed, as yesterday's solutions might not work today

Table 5: Learning Outcomes and Teachers' Experience, based on mapping of five levels of outcome based on Biggs's SOLO Taxonomy (Table 4.4) and Teachers' response to questions on teaching and learning from Chapter 2 (Ramsden, 1992)

Table 5 has depicted the mapping of levels of outcome used in classifying the structural complexity of the responses given by students, as identified using the SOLO taxonomy (Biggs & Collis, 1982; Van Rossum and Schenk, 1984) with the teachers' conceptions from the fields of electrical engineering, politics and physiology on questions of teaching and learning (Ramsden, 1992). The Table 5 mapping also represents that the teachers' conceptions is likely leading to learning outcomes.

In the overall context of educational research, the focus is shifting towards the perspective of the student or the learner. Students' perceptions of the learning context is in direct correlation to their previous experiences, with the approaches to learning determining their learning outcomes. The learning context includes the larger framework involving the teachers and their approaches to teaching, the course design and the curriculum; and the department or faculty in perspective (Prosser et al., 2003; Prosser & Trigwell, 1999). The learning environments at university level have focused on teaching instead of learning. The mission statement for the past century has centered on the teaching core, research and the professional services being offered and restricted to a singular function. This focus has shifted to the students' learning perspective at an individual level and in research where the humanity is learning at a collective level, with the impact of learning directed towards learning in the society at large (Bowden & Marton, 1998). The question of a learning and teaching model has been perceived as the universal correlation of education as an ecosystem with a complex, organic and unpredictable condition, like a natural 'swamp' as described by Schon (1987). Any measurable addition or subtraction to this ecosystem could well, destroy its natural condition (J. B. Biggs, 1994).

2.7.2 Classroom-based Constructivist Model
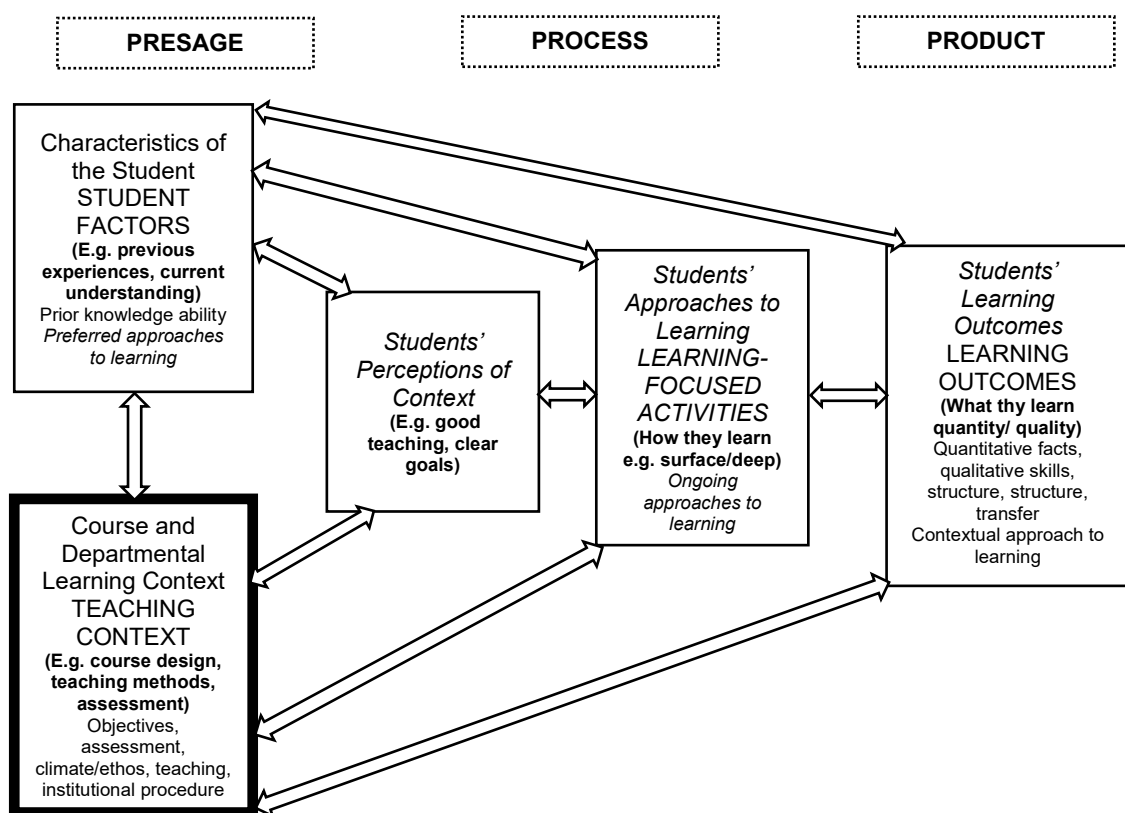
Figure 8: The 3-P Model Presage – Process – Product Model of Student Learning based on Figure 1 (J. B. Biggs et al., 2001) and Figure 2.1 (Prosser & Trigwell, 1999) adapting two versions and presenting Student Learning in Context

Learning from a constructivist viewpoint has pointed to two key facets that have developed beyond the perception of knowledge accumulation. The first facet is the flexibility within the cognitive structure for change at times, with no requirement of additional learning material. The second is the facilitation of selecting and assimilating additional learning material, with the choice of learning and creation of new meaning being in the hands of the learner (Moon, 2004). Biggs has described constructive alignment which is based on outcomes-based education with the focal point shifting back to learning "to increase the likelihood of most students achieving those (learning) outcomes" (J. B. Biggs, 2011). Learning as a process has been presented as creating a change in the conceptions of the learner instead of accumulating additional learning material (Bowden & Marton, 1998). The social constructivist movement has contributed to educational research with "its emphasis on the importance of cultural practices, language, and other people, in bringing knowledge about." This is in contrast to educational research that has a focus on student learning from a constructivist viewpoint of the cognitive structure, which has followed the movement of "individual constructivism" with "its emphasis on the learner's active role in the acquisition of knowledge" (Marton & Booth, 1997)

Two complementary theoretical models, *phenomenography* and *constructivism* have come to the fore in educational research with a focus on student learning since the 1970's. Phenomenography is based on the work of Marton and Saljo (1976) with the context of students' learning focusing on the perspective of the learner determining the question of "what is learned." The teaching perspective on the learning situation is not the focus of this model. The complementary model of constructivism has its focus on the intended learning outcomes within student learning. The framework of this model has taken teaching, learning activities and intended learning outcomes in perspective being able to conceptualize "outcome-based education (OBE)" (J. B. Biggs, 2011). Classroom-based constructivist model has its origins in cognitive psychology (Piaget, 1950) and the framework has been derived from the Dunkin and Biddle's (1974) Presage-Process-Product classroom teaching model or the 3-P Model (Biggs, 1993), presented as an amalgamated model in Figure 8. The SOLO (Structure of the Observed Learning Outcome) taxonomy (Biggs & Collis, 1982) has also been used in implementing outcome-based education (OBE) with the focus on teaching, learning and assessment (J. B. Biggs, 1994, 2011), presented as a qualitative model in Figure 9.

Through the classroom-based constructivist model and phenomenography, the research focus has been on effective learning from the learner's perspective and the changes that can be effected in that learner's perspective on the world (J. B. Biggs,

2011). This is further depicted in Figure 9, from both the students' approaches to learning and the teacher's approaches to teaching, which needs to be mapped within outcome-based education. This starting point on identifying the approaches to learning from the learner's perspective is the research focus of the other theoretical model; *Phenomenography*.

Characteristics of the student
(E.g. previous experiences, current understanding)

Students' perceptions of context
(E.g. good teaching, clear goals)

STUDENTS' APPROACHES TO LEARNING
(How they learn e.g. surface / deep)

Students' learning outcomes
(What they learn Quality / Quantity)

Course and departmental learning context
(E.g. course design, teaching methods, assessment)

Teachers' perceptions of context
(E.g. class size, teacher control)

TEACHERS' APPROACHES TO TEACHING
(E.g. teacher / student focus)

Characteristics of the teacher
(E.g. previous experiences, current understandings)

Figure 9: Model of Student Learning (Fig. 1) (Prosser et al., 2003) in the context of the Classroom –based Constructivist Model

2.8 Phenomenography & Approaches to Learning

The origins of phenomenography have as their starting point the question of 'what is learning?', that has been central to the research on learning approaches. A departure from other theoretical perspectives of learning like cognitivism, individual and social constructivism, the learner and his or her experience of learning from a constitutionalist perspective is the differentiator of phenomenography, which is elaborated further in Chapter 4, Sub-section 4.2.3. Learning has been studied in phenomenography based

on the internal relationship between the learner and the world (Prosser & Trigwell, 1999), with the focus of studying learning as the phenomenon.

Learning as the phenomenon in question is explained through its representation from the first as well as second-order perspectives. The first-order perspective is used in studying the phenomenon of learning by using specific learning models (3-P) and taxonomies (SOLO) within the research framework framed by the researcher. The experiential statements made about the 'learner-learning' or the 'person-phenomenon' relationship focusing on the learner is excluded or filtered out of the data collected. This has also been termed as '*bracketing*.' The first-order perspective is all about the detailed understanding of learning as the phenomenon, and about the learner or learners; and thus discussing the relationship between learning and learner. This discussion is based on the research framework, as the learning experience of the learners is excluded from the analysis. The first-order perspective has been used in phenomenological studies elaborated in Chapter 4, Sub-section 4.3.1.

Phenomenography uses the second-order perspective, which is the key towards unfolding the phenomenon in question. The second-order perspective is all about recording the learning experiences of the learner and learning; i.e. the phenomenon and "the question of what the phenomenon is like is bracketed" (Marton & Booth, 1997). 'Bracketing' as per Morris (2006) from the phenomenographic perspective within the qualitative research framework is the requirement placed on the researcher to filter out "preconceived ideas" by excluding certain selected portions of the collected data related to the phenomenon being studied, thus avoiding "predetermined classification" of the categories being analyzed (Kebaetse, 2010). The second-order perspective includes the focus given in recording the experiences between the learner and learning, and looking at the development and the evolution of the phenomenon in question (Marton & Booth, 1997).

Phenomenography and the research on approaches to learning by Marton and Saljo (1976) is therefore considered as the starting point for this new revolution in educational research, which is carried forward by objective-based education (OBE) looking into the teaching and learning framework through the individual constructivist viewpoint. Phenomenography from a methodological standpoint will be discussed in detail in Chapter 4. The research focus of this study is on classification of students' learning approaches that has brought back the spotlight on the learner's experience also termed as 'experiential learning' and 'reflective learning'. This is further elaborated in Chapter 3, Section 3.3.

2.9 Approaches to Learning in Other Fields & Design

Studies conducted in the field of engineering have also provided an insight into the context of understanding approaches to learning beyond the realm of deep and surface approaches. Booth's 1992 investigation into first-year computer science students' learning in writing computer programs led to the identification of four distinct approaches to learning including the 'expedient' and the 'constructional' approach that fell within the range of the surface category; whereas the 'operational' and 'structural' approach emerged within the deep category. Further research on collaborative or group studies pointed to three distinct learning categories including "Learning in isolation within the group, Learning as part of a distributed effort, and Learning as part of a collaborative effort" (Booth, 2001).

A study on a group of fashion design students approaching their project revealed four distinctive approaches to learning which were hierarchical, ranging from the deep to surface level. An earlier pilot study for this research was conducted based on these fashion design studies, and this is discussed in Chapter 5 (Bailey, 2002; Drew et al., 2001; Iyer & Roberts, 2014). Case and Marshall have compared the findings of Booth (1992), Drew et al. (2001) and two further studies in the field of engineering. Marshall (1995) and Case (2000) have indicated a further procedural range within the surface, achieving (strategic), and deeper dimensions (J. Case & Marshall, 2004). A mapping of the identified learning approaches in the above studies as depicted in Table 6 has presented the need for further research in the fields of design and architecture using phenomenography.

Marton & Saljo (1976), Biggs (1987) Approaches to Learning	Booth (1992) First Year Computer Science	Marshall (1995) First Year Engineering	Case (2000) Second Year Chemical Engineering	Drew et al. (2001) First & Second Year Fashion Design	Booth (2001) First Year Computer Science & Engineering	Case and Marshall (2004)
Surface Approach	Expedient Approach	Surface Approach	Information-based Approach	Intention to demonstrate technical competence	Learning in isolation within the group	**Surface Approach**
	Constructional approach		Algorithmic Approach	Intention to develop the design product		**Procedural Surface Approach**
Achieving (Strategic) Approach		Procedural Deep Approach		Intention to develop the design process	Learning as part of a distributed effort	**Procedural Deep Approach**
Deep Approach	Operational Approach	Conceptual Deep Approach	Conceptual Deep Approach	Intention to develop own conceptions	Learning as part of a collaborative effort	**Conceptual Deep Approach**
Table 6: Mapping of Various Studies on Approaches to learning in the field of Engineering & Design with the key studies of Approaches to Learning done in the 1970's and 80's						

2.10 Summary

The current chapter has reviewed educational research with its focus on learning, further explaining the philosophical, theoretical and pedagogical perspectives and defining the conceptions and approaches to learning. The review is further presented by looking into the cognitive and learning styles, the learning models and research methodologies in addition to the studies conducted on students' learning.

This review has presented the theoretical underpinnings of students' approaches to learning within the larger context of the philosophical and scientific standpoints of the available research in higher and university education. The definition of learning has been further extrapolated from the 'how' and 'what' aspects of learning, reflecting on both the learning context as well as the learners' experience; thus presenting the importance of students' approaches to learning in the ongoing educational research within higher and university education.

Chapter 3 explores the existing literature on learning in the field of architecture and design from a student's perspective (A. G. Iyer, 2015). The current chapter has outlined the nature of students' approaches to learning, differentiating between deep and surface which is further explored in Chapter 3 on how these approaches manifest themselves in design education.

Chapter 3: Learning: Theoretical Underpinnings within Pedagogical Research in Architectural Design Education

Learning has been summarized in Chapter 2 from the learner's perspective as the qualitative changes in their visualization, experience and conceptualization of something specific to the worldwide learning context. *Approaches to learning* are further described as actions taken by learners while undertaking specific learning tasks, within particular learning contexts. These approaches have been summarized as deep and surface approaches as well as strategic approaches based on educational and pedagogical research in higher education (J. Biggs, 1979; Marton & Säljö, 1976)

Chapter 3 reviews the existing literature within pedagogical research focusing on learning approaches in architectural education according to the definition of students' approaches to learning elaborated in Chapter 2.

3.1 Learning Approaches in Architectural Design: The Gap

"In order to teach architectural design, the ability to do a good project is not sufficient; one also needs to explain what architectural design is and how one designs. In order to learn design, carrying out a project is not enough" (Salvestrini, 1995).

Classifying the approaches to learning adopted by students in the design studio is the central theme for the current study, which examines how architecture is taught, or indeed learned. The architectural curriculum, the role-play of tutor and student within the design studio as well as the core coursework of design have been revisited on numerous occasions to examine parallels for this research question (A. Salama, 1995; A. M. A. Salama & Wilkinson, 2007; Schon, 1983, 1985).

The Salama and Wilkinson review of research scholarship into teaching and learning in the field of art, design and architecture points out that educators and researchers predominantly focus on key pedagogical issues generalized from a teaching and administrative perspective. This review focuses on pedagogic research into architectural education exploring the Classical Vitruvian triad of *'utilitas,' 'firmatis'* and *'venustatis'* (Vitruvius, 1960, 1999) (Translation publication year) moving forward to Salama's identified domains of 'academic, craft-based, technological and sociological' in architectural design (A. Salama, 1995; A. M. A. Salama & Wilkinson, 2007). There is little scholarly research work in pedagogy pertaining to students' learning in art, design and architectural education (A. Iyer, 2015). A further breakdown of scholarly research on learning has focused on the categories of learning style, industry-academia interface,

learning outcomes, technology or blended learning, collaborative and self-regulated learning, with approaches to learning being considered a minor category in this overall research output (de la Harpe & Peterson, 2009).

This brings us back to the question of 'how architecture is taught or indeed learned?' and this study has examined this theme by looking at the classification of students' approaches to learning in architectural design coursework. Students' approaches to learning in higher education have been presented in terms of surface and deep approaches (Marton & Säljö, 1976) as-well-as 'strategic' approaches (J. Biggs, 1979) as outlined in in Chapter 2. Learning approaches are informed by students' prior experiences of studying and understanding the key concepts of the subject matter, which is vital to the subsequent approaches to studying and learning outcomes (Prosser & Trigwell, 1999). Biggs has discussed the implicit and explicit theories of students' learning; with the latter pointing to the importance of the phenomenographic model (J. B. Biggs, 1994), further described as surface and deep approaches to learning (Marton & Säljö, 1976). The phenomenographic research methodology is further explained in Chapter 4.

The central theme for this study is based on the classification of the students' learning approaches to architectural design. This chapter review is correlated to the identified learning approaches from the pilot study in Chapter 5 where the first and fourth year architecture students' learning approaches have been compared (Iyer & Roberts, 2014). This pilot study has further examined the related question of whether students' approaches in architectural design are different from the deep and surface dimension. This has raised a further question on whether these identified approaches form different points on a continuum between the deep and surface dimension, or whether some approaches lie in a different dimension (A. Iyer, 2015).

Ramsden has discussed the management of teaching and learning for the teaching faculty stating that "a clear awareness of key educational principles; in particular, the principle that the content of student learning is logically prior to the methods of teaching the content" (Ramsden, 1992). Application of knowledge in an abstract learning situation has been a critical area of discussion within pedagogical research in higher education as there is a counter-argument that knowledge is best learned in the context of practice, rather than an abstract situation and then applied. Gibbons et al. have presented this dichotomy within pedagogical research by classifying knowledge as 'Mode 1 – traditional knowledge', "generated within a disciplinary, primarily cognitive, context," whereas "Mode 2 knowledge is created in broader, transdisciplinary social and economic

contexts" (Gibbons et al., 2010). Barnett et al. have connected knowledge through the engagement of students, academics and the curriculum in the learning process through the 'three challenges of knowing, acting and being' (Barnett, 2007).

This chapter reviews the philosophical differences in terms of architectural education from an international perspective in sub-section 3.4. In the United Kingdom and the European Union, architectural education is becoming increasing complex because of reinforcement of the learning context, rather than the transmission of pure knowledge that is subsequently applied. This review has further examined the North American and the Indian contexts and reviewed their philosophies of architectural education as a part of the data analysis from Chapters 7 to 10. This study has considered the first-year design coursework as the primary research vehicle for the classification of students' learning approaches. Architectural design is integral to the in-studio design process that the students undertake, which is a central theme of this classification.

3.2 Learning: Language, Pedagogy and Theory in Architectural Design

Reflections on the student learning experience are used to understand the impact on their learning approaches, and their prior experience is correlated with their design coursework. This is further exemplified in first-year design with the students being encouraged to revisit their prior experiences and explore the architectural domain. The seminal research into "how students learn" and "what motivates the student" are fundamental questions that help define students' approaches to learning (J. B. Biggs, 2011).

Roberts (2009) has articulated Biggs' focus of "the student" which he says "we all encounter". "Learning is about what the students do rather than what the teachers do" and, "if students value something, then they see it as important, and will be motivated to learn" (Roberts, 2009). This brings a requirement to classify students' learning approaches in architectural education into the foreground of this research. The structured definition of the learning approaches adopted by architecture students should be based on their prior experiences and exposure to the subject, their motivation to enrol and the value they bring to the profession.

Van Bakel traverses various definitions of *architectural design,* from a 'signifier of power' by Rapoport (1979) through the 'Vitruvian expressions to the modern values of aesthetics, function and technology' by Moore (1979) and the 'transformational brief' by Foz (1972). Through multiple definitions he has stated that "unique for architectural designing is the combination of the designing of a space and the use of this space, where sometimes the form follows function, and sometimes the function follows form"

(Van Bakel, 1995). His research looks into the dichotomy that exists in architecture when compared to other fields including fine arts and design encompassing fashion, or industrial design, where the design problem can be tested using prototyping. This is virtually impossible in architectural design, where the solution is constructed over a period of time which could be months, if not years, before it is tested by the user (Van Bakel, 1995).

This poses a major challenge from both, the teaching and learning perspective for the faculty and the student of architecture. Architectural design has the requirement to solve a problem which "involves an understanding of how problem spaces are constructed and transmitted" (Haider, 1986). This has created a unique situation where the traditional pedagogy of teaching that is 'disciplinary, cognitive and context-driven' cannot be applied to architectural design. This presents a unique learning situation, which is dominated by skill-based and craft-based approaches to acquisition of design knowledge. The debate concerning the 'hidden curriculum' and the 'power-play' of master and pupil,—prevailing behavioral systems that persist within the design studio— poses an added challenge in architectural education (Dutton, 1991a, 1991b; Haider, 1986; Webster, 2004).

This challenge is further exacerbated for the architecture student in learning "*the language of architecture*" (Unwin, 2014) when this is in the context of the general language of higher education, with a marked contrast between the two educational contexts. The approaches to learning within architecture will also be in contrast to those found overall in higher education. A comparative example is the difference between learning a second foreign language and learning the native language for the first time as an infant. As these are not quite the same processes, so learning architectural design may also be different from that of higher education.

This has been interpreted as the study of a new language that involves communication in visual and tactile terms. The educational experience for the students in architectural education includes learning the process and gaining the competency to practice as a professional (Unwin, 2014). The students are taken through an exploratory journey of arts, science and professional practice in the design coursework, which resonates in their learning approaches. Nicol and Pilling emphasize this focus on the curriculum and the "time spent by students in architectural design. It is in the design studio that students are expected to bring together knowledge from the different disciplines to inform the development of their architectural designs" (Nicol & Pilling, 2000).

3.2.1 Architectural Design: Pedagogy and Content

The architectural curriculum in general represents the 'contested discussions', or debate, over content, rather than how students learn. Architectural education further represents students' approaches to learning as a self-taught methodology, as opposed to the traditional view of education where the focus is on teaching the structure and the tools within the curriculum surrounding this activity. Through using varied teaching and learning strategies, the students of architecture are constantly exposed to learning as an experience; familiar strategies including 'learning-by-doing,' 'self-learning,' 'reflecting on prior experiences' and 'reflection-in-action' represent these approaches in the deeper dimension, and direct them towards developing into well-rounded professionals (Bradley, 2000; Brown & Yates, 2000; Schon, 1983; Webster, 2000).

Scientific Mode

Architectural Design

Artistic Mode

Urban Design & Society
Anthropology
Environmental Psychology
Architectural Programming
Decision Making
User Participation
Economics
Ecology
Building Science
Construction Technology
Environmental Control

Digital Architecture
Virtual Reality
3-D Printing

Architectural History
Cognitive Psychology
Visual Organization
Theory and Criticism
Aesthetic Theory

Sociological Domain

Social Ends

Technological Domain

Technical Means

Craft-Based Domain

Academic Domain

Aesthetic Means

Figure 10: Holistic Understanding of the Architectural Design Studio based on Figure 6 (Haider, 1986) and four established pedagogical research approaches in architectural education (J. Biggs, 1979; A. Salama, 1995; A. M. A. Salama & Wilkinson, 2007)

Figure 10 depicts these debates as focusing on content in the design coursework within established pedagogical research in architectural education. A holistic understanding of teaching and learning the design coursework poses a major challenge, from the artistic and scientific nature of the pedagogical research framework that runs in parallel with the four classified domains - the academic, craft-based, technological and sociological domains (Haider, 1986; A. Salama, 1995; A. M. A. Salama & Wilkinson, 2007).

The research framework for this study using phenomenography is further discussed in Chapter 4, which aims at understanding the link between pedagogy and content to learning approaches in architectural design, and how students learn. This examines the content-focused architectural design pedagogy which may well be driven by the philosophy of the school rather than the learning approaches of the student.

3.2.2 Pedagogy in Architectural Design

The pedagogical spectrum includes areas of focus ranging from the aesthetic to the technical, and continuing to the social in the specialized areas that range between aesthetic theory and urban design, as depicted in Figure-10. The paradigm of defining the design coursework has its origins in western culture through the Classical *Vitruvian triad* of architectural characteristics from first century BC of *'utilitas'* also termed as commodity and / or utility, *'firmatis'* for firmness or durability and *'venustatis;'* for delight or beauty that has been interpreted through various translations. Vitruvius has further elaborated in *Book I* on the education undertaken by an architect where the focus of learning is on gaining theoretical inputs from various departments and applying it in practice (Vitruvius, 1960, 1999) (Translation publication year).

Pedagogical research descended from the *Vitruvian triad* in *De Architectura* and its historic interpretation from early Renaissance onward, were challenged by the industrial revolution and its impact on architectural design. Rasmussen has reflected on the eternal debate on placing 'the beautiful' within architecture and its role as "a very functional art" due to the presence of the 'utility' factor (Rasmussen, 1964). Alexander has further expanded on architectural design by defining design as "the process of inventing things which display new physical order, organization, form, in response to function..." (Alexander, 1964). Alexander further proposed a philosophical treatise on architectural design and constructing a language through a series of patterns identified within the human civilization and urbanity at the macro level, reducing to the scale of a building and its spatial and technological aspects at the micro level (Alexander, 1977, 1979).

Broadbent has given a glimpse into the world of learning for the architect by classifying it as *'theory in a classroom of some kind (design studio)'* and within *'practice.'* He has presented the tension that exists between architectural education and practice as a compliance mechanism for the latter with the former playing the role of the conscience keeper (Broadbent, 1995). The basis of this tension between education and practice is Broadbent's elaboration of 'the architect as designer' and 'the architect at work' with the differing role-plays that are required in the process of design from creation to the execution of a building (Broadbent, 1988). So this suggests a way of thinking, rather

than content that may be more linked to learning and how students act in a particular situation.

Lawson has broadened this argument by amalgamating the tensions within design education by referencing the fields of design and engineering. He has further focused on the nature of architectural education amalgamating urban and landscape design at the macro level with industrial, interior and product design reflecting the micro level; "all require the designer to produce beautiful and also practically useful and well-functioning end-products" (Lawson, 2006). Lawson's triad of beauty, utility and functionality within architectural design is once more a reflection through the pedagogical dispositions of Rasmussen, Alexander and Broadbent of the Vitruvian triad of *'utilitas,' 'firmatis'* and *'venustatis'.*

Vitruvius - De *Architectura*		
Utilitas	Firmatis	Venustatis

Rasmussen - Experiencing Architecture	
The Functional Art	The Beautiful Art

Alexander - A Pattern Language (253 Patterns)		
Construction	Building	Towns

Broadbent - Design in Architecture	
The Architect at Work	The Architect as Designer

Lawson - How Designers Think		
Uitlity	Functionality	Beauty

Ching - Architecture		
Form	Space	Order

Salama Et al. - Pedagogical Research			
Sociological Domain	Technological Domain	Craft Domain	Academic Domain

Unwin - Analysing Architecture		
Identification of place	Elements of Architecture	Spatial Organization

Figure 11: Amalgamated Canvas of Definitions & Meanings in the Design Coursework from Pedagogical Research in Architectural Education (Alexander, 1964, 1977; Broadbent, 1988, 1995; Ching, 1996; Haider, 1986; Lawson, 2006; Rasmussen, 1964; A. Salama, 1995; A. M. A. Salama & Wilkinson, 2007; Unwin, 2009; Vitruvius, 1960, 1999)

Ching has extrapolated a further triad of *'form,' 'space,'* and *'order'* within architectural design. *Form* is explored through the primary elements and various geometries that are required to be studied in architecture. Form is further correlated with *space* by understanding the invisible connections related to organization, circulation, proportion

and scale within architecture. *Order* has been architecturally extrapolated through the ordering principles of design (Ching, 1996).

Unwin has explored the architectural language that students need to learn through various facets of understanding design. *Analysing Architecture* is an interpretation of design from the 'identification of place' to the various 'elements,' further exploring the architectural language from historic, geometric and thematic facets of spatial organization through selected case studies as perceived by the architect in the design diary (Unwin, 2009). This exploration of the architectural language through the design diary is a further distinction between ways of thinking and content.

Figure 11 depicts the overall amalgamated canvas of the definitions and meanings that have been derived in the design coursework from an historical to the contemporary perspective. This study on classification of the approaches to learning is a journey based on the definition of design from the Vitruvian triad to Unwin's perspective of architectural analysis through the pedagogical structure of architectural design. This classification is analyzed using the students' experiential journey and the research vehicle of first-year architectural design through phenomenography further reviewed in Chapter 4. This research vehicle is used in both the pilot study elaborated in Chapter 5 and the current study from Chapters 6 to 12.

3.3 Architectural Design: Experiential & Reflective Learning

Moon (2004) correlates learning, experience and meaning as part of the cyclic process of the task undertaken. So learning can be correlated as the connection "to our present and prior experience (i.e. the state of the cognitive structure)" that is the guiding factor for the present experience (Moon, 2004).
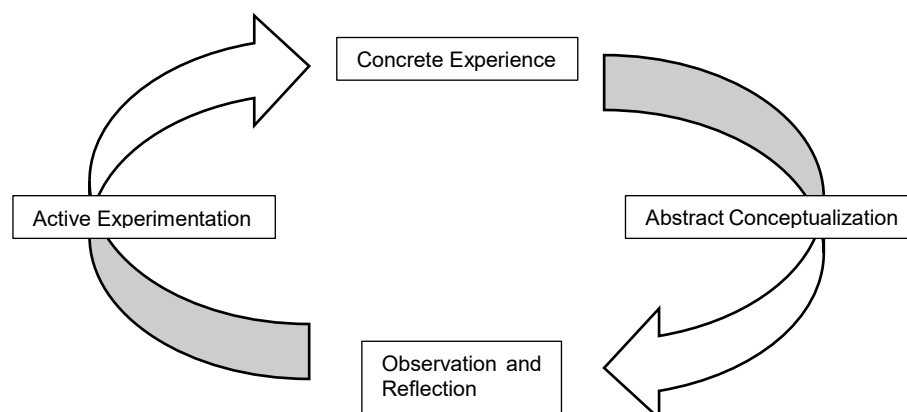
Figure 12: The Kolb (1984) Cycle of Experiential Learning (Moon, 2004)

The Kolb (1984) cycle of experiential learning (Figure 12) represents a model that facilitates learning through the managed framework of the teaching situation. This cycle

has a correlation to learning and teaching in architectural education as the four key activities within this cycle are interplayed in the design studio as a part of the design coursework through approaches to teach and to learn. *Reflective learning*, considered as core training endorsed within architectural practice and the design studio, is further elaborated by Schon (1983) through the dialogue between the design faculty and the student in the design coursework as 'the reflective practitioner' (Schon, 1983, 1985, 1987) in Sub-section 3.5.1.

3.3.1 Learning in Design Studio

This section examines the impact of the design studio on the students' approaches to learning. The central role that the design studio plays has been "routinely referred to as being a core of architectural education" (Webster, 2001). 'The Reflective Practitioner' represents the design studio as central, both to architectural education, the profession and the pedagogic connect of teaching design with "the distinctive structure of reflection-in-action" and "the future interaction of research and practice" (Schon, 1983).

Webster provides an outline of the ideas of Schon and related literature from disciplines outside architectural education, identifying the importance of the "design project, as a vehicle for project-based learning, … adopted on the assumption that the expertise needed by architects could only partially be learnt through the traditional methods of knowledge transmission, lectures, etc. used by most academic disciplines" (Webster, 2001, 2008). Schon's work (Schon, 1983, 1985, 1987) has been described as "an attack on the dominant technical rationality in professional education, criticizing it for being unable to respond to the complexities of the real world and of failing to account for how professionals work in practice" (Webster, 2001). The design studio represents the core of the architectural design curriculum and the integrated design project is seen as the principal teaching vehicle (Schon, 1985, 1987). The centrality of the design studio in the design coursework raises the question of its impact on students' approaches to learning.

This question also impacts on the balance between the tenured academics and the professionals, with the former focusing on teaching design and the latter constructing the design process (Platt, 2000). Roberts has suggested that Schon's(1983) work on the project-based approaches of 'learning by doing' in architectural education should be considered a pioneering model for professional education and "the design studio provides a venue for students to engage in conversation, dialogues and collaboration related to open-ended problems and encourages speculative exploration. *Studio-based learning* has been seen to be an enjoyable and effective way of learning critical design skills" (Roberts, 2004a).

The lack of architectural *'thinking'* in secondary schools is key reason for initiation of first-year design students to *'think like an architect.'* This can be considered central in defining the role of the design studio amongst the new cohort. The design studio has been portrayed as the hearth where development of architectural education takes place and studio culture is inculcated. Approaches to learning within the studio are portrayed as understanding the design process from extrapolating the design problem to professionally presenting the solution, as reflected in architectural practice. (Nicol & Pilling, 2000; Ashraf M. Salama, 2005; Schon, 1985).

Studio culture embodies approaches to learning that focus on students' holistic development and prepares them for real-life practice. This is further exemplified by Demirbas and Demirkan, who state that "learning as an interactive process is an important issue in architectural design education." They have examined "the role of the design studio," outlining three steps namely "learn and practice some new skills, say, visualization and representation; learn and practice a new language as Schon(1984) described design as a graphic and verbal language; and learn to think architecturally, as pointed by Lede Witz(1985)" (Demirbaş & Demirkan, 2003). Inculcating the studio culture where the students learn new skills, a new architectural language and a new thinking process is seen as central, both in education and the profession.

3.3.2 Architectural Design Studio-based Education

Rowe extends the argument for professional design education through the involvement of an innate process in the field of architecture, namely 'life-cycle learning.' This process has been presented as a direct challenge to both the dominance of the design studio within the architecture program from the historic Beaux-Arts perspective, and the notion of a professional experience-based program through practical training, internship and apprenticeship (Rowe, 2002). Life-cycle and lifelong learning have challenged the prevailing notions within architectural education and practice which includes an indulgence towards professional competence and mastery, and professional stagnation in today's ever-changing world. The changing notion of the architectural professional's self-esteem in society and the concept of cross-cohort engagement through trans-disciplinary exchange of knowledge within the design studio, are the two other facets, thus preparing students for lifelong management of self-learning (Nicol & Pilling, 2000; Rowe, 2002; Ashraf M Salama, 2012).

Schon has presented a forceful argument concerning deeper learning approaches through the process of internalization that architecture students need to achieve in the design studio. This is a fundamental role that the design studio fulfils in the development of the students' learning approaches by inculcating the responsibility of autonomy -

independent learning - within the process (Nicol & Pilling, 2000; Schon, 1985). The studio environment has a role in fostering self-learning or independent learning, and in creating a structure amongst the students to monitor their own learning approaches in the program throughout their architectural education. It also represents the learning approaches, teaching and learning outcomes, through the social construct of the design studio; and is articulated beyond the horizon of Schon's seminal work (J. B. Biggs, 2011; Ramsden, 1992; Stevens, 1998).

Stevens has presented a well-founded criticism on architectural education focusing on the design studio using Bourdieu's notion of '*habitus*,' and suggesting the creation of a 'symbolic capital' amongst the student cohort through an internalized 'embodied capital' that favors the privileged. The studio system of 'self-learning' or 'learning-by-doing' is portrayed as an elimination playground for the students who are not attuned to these learning approaches, thus consecrating the notion of privilege or the embodied capital (Stevens, 1995, 1998). The design studio has a direct impact on students' approaches to learning by inculcating a collaborative dimension termed as 'studio culture,' moving in the direction of self-identification within the design process and reflecting on the dynamism required to experience this culture. It further emphasises the importance of the structure required within the curriculum, the philosophy of the school and the academic fraternity in encouraging the students to participate and respond to the design studio as an important feature in evolution of their learning approaches.

Salama has suggested a change in the role of the architectural professional through 'a social agenda for a knowledge-based design studio' focused on social and ethical responsibilities together with an incremental efficacy for the profession in society (A. Salama, 1995). The focus on the design studio links studio culture to ways of thinking rather than the content of architectural design. Major architects and thinkers have voiced the need for holistic approaches towards design coursework in architectural education in their seminal works, including 'Experiencing Architecture' (Rasmussen, 1964), 'A Pattern Language' (Alexander, 1977), 'Lessons for Students in Architecture' (Hertzberger, 2005) and 'Thinking Architecture' (Zumthor, 1998).

Unwin has explored the question of "how new students in Welsh school of architecture are inducted to architecture through a first semester program of design project run in parallel with supplementary exercises focusing on analysis, place and technique" (Unwin, 2001) and extrapolates on each theme with architectural examples (Unwin, 1997). He concludes that "students learn for themselves rather than doing what they are told, but at the same time they are not left to struggle with design without sources of

ideas and information" (Unwin, 1997). This statement represents two different approaches; one where the students' are learning by mechanically following a demonstration - a craft-based approach - and the other, where they learn by undergoing the process of making architecture, which can be regarded as parallel to surface and deep approaches to learning (Marton & Säljö, 1976). They see the benefit of "learning by doing" but also of "learning by looking at the work of others" (Unwin, 2001) and this review is connected to the range of students' learning approaches in the architecture program that has been further widened (A. Iyer, 2015).

3.4 Schools & Philosophies – Emerging Pedagogies in Architectural Education

The philosophical platform on which the schools impart architectural education holds the key to understanding students' learning development. This has been explored through various schools of thought within pedagogical research in architectural education from the Beaux Arts to Bauhaus and the prevailing philosophical viewpoints of various schools around the world (Bax, 1991; *Education of an achitect*, 1988; Gulgonen & Laisney, 1982; Littmann, 2000). The 'learning climate' within the school involving learner and teacher is key to understanding this dynamic relationship which impacts directly on students' learning approaches (Nicol & Pilling, 2000). This represents the reality for international architectural education, for schools in the days of globalization. Architectural education is constantly reviewed in tandem with the profession and presented within the traditional perspective around the key issue of design practice. This is made more complex by the association of architectural style and language with different schools. The key to improvement in student learning approaches has revolved around skill-development, their connection with faculty, problem-based learning and reflection in action; with this entire spectrum being presented in the realm of architectural schools and their philosophies (Meiss, 1995; Nicol & Pilling, 2000; Schon, 1985).

3.4.1 Architectural Education: The International Context & Philosophies

The European Commission Architects' Directive (1985) on education and architectural training (Article 3) calls for a balance in the dissemination of theory and practical facets by focusing on knowledge and understanding through the required design skills, to satisfy the aesthetic and technical requirements within architectural design (*Tomorrow's architect : RIBA outline syllabus for the validation of courses, programmes and examinations in architecture*, 2003) (pg. 63). These directives are in contrast to the Ecole and Academie (des Beaux Arts) French model together with the industrial training and research-based German model developed in the mid-nineteenth to early twentieth-century in Europe (Giedion, 2008; Stevens, 1998).

Stevens has outlined the inadequacies of the profession and universities alike on dissemination of architectural education in terms of their important functions of *'reproduction'* (of the profession) and *'production'* (of intellectual discourse) (Stevens, 1998). The British model of *articled pupillage* until the early twentieth century and the emergence of polytechnic institutes together with the call for architectural education in universities in the 1958 Oxford conference (Oxford Conference on Architectural, 2008; Stevens, 1998) have all fed the debate on schools and philosophies in the international context of architectural education.

The Royal Institute of British Architects (RIBA) has offered defining descriptions for the key terms in the outline syllabus including *'awareness'* from the students' perspective in understanding their limits, *'knowledge'* and its implications within architecture, *'understanding'* for the students' practical application and *'ability'* or the skill in solving particular problems (*Tomorrow's architect : RIBA outline syllabus for the validation of courses, programmes and examinations in architecture*, 2003). The Architects Registration Board (ARB), established by the UK Parliament in 1997, has specified the RIBA – Part 1, 2 and 3 or Professional Practice Examination, with a specified period of professional training experience, as the route to register and practice as an architect in Britain (Board, 1997). The articled pupillage-based model, with renewed focus on professional training experience for the architecture student, has been central to the British System.

North American architectural education developed on the British practice-based system and the French state-based, Ecole De Beaux Arts system, towards the beginning of the twentieth century. With the advent of the Second World War, the industrial research-based German system also had a deep influence on the North American model (Giedion, 2008; Stevens, 1998). The National Architectural Accrediting Board (NAAB) was established in 1940 by the Association of Collegiate Schools of Architecture (ACSA), American Institute of Architects (AIA), and National Council of Architectural Registration Boards (NCARB) and is the oldest architectural accreditation body in North America (NAAB, 2017). The vision and mission document of NAAB has reflected on the dual focus of professional architecture education and catering to the individual institutional context with the values specifying the preparation of architecture students towards engagement with lifelong learning as future graduates in practice (NAAB, 2016).

The Indian architectural education system followed the articled pupillage and polytechnic/technical college system inherited from the British following the country's independence in 1947. The Council of Architecture (COA), India's architectural

accreditation and registration board, was enacted by the parliament in 1972. COA regulations (1982) stipulated the accreditation process of architectural institutions across the country and the COA Minimum Standards of Architectural Education Regulations (1983) have represented the development of Schools of architecture in the country (NIC/NICSE & Architecture, 2015). Mazumdar's (1993) critique of the cultural and philosophical positions taken by proponents of the Indian model has created a vacuum in relating to the immediate human and contextual nature of the region's architecture. This is reflected in the COA Minimum Standards, 1983, the modified 2008 version, and the current 2017 draft (Mazumdar, 1993; NIC/NICSE & Architecture, 2015).

Dissemination of architectural education in this prevailing international context within various schools and in prevailing philosophies of design coursework is also connected to students' approaches to learning. The international perspective is explored in this study within the cross-sectional data of the architecture program from the four institutions in Chapters 7, 8, 9 and 10.

3.5 Skills & Craft-Based Approaches

The earlier pilot study (Chapter 5) outlines skills and craft-based design process as an identified category, centered between the product-to-process based approaches to learning. Richard Sennett defines craftsmanship as "the basic human impulse to do a job well for its own sake," and "good craftsmanship involves developing skills and focusing on the work rather than ourselves" (Sennett, 2008). 'The act of doing' or 'the content of doing' has been generally misunderstood as a skills and craft-based creative process that leads to a design solution. This is further exaggerated by the emphasis on product-oriented strategies that students use as a learning framework in their early years of architecture together with categorized approaches in design education identified in Chapter 5, both in the fashion design studies and the first and fourth year architecture students' pilot (Bailey, 2002; Drew et al., 2001; Iyer & Roberts, 2014).

'Design as product' has been further reinforced as learning the conceptions of design. Students' approaches to learning reflect on the learning conceptions of 'design as a product' based on similar themes being emphasized in main stream practice (Lawson, 2006; Nicol & Pilling, 2000; Schon, 1985). Schon has elaborated on the design process "of reciprocal reflection-in-action" where "the student learns both about designing and about learning to design." The student "learns how the studio master makes his judgement of design quality, and something of what enters into those judgements," but also learns to make judgements at different levels. "The student also learns to be attentive to certain norms of designing" (Schon, 1985). But this view of reciprocal reflection-in-action has also been seen as a 'product-focused approach' over a 'process-

focused approach' and is represented in various arenas including students' portfolios produced in schools of architecture, professional practice and publications including design competitions and awards (Lawson, 2006). These product-focused learning approaches influence students towards thinking of architecture in terms of its reflection in mainstream practice.

3.5.1 Product vs Process-based Approaches in Architectural Design

This discussion between product-based vs. process-based approaches is further extended to assessment of the students' work as being output-based rather than focusing on the process of developing the design. This echoes discussion on Schon's view of reciprocal reflection-in-action of being process-focused over the product. The *product-focused approach* is further explained as the basis for evaluation and assessment in various schools of architecture where a distinctive balance between 'craft and knowledge' and 'image production' needs to be reassessed (Callicott & Sheil, 2000; Morrow, 2000). This brings to the fore the notion of "architect - the maker," "representation of work" and architectural design with Callicott and Sheil stating that the design process *(process-focused approaches)* has to be given precedence over the craft of making. This represents that delicate balance that needs to be achieved within the approaches to learning (Callicott & Sheil, 2000). This brings us to the other distinction between output and outcome-based design with the question of whether the product from the learning approaches is the qualified student or the architecture being produced.

Skills and craft-based approaches can be transitioned from focus on the design product to the process of design by enabling the architecture students to understand the importance of self-assessment of the individual design project (Nicol & Pilling, 2000). This can only be achieved if the students of architecture are given an opportunity to look beyond the facet of design as a product or final portfolio; and are appraised on the design process in tangible ways that encourage process-focused approaches to learning. The emphasis on skills and craft-based learning approaches in architectural education needs to shift from a product-to-process focused approach by making the students understand architectural practice (Lawson, 2004). This will lead the students towards learning approaches that will gradually move from the surface-to-deeper dimension, thus helping them in obtaining an understanding and connection to architecture. These learning approaches need further channelling from product-oriented to process-oriented approaches and this will allow the students to explore architectural design holistically.

Whereas students' approaches to learning in the educational research have been described as actions taken while undertaking specific tasks in particular learning contexts, the question arises on the role of the conceptions of design learning. Within architectural design, would a learning approach really be about the way in which a student acts in a particular situation? How would a particular conception of design learning, whether it is product or process-focused, lead the student to act in a particular way? The process vs. product-focused approaches are classified further in the pilot study (Chapter5) to consider their impact on the learning conceptions in architectural design.

3.5.2 Learning Styles and Approaches in Architectural Design

Demirkan and Osman Demirbas have explored the learning styles using Kolb's model, concluding that "the bipolar perceive[d] dimension indicated that the freshman design students are more related to the analytical skills of theory building, quantitative analysis and technology. Also, the bipolar process dimension showed that they have better behavioral skills compared to perceptual learning skills" (Demirkan & Osman Demirbaş, 2008).

Roberts has investigated "how students with particular cognitive styles, as measured by Riding's Cognitive Style analysis, perform in design project work at particular stages of architectural education", concluding that "contrary to assumptions found in the literature, those with a preference for thinking in a holistic, global manner, perform less well than their peers in the early stages of their education, but tend to improve as they progress through their education" (Roberts, 2004b, 2006).

Research into studies on learning approaches in higher education have suggested that the deeper dimension of learning is not reflected in the form of higher grades in the examination or evaluation for the students. This form of learning approach presents itself as the 'strategic' dimension in addition to the deep and surface dimension within the range of approaches to learning (J. Biggs, 1979; N. J. Entwistle, 1997; Ramsden, 1992). The research into cognitive style analysis (Roberts, 2004b) and learning styles (Van Bakel, 1995) in architectural design can be considered as starting points for this study.

3.5.3 Architectural Design Studio Reflections: Faculty & Student

Schon has explored the learning process by presenting the dialogue of the studio master - Quist with his student – Petra and the underlying process of reflection-in-action built into the problem-solving steps undertaken in the design studio (Schon, 1983). Schon (1987) has further presented four more discussions, the first of which has the studio

master – Leftwitch and Lauda, the student representing the "paradoxes and predicaments in learning to design" through the implicit as well as explicit communication between the student and faculty in the design studio. The second discussion of Northover, a studio assistant of Quist and a combative student, Judiath, represents the disconnection that arises through the theory-in-use and being in a self-internalised 'learning cycle' (in this case – Northover). Whereas the discussion between Quist and Petra, and between Leftwitch and Lauda, are examples of 'the dialogue between coach and student,' Northover and Judiath represents 'how the teaching and learning processes can go wrong.' Northover's stance of controlling discussion eventually creates a 'learning bind' in his discussion with Judiath leading to a stalemate 'at the lowest level of the ladder of reflection.'

Quist & Petra	• Dialogue between Coach and Student • Reflection-in-Action
Dani & Michal	• Coach & Student jointly solve problem • Reciprocal Reflection-in-Action
Leftwitch & Lauda	• Paradoxes & Predicaments in learning to design • Implicit as-well-as explicit communication
Quist & Johanna	• Authoritative structure of coach & acceptance by student • Student's acceptance & reflect-in-action
Northover & Judiath	• How the teaching & learning processes can go wrong • Learning bind - stalemate - lowest level of the ladder of reflection

Figure 13: Five Discussions presented by Schon (1983-87) between Coach and Student representing various Learning Categories of Reflection-in-Action within the Design Studio (Schon, 1983, 1987)

Quist's discussion (third) with Johanna represents the authoritative structure of the coach, and the acceptance by the student in responding to this structure and reflect-in-action. The fourth and final discussion between Dani, a practising architect and studio master with Michal, a first year student represents reciprocal reflection-in-action. Dani as the coach has prompted Michal, with both then working together to solve the problem through the goals set by the student, which leads to reciprocal reflection-in-action (Schon, 1987). Figure-13 depicts Schon's (1983-87) five documented discussions amongst design faculty and students on the various degrees of reflection-in-action that can be categorized in parallel to the students' learning approaches being adopted in the design studio. Till is particularly critical of the "virtuoso" performance presented by Schon

between the faculty and students considering it in parallel to power-play and gender domination. This criticism of faculty and student interaction in the design studio and its utilization for the transmission of knowledge represents the notion of the 'hidden curriculum' within the coursework of design (Dutton, 1987, 1991b; Till, 2005; Webster, 2004).

3.6 Architecture Education and Collaborative Learning

Chapter-5 describes *collaborative learning* and working in a group as an emerging phenomenon that is inculcated in the students' learning experience when they join the architecture program. These peer-based learning experiences are adopted by the student cohort in gaining the skill and craft-based design learning process that is required in the product-to-process based approaches to learning in the design coursework.

Research has suggested that the potential of this well-used tool in the architectural design studio is under-used, and though used as an approach to learning, remain unstructured. This thus curtails a very important method of moulding the future professional architect. Group learning is reinforced as a parallel to the critique, or 'crit' process and has the potential to develop team spirit, within both the domain of architectural education and practice (Vowles, 2000). The concept of learning from each individual within the group, and the enhancement of their approaches to learning within the architectural domain, points towards encouraging these approaches also in the design studio (Nicol & Pilling, 2000; Schon, 1985). Group or collaborative learning in the design studio is a phenomenon reflecting a new direction for the students in comparison to the earlier learning approaches adopted in architecture education.

The virtues of collaborative learning in the design studio are exemplified as a vehicle for further reflection by the students on the learning process, and is presented as a structured tool towards the development of rounded architectural professionals (Nicol & Pilling, 2000). Peer-group learning and assessments are used as structured platforms to elevate collaborative learning in the design studio to an organizational level of functioning, with design projects being dealt from a process-oriented perspective. This enables students to engage using learning approaches at a deeper dimension, which is seen as a parallel to similar approaches within the professional practice (Nicol & Pilling, 2000; Torrington, 2000). Collaborative learning in the studio should be channelled into reflection amongst these students and can be structured into a holistic architectural experience. Collaborative learning needs to be formally structured in the design studio to enhance the value of these approaches to learning (Cowan, 1998; McClean & Hourigan, 2013; Nicol & Pilling, 2000).

Learning to work as a group in the architecture studio represents an approach to reflective learning that will lead the students to develop themselves at a deeper dimension as they move on into the profession. Table 7 depicts the various stages of learning development within 'the world of the learner' (Morgan & Beaty, 1997) and its parallel to the emerging approaches to learning within architectural design that is further elaborated in the pilot study in Chapter 5. Product-to-process-based, skills and craft-based, role of the design tutor, critique and assessment-based approaches represent key features in the development of students' approaches to learning in architectural design.

Stage		Control of Learning	Confidence	Competence	Stages of Learning Development in Architectural Design
Fresher	1	By the system and institution	To enroll	Understanding the system	Product-to-Process-Based, Skills & Craft-Based, and Role of Design Tutor, Critique & Assessment as learning approaches play a key role in the development of Architecture students extrapolated within the learning approaches in Chapter 5
Novice	2	By the system and institution	To attempt to Study	Understanding about oneself in the system	
Intermediate	3	By the system and institution	To select	Beginning to see a course as a whole	
Expert	4	By self within a course	To question	Engaging personally with the content	**Collaborative & Group-Based (Peer-based)** extrapolated in Chapter 5 And **Emerging classification of Students' Approaches to Learning in the current research**
Graduate	5	By self, in both in content and method of learning	To go it alone	Using skills and knowledge in new contexts	

Table 7: Emerging Stages of Learning Development in Architectural Education correlated to 'The World of the Learner,' - Adapted from Stages of Development (Table 14.3) (Morgan & Beaty, 1997)

Students are currently placed within the 'fresher,' 'novice,' and 'intermediate' stages of development of the learner presented in Table 7, with 'expert' and 'graduate' stages being further classified as a part of this study. Collaborative-*cum*-group-based (peer-based) learning identified as a part of the pilot study (Chapter 5) is located in these stages.

3.7 Faculty, Critique & Assessment

Architectural review forms an important pedagogical component of the design coursework. Also termed as 'crit,' 'critique,' 'jury' and 'viva' in various parts of the world, the architectural review is the central part of the coursework. Students are expected to work on their design project and there are a series of progressive reviews or assessments and the final review. These reviews are equivalent to the meetings between the architect and the client giving the student a glimpse of the equivalent in professional practice. In a typical review, the students is expected to display work in the

form of drawing sheets, architectural models, digital output and progressive work and communicate his or her design with the faculty, and with professionals invited from practice.

Research has suggested a revisit of this model of assessment. A guide has been proposed for the design studio tutors by looking at "the established model highlighting inherent opportunities for learning and conditions associated with a lack of learning" (Sara & Parnell, 2004) reflecting the balance between the challenge and the support required. Chadwick and Crotch have focused on "the review, as a learning and teaching tool, is a fundamental component of architectural education" and termed this model as "educationally flawed" with the process being seen as "intimidating and unnecessarily gruelling and can lead to students feeling demoralized and humiliated." They propose a developmental model to humanize the review process and integrate it into students' learning process in the design studio (Chadwick & Crotch, 2006).

The review process as a constructive learning assessment tool in the design studio can be used by the design tutor and the student cohort to encourage deeper learning approaches towards understanding the complexities of architectural education from the early stages to the later years. In comparison, a typical surface approach, where the response of the student in early stages might be that the reviewers did not like the presented work, perhaps oversimplifies the discussion and the purpose of the review; this needs further exploration (A. Iyer, 2015). The faculty, studio instructor or master practitioner and the structured framework of "individual and collective learning-by-doing" (Schon, 1985) has been correlated with project-based learning. The faculty conducting the critique is seen portraying various roles with the students' connected experience based on these portrayals. Webster suggests that the role of the faculty as a 'liminal servant' is seen as an encouragement for the students of architecture, and has a positive impact on their approaches to learning (Webster, 2004).

Lawson reinforces this view. He states that anxiety for architecture students in the early years and the weighted expectations from the faculty's varied personalities, places their approaches to learning within stratified frameworks of power and authority (Lawson, 2001). The 'didactic model' of teaching and learning experienced by the students before they join the architecture program is at odds with the role played by the faculty in the design studio as a critique and scaffold in project-based learning. The faculty's transition from knowledge provider "to critic and instructor of knowledge" (Parnell, 2001) is a challenging transition within the students' approaches to learning. At this juncture it is important that this transition is conducted in a structured manner through the introduction

of peer-assessment (Parnell, 2001). Quist and Petra, together with Dani and Michal in Figure 13 represent this transition from knowledge provider to the role of instruction and critic, as described by Schon through reflection-in-action (Schon, 1983, 1987).

3.7.1 Faculty & Student: Inclusive Design & Understanding

Dutton has proposed a new pedagogical experience to counter the notion of the "hidden curriculum" within architectural education, through a "transformative pedagogy for the design studio" where the entire teaching-to-learning or faculty-to-student relationship and the production-to-dissemination of knowledge needs to be restructured to cater for current social requirements within the offered program (Dutton, 1987, 1991a). The role of the tutor in ensuring that architecture students obtain in-depth understanding of the importance of 'design and analysis' is the key to 'inclusive design.' The tutors play a further role by adopting 'inclusive understanding' within their teaching pedagogy; thus helping the student learn 'to reflect-in-action' (Morrow, 2000; Schon, 1985).

Dutton and Morrow have articulated architectural education from the social perspective. They propose a rethink to come into line with pedagogical good practice to encourage students' independence when making personal decisions based on ethical standpoints. These questions of what is teachable and what is learnable in architectural design represents the importance of the faculty within the design studio in initializing students' learning approaches that move towards the deeper dimensions. The evolution from the surface-to-deeper dimension is reflected in the early stages, where they consider the faculty as an academic support in the process of design (Chapter 5) (Iyer & Roberts, 2014).

The students' progress towards inclusive designing and analysis during the later stages of the program. This variation in their learning approaches is also visible amongst the talented or creative students in the cohort and their fellow counterparts (Schon, 1985; Torrington, 2000; Wilkin, 2000). The reflective process in the students' learning approaches and their communication with the faculty is presented in "the process of designing and the process of learning to design" (Schon, 1985). These students teach themselves through their own actions and those of their faculty or studio master; termed as 'demonstrations and descriptions' that represent the environment around an architectural practice. The faculty and students' 'reflect-in-action' which in turn translates the latter's learning approaches to a deeper dimension (Brindley, Doidge, & Willmott, 2000; Schon, 1985, 1987).

The approaches to learning adopted by the students in the early and later years of their architectural education in the design coursework has to be structured on the notion of

the faculty, the studio master, the master practitioner and the evolving perceptions of self-learning. This role of the faculty, and critique through structured assessments, presents a reflection on the emerging classification of students' learning approaches that manifest themselves during the years of their architectural education.

3.8 Architectural Design: Research Vehicle for Classification of the Learning Approaches

Architectural design has been a subject for curricular debate for the past few decades amongst academics and practitioners, with diverse opinions on this matter. As depicted in Table 7 as the emerging stages in the development of learning, the first year design coursework reflects the direct control placed on this process 'by the system and institution' on the fresher, novice and intermediate student of architecture. This representation is from the perspective of both the confidence and competence expected from the 'fresher' student in the architecture program from enrollment 'by understanding the system' of the school. The 'novice' student is attempting to study architecture 'by understanding about oneself in the system,' whereas the 'intermediate' student has started 'to select' and is 'beginning to see a course as a whole.' 'The world of the learner' is representational of the research vehicle for this emerging classification of learning approaches, the first year architectural design coursework and its continuing role in the subsequent years that are studied in the pilot study and the final study of this research (Iyer & Roberts, 2014; Morgan & Beaty, 1997).

3.8.1 Architectural Design: Institutions & Philosophies in Perspective

In 'the architect at work,' Broadbent describes the design process of the modern architectural masters stating that "in the act of designing, whatever other decisions they made, the founding fathers of modern architecture combined the pragmatic, iconic, analogic and canonic approaches whenever they needed to generate three-dimensional form" (Broadbent, 1988). In the modern context, this statement reinforces the learning approaches framed in the design process, focusing on the architectural form. Alexander analyses the supremacy of the value of form in architecture in his treatise with the phrase, 'loss of innocence' from the times of William Morris to Gropius and his vision through the Bauhaus (Alexander, 1964).

On the continuum downwards from architectural practice to education, the foundation course introduced in the early-stage curriculum is derived from the 1919 manifesto that Walter Gropius established, '*Basic Design*.' This coursework was conducted by world renowned artists including Wassily Kandinsky, Paul Klee and Johannes Itten to name a few at the Bauhaus. The students were required to concentrate on various arts and crafts "including studies of nature, fabrics, geometry, colour and composition,

constructions and presentations, materials and tools" before being introduced to architectural design (Broadbent, 1995).

With the advent of the Second World War, this became a global vision spreading to schools in America including the Illinois Institute of Technology; 'various design institutions in the United Kingdom' (Basic Design 2013) and other parts of Europe. In 1992, the Prince of Wales' Institute for Architecture was set up with a new foundation course on the lines of 'basic design' coursework, but to instill British values. The first year design coursework being undertaken in schools such as the Bartlett School takes its starting-point in the purely scientific realm. In the Architectural Association (AA), the presence of world-renowned architectural professionals, has led to such "a creative ferment that an actual style was born" (Broadbent, 1995). The importance of the first year design coursework needs to be translated into a holistic perspective of architecture. This is required as the comparison to the focus on students' visual, skill and craft-based learning approaches, or from the perspective of architectural language. The first year design coursework should be presented within a broader spectrum of architecture where the students are encouraged towards the deeper dimension of 'learning-by-doing.' Reflection is needed on this facet instead of the focus continuing on the narrower framework propagated in the basic design coursework with the philosophical emphasis propagated by the Bauhaus (Abel, 1995; *Basic Design* 2013; Bax, 1991).

Certain schools in architectural education use design theory as a part of the first year design coursework within the framework of '*Basic Design*'. This is to develop the student's learning skills of problem-solving and understanding the use of visual analogy in the early stages of the program (Casakin & Goldschmidt, 1999; Yurtkuran & Taneli, 2013). Various design exercises conducted as a part of this design coursework using the basic design model help the students of architecture in the early stages of the program to assimilate the contrasting learning approaches that are required to be adopted in comparison to the didactic model that has prevailed in their pre-university education (Cusens & Byrd, 2013; Demirkan & Afacan, 2012; Golja & Schaverien, 2013).

3.8.2 Architectural Design: Holistic Perspective

Further reflections from influential voices have pressed for holistic and inclusive approaches to learning and teaching design coursework within architectural education, both from a curricular and professional perspective. This is a step forward within the perspective of the design coursework as an addition to the visual and the tactile, the historic, cultural and human dimensions that are considered as a part of the architectural experience (Alexander, 1977; Hertzberger, 2002, 2005; Rasmussen, 1964; Zumthor, 1998). Studies on approaches to learning into holistic and global thinking about

architecture represent a structured effect on students in the early years of architectural education. 'Studio-based learning' is also seen as a platform towards assisting students through skills and craft-based 'learning-by-doing' approaches in the early stages of architectural education (Demirkan & Osman Demirbaş, 2008; Roberts, 2004a, 2006).

The student's learning approaches for the design coursework represents the wider spectrum introduced in the structure of the architectural curriculum and its connection to the design studio. This review on pedagogical research in architectural education constitutes the framework depicted through Figures 11, 12 and 13 towards this emerging classification.

3.9 Approaches to Learning as an Architectural Experience

Architectural experience is a life-long learning process, and the students' journey begins prior to being formally a part of the program. The students' range of approaches to learning during their architectural education is represented in the traditional environment of the design studio. They gain the competency of 'artistry in Design' and through the process of *'reflection-in-action,'* the architects of the future become trained. The cognitive strategies and analogical reasoning of students in the early and latter stages of the architecture program is different and this is relative to advances in their approaches to learning (Nicol & Pilling, 2000; Ozkan & Dogan, 2013; Schon, 1985). Thus students' approaches to learning in the design coursework can be expressed as their architectural experience.

Architectural education is seen as the platform where the evolving notions of change including technology and other social constructs of humanity can be amalgamated in the students' approaches to learning. Based on 'reflection-in-action', which is fundamental to architectural inquiry, the learning approaches are propagated through the notion of constant reflection. The expectation for students' to train themselves through 'self-regulation' is considered as an experience for a lifetime and is correlated to this notion of the students' architectural learning experience (Nicol & Pilling, 2000; Schon, 1985). The process of learning in the studio is further expressed as hands-on approaches where the students consider the design faculty as academic support, moving towards the process of perception and reflection. The approaches to learning are amalgamated with this process of internalization (Schon, 1985).

An exemplary expression given to the range of learning approaches achieved by the design student states that "the ladder of reflection involves several levels" or 'rungs' (Schon, 1985). The base or 'ground' level consists of the substantive phenomena of the design process. In the first level, there is reflection on the action of designing. The next

level had the student or studio master reflecting on the meaning of the other's words or actions. This has been depicted in Figure13 encapsulated in the five discussions between the faculty and students (Schon, 1983, 1985, 1987). The student is called upon to educate himself in designing, both through reflection on his own efforts to design through active listening and reflective imitation, reflection on his own knowing-in-action, "a testing of his grasp of the studio master's meaning" (Schon, 1985).

But Schon's work on reflective learning has been criticized for not considering the equation of power with reference to the faculty/ student relationship. The criticism is further based on the drudgery of the students' slavish tendency towards approaching learning, that is seen through a negative construct from the perspective of the design studio, architectural education and the profession as a whole (Dutton, 1987, 1991b; Webster, 2001, 2008). This further correlates reflection-in-action to the cyclical process of learning, experience and meaning within the design studio, as depicted in Kolb's Cycle (Figure-12) (Moon, 2004).

Nicol and Pilling express the learning approaches in conventional terms stating that "authentic learning tasks develop professional competencies". They further articulate the ideal learning tasks to prepare students for architectural practice stating that "students' learning processes should be embedded in authentic physical and social contexts that represent, as far as possible, 'real life' practice situations. If we wish students to learn the social art of design in practice, it is better that they negotiate a brief with a real client than receive a typed brief from the course tutor. Similarly, learning about the needs of building users is better achieved by having students go into the community to talk with users than by having them infer the needs of users while at the drawing board" (Nicol & Pilling, 2000). Stevens has presented a critique on architectural education presenting the design studio as an enforcement system of an "enculturation process" for the students' cohort towards "docile acceptance.. in a state of insecure expectation" (Stevens, 1998).

3.10 Towards an Emerging Classification of Approaches to Learning in Architectural Design Education

This chapter has reviewed the theoretical underpinnings within pedagogical research in architectural design education and its relevance to students' approaches to learning. This review has addressed the central question, "What are the approaches to learning being adopted by the students in the architectural design coursework?" by identifying the gap in the available literature of pedagogical research in architectural education with reference to the phenomenon in question, 'students' approaches to learning.' The

literature review spanning the Roman period of the Vitruvian triad (Before Christ 60-70BC) (Vitruvius, 1960, 1999) (Translation Publication Year) to the exploration of design through architectural language (Unwin, 2014) (Figure 11) has focused on language, pedagogy, theory and content to present this gap.

The connected research question on how the students' learning approaches progress from the first year architectural design coursework to subsequent years has been explored through the theories of experiential and reflective learning within the design studio (Section 3.3) as well as the schools of thought and philosophies within architectural education in the international context (Section 3.4). This has included a discussion on the role played by various accreditation bodies with a focus on the European, North-American and Indian context (Sub-section 3.4.1). The progression in the learning approaches from the first to fifth year has been further discussed through the identified research vehicle of architectural design coursework within the learning context of specific institutions and their philosophical underpinnings in the international context (Sub-section 3.8.1).

The final question of how do approaches to learning evolve in the architectural design coursework from the first-to-fifth year of the program has been explored through available research on architectural skills and craft-based approaches (Sections 3.5, 3.6 and 3.7) from the perspective of focusing on the design product as well as process, in addition to learning styles, collaborative learning and the role played by faculty in the design studio.

This review represents a backdrop to established pedagogical research within architectural education on classification of students' learning approaches in this study. The pilot study discussed in Chapter 5 — a comparative analysis of students' approaches to learning adopted in the first and fourth year based on their experiences while undertaking an architectural design project - has identified six categorized learning approaches (Iyer & Roberts, 2014) (Appendix II). This study further reinforces the overall research theme for the emerging classification of student's learning approaches seen through the literature review in the current chapter. This review provides a broad canvas to draw upon as a definition on learning approaches with those identified in the pilot study falling within the spectrum of the deep and surface dimension (A. Iyer, 2015; Marton & Säljö, 1976).

The emerging categorized approaches to learning have formed a framework that draw parallels to Unwin and his work with students in the early stages of architectural

education at Welsh School of Architecture (Unwin, 2001). This review in the current study into this emerging classification has prepared the canvas for the process of learning adopted by architecture students as they progress up the ladder of their rigorous years in the educational context, and step into the portals of professional practice; thereby moving from the surface to the deeper dimensions of learning approaches. This is outlined in Appendix II, the literature review of approaches to learning in architectural education (A. Iyer, 2015)

As a further parallel the emerging categories from this extensive literature review reflect upon the approaches to learning adopted by students in the architectural design coursework and its manifestation in the subsequent years as a viable methodological connection through phenomenography for the data collection, analysis and classification of the learning approaches in question, further elaborated in the next chapter.

Chapter 4: Phenomenography- Methodology and Method

4.1 Phenomenography and Approaches to Learning in Architectural Education

This research is about developing a taxonomy of approaches to learning within architectural education, focusing on how these approaches may change as students' progress towards graduation. The central phenomenon of students' approaches to learning is further explored by understanding the classification of learning approaches from the first year of the architectural design coursework to subsequent years.

Approaches to learning have been well-understood in other disciplines but less-researched in the field of architecture (A. Iyer, 2015). Students' learning approaches in higher education have been expressed in terms of surface and deep approaches (Marton & Säljö, 1976) and strategic (achieving) approaches (J. Biggs, 1979). This chapter focuses on exploring the qualitative research methodology of *Phenomenography*, the research tool used by Matron and his team to uncover the phenomena of surface and deep approaches to learning; which will be used to generate the proposed classification of approaches to learning in this study. As per Marton (1992), *phenomenography* has been defined as "the empirical study of the limited number of qualitatively different ways in which we could experience, conceptualize, understand, etc. various phenomena in and aspects of the world around us. These differing experiences, understanding, etc. are characterized in terms of categories of descriptions, logically related to each other, and forming hierarchies in relation to the given criteria. Such an ordered set of categories of description is called the outcome space of the phenomenon or concepts in question" (Drew et al., 2001; Marton, 1992).

Phenomenography was applied in this study by mapping the experiences of the research participants, i.e. architecture students based on their understanding of the phenomenon in question, and their learning approaches in the design coursework. The approaches to teaching and learning in various fields of higher education and in creative fields within design education have been studied using the phenomenography. A literature review on phenomenography in design education has indicated further research that needs to be undertaken in architectural education (Bailey, 2002; Drew et al., 2001; Trigwell, 2002). The phenomenography-based *pilot study* in Chapter 5 (Appendix III) has identified categories of learning approaches adopted by first and fourth year architecture students. These categorized approaches have pointed towards the manifestation of a more complex division within architectural design to the established deep and surface dimensions of learning approaches (Iyer & Roberts, 2014).

Students of architecture are introduced to various theoretical constructs in design coursework as a part of their curriculum. This research explores how students' approaches to learning manifest themselves in architectural design from the first year of the curriculum through the entire duration of the program. The design coursework of the five-year program was used as the context of this research for classifying the students' learning approaches. This was considered appropriate instead of history, theory and technology; as architectural design plays a central role throughout their education. The academic context was explored through the literature review in Chapter 3 with the focus on pedagogical research in architectural education and students' approaches to learning (A. Iyer, 2015). This review further explored the facets of students' learning in design coursework (Roberts, 2006; Webster, 2001, 2004), the design studio (Schon, 1985) and the historic, international and philosophical perspectives in architectural education (Bax, 1991; Gulgonen & Laisney, 1982; Littmann, 2000; Stevens, 1998).

This research has been undertaken using phenomenography from an international perspective represented by four institutions of architecture by examining their design curricula offered in the undergraduate programs. This includes the Sir JJ College of Architecture, India; School of Architecture, Oklahoma State University and School of Architecture, University of Texas in Austin, the United States of America and the Welsh School of Architecture, Cardiff University, UK.

4.2 What is Phenomenography?

"Phenomenography enables the researcher to identify the range of different ways in which people understand and experience the same thing" and "is interested primarily in surfacing variation of experience and understanding"(Cousin, 2009).

Phenomenography as an idea has been termed as "gaining knowledge about the world" through constructed arguments by exploring "the nature of learning and in particular the nature of the experience of learning"(Marton & Booth, 1997). The design construct for this research approach is based on resolutions to enquiries relating to learning and thinking. From initial evolution at the Department of Education, University of Gothenburg, Sweden; the term 'phenomenography' emerged in 1979, and was published in 1981(Marton, 1981, 1988). A classical definition that has permeated within research publications states, *"phenomenography is a research for mapping the qualitatively different ways in which people experience, conceptualize, perceive, and understand various aspects of, and phenomena in, the world around them"* (Marton, 1988).

Phenomenography approaches the human experience by transforming individual awareness qualitatively and presenting the phenomenon through a collective cohort of experiences. It embodies a *second-order perspective* where the focal point explores the experiences of the people in the diverse contexts of humanity (Marton & Booth, 1997). The phenomenographic researcher does not try to describe these facets on his own accord as approached in a *first-order perspective* like ethnographic research. Phenomenography is presented from a *non-dualistic* perspective as there is an understanding that there cannot be a disconnect between the objects and the subjects, with humanity or the world being "what we perceive and experience it to be" (Hsu, 2008). This methodology uses the collection of experiences of specific individuals experiencing the phenomenon being studied as the basis for representing the *non-duality* in the research undertaken, where the researcher's perspective is not taken into consideration. This non-dualistic perspective represents the connection between the collective experiences and the phenomenon in question.

The interpretation of *phenomena* is the experience of an individual or a range of shared experiences of a group of people. The focus of phenomenographic research is to present this range of shared experiences within "limited ways in which any given phenomena are experienced" (Brew, 2001). The researcher is in a position to present a holistic perspective of the phenomena in focus through rigorous qualitative analysis using the collective experiences of the group by remaining true to the individual's experience (Boon, Johnston, & Webber, 2007). These common ways of understanding humanity are collectively presented as *categories of description* classified by their characteristics as *relational* categories (intentional or subject-object relations), *experiential* categories, *content-oriented* categories (meaning of the phenomenon) and/or *qualitative* categories (description of the phenomenon) (Demirkaya, 2008; Marton, 1981). These variations or differences in the human experience or meanings are presented in phenomenography through structural relationships between these meanings through three important assumptions. *Experience* and *awareness* are non-dualistic and relational; human awareness is the object of any study following this approach. Also there is a *structural* and *referential* facet to this architecture of awareness (Kebaetse, 2010; G. S. Åkerlind, 2011). Within phenomenographic research, the *structural* and *referential* facets of awareness form the key components to the *outcome space* that will emerge from the *categories of description* and elaborated in sub-section 4.5.2.

Though it has a well-founded empirical point of departure rather than a philosophical and theoretical grounding, two reasons for the development of phenomenography

include, firstly its use as a research tool in clarifying "the nature of human awareness" and secondly, use in the improvement of learning and teaching "as an educational tool" (G. S. Åkerlind, 2011). The phenomenographic aim of humanity as perceived represents the second-order perspective which is in contrast to the description of humanity or "the world as it is," from a first-order perspective (Gibbs, Morgan, & Taylor, 1982). This description of the second-order perspective as presented from the construct of students' learning looks into "the content, context and awareness of learning." Within the learning context, this is distinct from the first-order perspective as "the context of learning is (thus) not described independently of the learners but through their eyes" (Marton & Svensson, 1979).

The second-order perspective in this study represents the students' approaches to learning analyzed through phenomenography using their learning experiences while undergoing architectural education. The well-founded emphasis on an empirical basis of analyzing human experience and awareness in comparison to theoretical or philosophical construct raises the question of whether phenomenography can be perceived as a research methodology or a method. This is based on the qualitative rigour that is necessary in the identification and description of people's experience, central to phenomenography (Dortins, 2002; Gerlese S. Åkerlind, 2005a).

The origins of phenomenography in the 1970's is grounded in rigorous qualitative analysis of codification where "the abstract and empirically unverifiable conceptual frameworks" are replaced by "a truly empirical approach to learning as a human and institutional phenomenon" (N. Entwistle, 1997; Marton & Säljö, 1976). Discerning this phenomena with a focus on learning is presented as central to the phenomenographic tradition of research (Madeleine Abrandt, 1998; M. Svensson & Ingerman, 2010). Phenomenography is presented as a research orientation where the focus "is restricted to the way of arriving at descriptions of conceptions" and isn't considered as "a system of philosophical assumptions and theses" where notions of "metaphysical beliefs and ideas about the nature of reality and the nature of knowledge" are given prominence (L. Svensson, 1997). The empirical grounding of this approach, thus raises the question of whether phenomenography needs to be presented as a research methodology or as a research method.

4.2.1 Phenomenography: Research Methodology - Method

Research methodology in the domain of educational research is positioned by focusing on the research process within four key elements. These include methods or procedures used for gathering and analyzing the data; methodology or the strategy of the research design or process in selecting a particular research method; theoretical or philosophical

position inspiring the methodology; and epistemology or the theoretical knowledge construct encapsulated in the said methodology (J. M. Case & Light, 2011).

The fundamental assumptions that ground phenomenography as a research method has its basis in general scientific traditions, in comparison with a research methodology that has a philosophical basis with specific emphasis on certain schools of thought.

Svensson has listed six assumptions including

- "knowledge has a relational and holistic nature;".
- "conceptions are the central form of knowledge;".
- "scientific knowledge about conceptions (and generally) is not true but uncertain and more and (or) less fruitful;".
- "descriptions are fundamental to scientific knowledge about conceptions (and generally);".
- scientific knowledge about conceptions is based on exploration of delimitations and holistic meanings of objects as conceptualized;".
- scientific knowledge about conceptions (and generally) is based on differentiation, abstraction, reduction and comparison of meaning".

He has identified the relationships of the varied set of experiences in a specific context that leads to the formulation of an idea or concept. The scientific basis for this idea or concept would be relative within the actual world context of the experiences. The scientific definition or description of that idea, concept or the phenomenon in question would therefore depend on presenting it within a certain framework which includes the categorization of the collected experiences and distillation to reflect this empirical position within general scientific traditions (L. Svensson, 1997).

Marton has stated that the search is *"for the singular essence of the phenomenon"* using the *first-order* within the *phenomenological* perspective; phenomenography in contrast, as a qualitative research approach, represents the *second-order perspective* and *"it is the study of variation on ways that people understand phenomena in the world around them"* (Marton, 1981; Röing, Hirsch, & Holmström, 2006). The framework for this research tradition includes the research hypothesis of variation in the identified phenomenon. It also involves collating and classifying the experiences of the population through rigorous qualitative analysis, with the categories of description evolving from the various ways of experiencing the phenomenon in question. As the description of "human experiences of phenomena or generic concepts" is coupled with the identification of "the meaning that people assign to it," phenomenography as a research method aims at

capturing the variations in the day-to-day experiences of the people's phenomenon of learning and teaching (Austerlitz, 2006).

Phenomenography as a research method is dominant within educational research in higher education, in understanding the students' experiences (Austerlitz, 2006; N. J. Entwistle, 1997; Marton & Saljo, 1997). Marton and Booth side-step the question of phenomenography as a methodology or method by implying that "although there are methodical elements associated with it, nor is it a theory of experience, although there are theoretical elements to be derived from it." Phenomenography is portrayed as a method that involves the identification, formulation and addressing specific forms of research questions. The research method has focused on the hypothesis pertaining to "learning and understanding on an educational setting" (Marton & Booth, 1997). As a research method, it is impossible to separate data collection from data analysis, due to the strong dialectic relationship that constitutes the object of research. This *object of research* or the phenomenon in question is analyzed through "the pool of meanings" from a range of individual experiences. This procedure of discovery is reiterated as "rigorous qualitative analysis" leading to the categories of description and outcome space in the phenomenographic research method (Marton & Booth, 1997; Marton & Saljo, 1997).

4.2.2 Phenomenography & Other Research Methods in Education
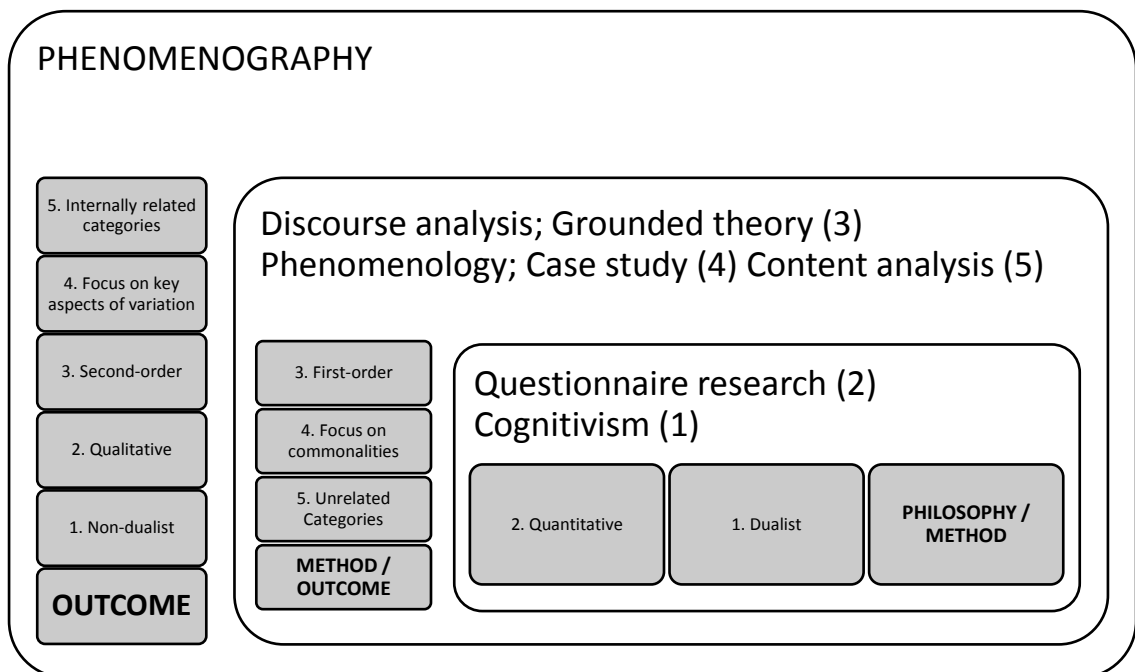
Figure 14: Phenomenography and Other Research Methods in Traditional Qualitative Analysis, adapted from Figure 1. On defining phenomenography, (Source Pg. 369) (Trigwell, 2006)

Whereas traditional qualitative analysis is built on categories of human experiences being determined in advance of being sorted and analyzed, the dialectic process of analysis within phenomenography is a process of discovery. This qualitative research

method is time-consuming, tedious and iterative process until a state of stability is achieved within the categories of description or "the whole system of meanings" (Marton, 1988). Trigwell (2006) presents a visual definition of phenomenography within the broad qualitative research methodological framework in Figure 14 that encompasses the various methodologies including cognitivism, grounded theory and phenomenology, focusing on first-order, philosophical and methodological domains, as compared with second-order, non-dualist and outcome-based domains of this research method (Trigwell, 2006).

Practical guidelines for phenomenography have included a step-by-step approach to the research method that will be explained in Chapter 6, Sub-section 6.9.2. The researcher's empathy towards the entire spectrum of the phenomenographic study is particularly important. This includes independence in participant selection, and freedom of expression in describing the experience, neutrality and empathy during interviews including data collection and analysis and discovery/identification of categories during the natural flow of the experiences (Ashworth & Lucas, 2000). Phenomenography as an outcome-based research method of educational research was central to its adoption for this study, in classification of students' approaches to learning in architectural design.

Educational research has its focus on learning and teaching as a basis through implicit and explicit theories. Biggs (1994) has elaborated on the implicit theories in educational research through the adoption of quantitative and qualitative methods. These theories are a long way from understanding the phenomenon of learning from an educational construct including the role of teaching in enhancing the students' learning experience. Biggs (1994) further presents the explicit theories of students' learning, that include student-based, teacher-based, process-based, classroom-based, the phenomenographic model and the institutional model (J. B. Biggs, 1994). These include quantitative, qualitative and mixed methods incorporated in research models, including the *Presage-Process-Product (3-P)* classroom teaching model (J. B. Biggs et al., 2001), *Structure of the Observed Learning Outcome (SOLO)* taxonomy (J. B. Biggs, 2011), the *Approaches to Studying Inventory (ASI)* – (Entwistle & Ramsden 1983), (J. B. Biggs, 1994), *Study Process Questionnaire (SPQ)* and *Learning Process Questionnaire (LPQ)* (J. B. Biggs et al., 2001) .

- Within qualitative research in education, methodologies including case study, grounded theory, ethnography, action research, discourse analysis and narrative analysis, have presented phenomenography as the research method primarily

focused "within particular educational and learning contexts" (J. M. Case & Light, 2011).

- Trigwell (2006) depicts the outcome-based perspective of phenomenography in Figure 14 by comparing this research method with other qualitative methodologies that focus on the philosophical and methodological perspective. These include cognitivism, grounded theory and phenomenology.

- Reductionism and the formalized research models within quantitative and qualitative methods in education research, where students' experience is not central to both the data collection and analysis, have presented phenomenography as an alternative research method, where empathy, rigour and scientific research go hand-in-hand (Figure14) (Trigwell, 2006; Webb, 1997; Gerlese S. Åkerlind, 2005b).

- Phenomenography is used for educational research as outcome-based research rather than being classified within the theoretical construct of philosophy. Neither can it be classified as a research methodology disconnected from the phenomenon of students' experience of learning (Trigwell, 2006).

- There is an amalgamation of the non-dualist, qualitative process, which involves the second-order perspective. The focus of phenomenography is on the key aspects of variation in the identified phenomenon that is presented as internally related categories in understanding the learning experience (Trigwell, 2006).

In the framework of this research, capturing the student's learning experience through their five years of their undergraduate education is important, basing the learning and research context on their architectural design coursework. Phenomenography as a method has played an important role in creating a research framework that encapsulates the data collected. This is in the form of students' learning experience of the physical domain of the research taken from the four architectural institutions.

4.2.3 Phenomenography: Psychology, Philosophy and the Sciences

It is a mistaken assumption to regard phenomenography as a theoretical construct of philosophy in comparison with an outcome-based research method. Neither should it be given the status of an empirical branch of psychology. Whereas in psychological classification the phenomenon is subordinate, in phenomenographic classification the phenomenon of various experiences, both structurally and referentially, are the focus of the research approach (Marton & Booth, 1997). In traditional psychology, the research focus is on "how people perceive and conceptualize the world" with the aim "to characterize, the process of perception and thought in general terms". This is in contrast to phenomenography where the research interest is "in the content of thinking" (Marton, 1988).

Phenomenographic studies present a language that represents outcome-based analysis, rather than the language of psychology where the philosophical methodology transcends the subject matter or the phenomenon in question (Marton, 1988; Trigwell, 2006). As a research specialization, phenomenography is one of the non-dualist approaches where the internal thinking process or people's experience is connected to the external world or humanity; thus differing from the generalizations and dualist approaches within the psychological domains of research (Marton, 1988; Säljö, 1997). Phenomenography has, therefore, been presented as one of the research methods within the learning context. This method transcends the philosophical and methodical perspective to provide an outcome-based analysis of the phenomenon in question.

Phenomenography takes the conceptions of reality beyond the framework of true-vs-false and right-vs-wrong, thus being placed in the midst of "natural science (disciplines that deal with what we hold true about the world) and traditional social sciences (which seek to discover laws of mental operations and social existence)" (Marton, 1988). The constructivist research traditions in social sciences, where the role and analysis of discourse within human affairs, is the key, and includes ethnography (Heritage, 1984), conversation analysis (Atkinson & Heritage, 1987), social constructionism (Shotter, 1993) and linguistic anthropology (Goodwin & Durante, 1992). Phenomenography espouses the constitutionalist research tradition with its focus on "the constitutive role of language in human life" which is presented through the individual and collective phenomena of experiences that constitute the world (Säljö, 1997). The role played by language in the individual and collective experiences related to the phenomenon in question represents the constitutionalist framework which is the focus of phenomenography (Anderberg, Svensson, Alvegård, & Johansson, 2008).

The traditions of realism are based on behavioral facets including mental entities from a cognitive perspective. However, the traditions of constructivism are concerned with the phenomenon in question. These include conceptions of learning within the academic framework of curriculum, which utilizes the theoretical construct of cognitive theory. Phenomenography presents the phenomena of learning from both an individual perspective and from that of the group of learners. This is 'individual constructivism' and 'social constructivism' but approached through a constitutional perspective as "discourse is given a critical role in this constitution of the world in social practices" (Richardson, 1999; Säljö, 1997).

Traditional *content analysis* has a predetermined framework of categories within which the phenomena are codified. In contrast, in phenomenographic analysis, the codification

and categorization of the said phenomena is a process of discovery (Marton & Saljo, 1997). This is because qualitative content analysis of the collected data involves theoretical and thematic coding which includes open, axial and selective coding that have their basis in the philosophical and methodological construct of the researcher, which is interpreted on the basis of the research question (Flick, 1998). Content analysis and the phenomena as human experience has led to the comparison and connection of phenomenography to the phenomenological traditions of research, within the realms of psychology, philosophy and the sciences.

4.3 Phenomenology vis–à–vis Phenomenography

With human experience as the object of research, one of the pre-eminent schools of philosophical thought—phenomenology, and its investigation of the study of experience—has led to comparison and contrast with the phenomenographic research approach (Marton & Booth, 1997). Though both the research traditions of *phenomenology* and *phenomenography* have their influence within phenomenological philosophy or the concept of intentionality, the variations in ways of experiencing a phenomenon are presented through phenomenography; whereas a specific meaning or essence of a range of experiences is captured through phenomenology (Hsu, 2008).

4.3.1 What is Phenomenology

Based on the philosophical focal point of intentionality propounded by German Philosopher, Franz Brentano (1973); *phenomenology* represents phenomena as all the scientific knowledge around the world which is established within our immediate experience. According to Husserl, the founder of modern phenomenology; it is possible for the perception of phenomena to remain uncontaminated through the experience of the historical and intellectual construct (Marton, 1988; Webb, 1997).

Phenomenology is described within three sources, including:
- Goethe's phenomenology (1960) of nature where the ordered phenomena in the natural environment such as colors and developments in flora and fauna are presented as a singular natural experience (Østergaard, Dahlin, & Hugo, 2008)
- philosophical phenomenology or Husserl's (1973) pure philosophical construct of the "absolute point zero" and the development of the entire knowledge spectrum from it (Østergaard et al., 2008) and
- anthropological phenomenology, which is Merleau-Ponty's (1962) dual emphasis within the cultural context on "action before cognition" and looking at "the meaning of action and experienced meaning" (Østergaard et al., 2008)

All the three sources subscribe to the argument posed by Husserl of the need to ignore the outer immediate experience and reducing the contents of personal consciousness

of the external world and treat it as pure or singular phenomena (Groenewald, 2004). The aim of phenomenology is to present the essence of the experience in its totality through the various ways in which a human being experiences and extrapolates "the phenomenon of interest" (Marton & Booth, 1997). So the phenomenon of experience, which is the common thread of the phenomenological and phenomenographic traditions, also raises the question of Phenomenology-vs-Phenomenography.

4.3.2 Phenomenology-vs-Phenomenography

The singular interest in presenting "the fullness of all the ways in which a person experiences and describes the phenomenon of interest" differentiates phenomenology from phenomenography which "is focused on the ways of experiencing different phenomena, ways of seeing them, knowing about them and having skills related to them" (Marton & Booth, 1997). Though both traditions share the common object of research in human experience, the approach in interpreting the object of the research or the phenomenon in question is very different. The focus of phenomenology is on "the most invariant meaning or essence of an experience" whereas phenomenography is identifying "the variations of an experience" (Kebaetse, 2010). There is also a variation in the population sample used to conduct phenomenological research which could even be a single individual, whereas phenomenography requires a sample of a number of individual experiences for the analysis (Kebaetse, 2010).

Phenomenology differs from phenomenography as "in the former, the researcher (the philosopher) is exploring [his or her] own experience by reflecting on it. In the latter, the researcher is exploring other people's experiences by reflecting on them" (Marton & Booth, 1997). The second-order perspective that connects the individual experience or that of a group of people with the object of the research, and their connection to the world, is pre-eminent for the phenomenographic researcher. The first-order perspective, or the personal experience of the researcher, with respect to the phenomenon is filtered or "*bracketed*" within phenomenographic analysis. In phenomenology, the "researcher's own experience" is prominent in the analysis; in phenomenography such "judgements about the object of experience are bracketed" (Marton & Booth, 1997). This leads us to the element of commonality within these research traditions and the possible overlap. This is represented through the various phenomenographic approaches adopted by researchers including *Experimental, Discursive, Naturalistic, Hermeneutic and Phenomenological Phenomenography* (Hasselgren & Beach, 1997; Kebaetse, 2010).

4.4 Phenomenography – Approaches within the Research Tradition

Five distinctive approaches within the phenomenographic research tradition have developed since its origins in the 1970's as a part of its initial evolution at the Department

of Education, University of Gothenburg, Sweden (Hasselgren & Beach, 1997; Kebaetse, 2010; Marton & Säljö, 1976).

1. *Experimental phenomenography* is an enterprise with its focus on the outcomes to learning that are analyzed through quantitative measures; but processed through the qualitative rigour required for the phenomenographic analysis and categorization.
2. *Discursive phenomenography* or pure-phenomenography is focused on the actual collection of experience and conception in comparison to the research outcome.
3. *Naturalistic phenomenography* has its focus on collecting data within the authentic environment without manipulation. A natural analysis of these actual observations is the key to this phenomenographic approach.
4. *Hermeneutic phenomenography* has its focus on the interpretation of data by the researcher who is the interpreter and the experience that is the object of interpretation. This approach has value in interpreting raw data dating to a certain period and its relevance to the actual period of research.
5. Traversing back a-full-circle, *phenomenological phenomenography* or a phenomenographic approach with its construct in Grounded Theory has its "focus on the essence of the learning experience rather than on describing the outcomes of learning" (Hasselgren & Beach, 1997; Kebaetse, 2010).

The above classification of the various approaches presents a somewhat nebulous framework for the research tradition of phenomenography, the reflective overlap with the phenomenological traditions and the various steps towards undertaking phenomenographic analysis have been criticized in various research quarters. This present study falls within the domain of *pure phenomenography* by exploring the central phenomenon of architecture students' approaches to learning and developing the classification through the phenomenographic research method. This taxonomy has been further reinforced through a new and original phenomenographic representation, which classifies these identified approaches based on the students' experiences through data collection in the four institutions.

Phenomenography as a research method has been used in this study with emphasis on
- the phenomena or the object of conception;
- the categories of description and the outcome space;
- the data collection and analysis;
- the reliability of the data;

- the research process involving physical and computer-aided analysis.

It is also important to understand the criticisms levelled on this research tradition that would not only present phenomenographic analysis in the perspective of this study, but also the steps taken in following this research method.

4.4.1 Phenomenography: Criticism of the Approach

Criticism of a research methodology brings the process and the steps undertaken within the research method in perspective, and its reliability needs to be checked at every stage of the research. Reliability of qualitative data and its analysis has its basis in the replicability of the results within a qualitative methodology. As phenomenography is a part of the qualitative research tradition, Marton (1986) a key member of the Gothenburg research group, confronts this question of replicability as a reliability test for the findings such as categories of description as they are arrived on the basis of discovery. As discoveries need not be replicated, this holds true for both the context of the discovery in terms of the hypothesis which is the phenomenon in question, or the object of conception, including the categorized fragments of experiences within each category (Sandbergh, 1997).

The question of inter-judge reliability leads us to limitations currently observed in phenomenographic studies, including the involvement of an individual researcher for a project, the research approach of discovery and interview being central as the key data collection tool for phenomenography (Kebaetse, 2010). Whereas phenomenographic research as a team with researchers of varied backgrounds does help in both the process of data collection and analysis, it is also seen as a solution to inter-judge reliability. This is done through consultation and verification of both the primary data collected, and also in the process of codification and categorization (Bruce, 1994; Drew et al., 2001; Kebaetse, 2010).

Saljo (1988) presents key pointers for effective inter-judge reliability within a team of researchers including consensus, comparisons with parallel studies, a strong case of thorough literature review as its basis; and graphical representation in constructing the outcome space on a relational basis of the analyzed categories (Bruce, 1994). Involvement of an individual researcher has an effect on both reliability and identification of the categories and on the process of discovery. Input from the dissertation supervisor and the committee can be a key reliability check for the individual researcher. For the discovery process, the identification of categories should be considered as the strength of phenomenography for the researcher who stays committed to the transcript and presents the true picture of the phenomenon in question (Kebaetse, 2010). The reliability

of the research findings is further enhanced through publication in research seminars, peer-reviewed journals and conferences to validate the phenomenographic results (Gerlese S. Åkerlind, 2005b).

Saljo (1997) has questioned the interview process as the important data collection tool within phenomenography because of the issue of reliability—whether the utterances within an interview are experiences related to the phenomenon or initial reflections of the individual based on the questions posed on the object of conception (Säljö, 1997). Some points to be considered include the experience of the interviewer in conducting semi-structured interviews of qualitative rigour, the encouragement of the interviewee to give in-depth responses, and renegotiating questions with further probes or prompts to elicit the experience of the phenomenon in question. The interviewer has to be aware of unexpected behavioral swings of the interviewee and conduct the interview in comfortable surroundings to avoid such situations. Feedback from interviewees, often considered as a key validity check, is not followed in phenomenographic research as the results are based on the collective experience and not individual interviews in presenting the meaning of the identified categories (Kebaetse, 2010; Gerlese S. Åkerlind, 2005b).

Such criticisms present cautionary steps to be adopted by the researcher, They include the collection of data through interviews where the interviewee accounts "from actions to experience, and from concrete to abstract", presentation of fully developed categorization within the categories of description using adequate interview extracts, reflective process for the data collected, and formulation of categories with the focus on interpretation. They also include established categories framed in the scope of literature within the phenomenographic research traditions including a logical and through analysis of embedded meaning (N. Entwistle, 1997). Chapter 6, Sub-section 6.9.2 of this study explains the various steps undertaken in the phenomenographic research method, and pilot study (Chapter 5) (Iyer & Roberts, 2014).

4.5 Phenomenography: The Research Method

In simple terms "phenomenography enables the researcher to identify the range of different ways in which people understand and experience the same thing" and "is interested primarily in surfacing variation of experience and understanding"(Cousin, 2009). Marton has stated that *"each phenomenon in our world can be seen and understood in only a limited number of distinctively different ways."* He further states that *"understanding is defined as the experiential relations between an individual and a phenomenon"* (Marton, 1992).

Thus a phenomenographic study helps in mapping the experiences based on the understanding of the participating individuals of the phenomenon being studied. Phenomenography involves the identification of a limited number of "qualitative different experiences and understanding of a particular phenomenon"(Cousin, 2009) and the emerging categories of description represents the research findings through the outcome space of the phenomenon in question, elaborated is Sub-section 4.5.2.

The categories of description, identified on the basis of the participants' experiences, hold the key in identifying conceptions and understanding of the particular phenomenon. The possibility of connecting the original experience with the participant is ruled out as the "scientific knowledge about conceptions is based on the exploration of delimitations and holistic meanings of objects as conceptualized" and "is based on differentiation, abstraction, reduction and comparison of meaning" (L. Svensson, 1997). Thus, phenomenography as a research method is based on the disconnection of the original experiences from the participants, through iteration and filtration (explained further in Sub-section 4.5.5); thus differentiating and abstracting these experiences as the categories of description. The phenomenographic analysis is further elaborated as ten steps in Chapter 6, Sub-section 6.9.2.

4.5.1 Phenomenography: The Phenomenon & the Object of Conception

The qualitatively different ways of experiencing a phenomenon is the focus of phenomenography in comparison to identifying the nature of the phenomenon. The phenomenographic researcher sets out on the mission of segregating the variation in the ways of experiencing the phenomenon. The structural and referential relationships in these variations are representative of the interpretations within what is experienced and explained in Sub-section 4.5.2. The experience of an event within a specific context can be described as a phenomenon. The phenomenon is presented as the unit of phenomenographic research described as the way of experiencing a context and these variations of the phenomena in question being the object of the research method (Brew, 2001; Bruce, 1994; Kebaetse, 2010; Marton & Booth, 1997).

The subject, comprising the individual or a group of people, and the object of research, i.e. the ways of experiencing, share a relationship that is presented as conceptualization, understanding or perceiving the phenomenon. This act of perceiving that experience is the collective description of the said phenomena through individual experiences at a collective level (Andretta, 2007; Marton & Booth, 1997). The phenomena of people's understanding, that constitutes the range of experiences of both the individual and the group of people, is characterized by investigating the variation that "can be understood in a limited number of qualitatively different ways" (Marton, 1988).

Marton (1986) feels that identifying the limited ways of understanding the phenomena through this process facilitates the transition "to a qualitatively better perception of reality" (Webb, 1997). These limited ways or outcomes are represented as 'categories of description' with the qualitative enhancement of the object of research presented through the 'outcome space'. These outcomes are presented as a "*pool of meaning*" which includes fragments of the individual experience and categorized as a pool of collective fragments of experiences (Gerlese S. Åkerlind, 2005b).

4.5.2 Phenomenography: The Structural & Referential Facets

Conception in phenomenographic research or the unit of description is described as ways of conceptualizing, experiencing, seeing, apprehending and understanding. It includes two interconnected facets, the *referential facet* that represents the meaning of the conceptualized object of research at a global level; and the *structural facet* that presents a specific blend of characteristics which is the focus of the research and observed in detail (Marton & Pong, 2005). Marton, (1994) has elaborated on the two stages of analyzing data in traditional phenomenography through the referential and structural facets of the identified phenomena within the outcome space, by hierarchically depicting the potential conceptions (Shamblin, 2006).

Svensson (1997) has further elaborated on phenomenographic analysis by looking at parts of the data, differentiating these parts and interpreting the data based on their referential meaning. These unit-based differentiations go through further analysis and descriptions based on their characteristics. The fundamental basis of delimiting these parts is not sequential, but is related to the content of the referential meaning of the data. This content, together with the formation of these whole-characteristics "makes the organization of content central in the description" when the units are analyzed together (L. Svensson, 1997). The importance in phenomenographic analysis is the focus on the *referential facet* and interpreting the identified conceptions related to the phenomena being studied based on its interpretation at the global level or the macro-context of research.

Prosser et al. have elaborated on phenomenographic analysis using the structural and referential components in the constitution of categories of description for university science teachers' conceptions of teaching and learning. This phenomenographic research that focused on teachers rather than students benefited in two aspects from "the structural and referential method of analysis of the conceptions" (Prosser, Trigwell, & Taylor, 1994).

- The categories of descriptions were identified based on "an internal structure of relations between the categories" and as Marton (1990) has stated that "the relations between the categories are of a logical character, and the categories have been ordered into a hierarchy in terms of inclusiveness (in which) they are progressively differentiated and integrated," (Prosser et al., 1994) pointing to the relevance of the referential facet.

- Saljo's (1979) report on the "dislocation in the internal structure" of the categories highlighting the differentiation required between "two qualitatively different groups," (Prosser et al., 1994) pointing to the role played by the structural facet in the phenomenographic analysis.

Pang (2003) has further extrapolated on the identification of each category within the outcome space including its description through structural and referential facets of phenomenographic analysis. The structural facet is represented by "the *internal* and *external horizons* of the phenomenon" in comparison with the referential facet that "involves the meaning given to the experience" (Hallett, 2010; Pang, 2003). The structural and referential facets for the phenomenographic analysis in this study has been further explained in Chapter 6, Sub-sections 6.10.1 and 6.10.2.

4.5.3 Phenomenography: The Phenomenon in Question

Tan (2009) has presented the case of the phenomena or the object of research i.e. conception which is central to phenomenography and is presented from the theoretical, analytical and pedagogical facets through three interconnected questions focusing on the methodological rigor of the research method. "What is a way of experiencing a phenomenon? What is the exact difference between the two (different) ways of experiencing a phenomenon? How can different ways of experiencing a phenomenon be brought about?" (Tan, 2009). The object of conception for this study has focused on students' learning approaches from four institutions with the research questions mapping the phenomenon in question through phenomenography (Marton, 1981; Marton & Säljö, 1976; Tan, 2009).

The research questions within this study, including what approaches to learning are being adopted by the students in the architectural design coursework, is reviewed through the theoretical facet of phenomenography. What this core phenomenon of approaches to learning is, and how the first year architectural design coursework impacts on their learning approaches in the subsequent years, has presented the analytical facet. Whereas the question, why approaches to learning evolve in the

architectural design coursework from the first year to the final year of the architecture program, gives a perspective on the pedagogical facet of the research.

4.5.4 Phenomenography: The Categories of Description & Outcome Space

The categories of description are presented as the results of phenomenography with interpretation, analysis and graphical depiction of the outcomes of this research method having a logical correlation to the said categorization or the object of the research, termed as the *outcome space* (Bruce, 1994; Marton, 1988). Outcome space and *categories of description* go hand-in-hand within the phenomenographic tradition of research. These categories of description are based on the collective platform of the limited variations that exist of experiencing the phenomenon. The phenomenon being studied is represented through a structure-of-awareness, termed the outcome space, involving the structural and referential facet (Bailey, 2002; Hsu, 2008).

The structural facet includes the *external horizon* or the refinement of the collective experiences to the entire context within the *internal horizon*, which involves the refinement of the categorized variations in these collective experiences and their relationship to the said context. In turn, the external and internal horizon determine the delimitation of the theme of awareness or the phenomenon in question. The meaning derived from the relationship of the collective and categorized variations of experiences is further presented as the referential facet (Bailey, 2002; Hsu, 2008; Pang, 2003). Whereas the categorized variations determining the categories of descriptions are primarily hierarchical, the vertical and horizontal axis of the outcome space graphically represent the structural and referential facet of the said phenomenon in question (Bailey, 2002; Hsu, 2008).

The factors that determine the quality of an outcome space include the revelation of key understandings through each category within the outcome space; the logical, hierarchical and structurally-inclusive parallel to the identified categories; and presented as outcomes limited to their minimum variation within the categories of the phenomenon in question (Marton & Booth, 1997; Gerlese S. Åkerlind, 2005b). This has led to the importance given to the in-depth understanding of data collection and analysis; but also the reliability of the data collected together with the qualitative rigor required within the phenomenographic research tradition.

4.5.5 Phenomenography: Data Collection

Data is primarily collected from the research participant in the form of interviews with the aim of encouraging the selected group to extrapolate on their personal experiences of expressing their "awareness of or ways of understanding the given phenomenon"

(Kebaetse, 2010) and reflect on the phenomenon, thus traversing from action to experience within the interview (G. S. Åkerlind, 2011). The researcher is in a position to access information on the experience of the interviewees, with the exception of their emotional intentions and physical actions that can be collected through direct observations. This data gathering within phenomenography includes open-ended questions (Vartiainen, 2009).

Since the focus of phenomenography is the range of collective experiences in the sample or the group being interviewed, the transcripts are presented as a collective whole with the categorized meanings being extrapolated from this data. The interviews are generally audio recordings, and are precisely transcribed, making them the focus of phenomenographic analysis. The analysis of the transcribed data and developing the categories of description requires the researcher to keep an open mind and explore the interviews as a collective experience. The emerging categories during the iterations of scanning the data are prescribed towards the collective experiential context in comparison to the context of an individual interview. Variations or the '*pool of meanings*' are codified in the context of the individual interview, i.e. 'in situ' or segregated and combined within the decontextualized context of the collective experience of the data in its entirety (Gerlese S. Åkerlind, 2005b).

The interviews are the preferred qualitative tool in collecting data within the phenomenographic tradition due to the substantial data describing the phenomenon that is collected together with the flexibility that is inbuilt in qualitative semi-structured interviews (Shamblin, 2006) and the representation of the interviewee's "*lived experience*" (Ashworth & Lucas, 1998). Qualitative interviews as a tool include the characteristics of understanding the phenomena in the interviewee's life with reference to the world; the interpersonal and sensitive approach of interaction with the interviewer; thus leading to a qualitative, positive and experiential, descriptive, open, theme-based and, on a specific line of conservation (Shamblin, 2006). The transcription process involves the transformation and distancing required on the part of the researcher from the interview, together with further editing the researcher's experience and reading the text in the context of the object of conception or the phenomenon in question (Dortins, 2002).

The data collection for this research using phenomenography was done through semi-structured interviews conducted by the principal researcher with students randomly chosen from the four architectural institutions. The interviews were recorded and transcribed verbatim according to the norms on anonymity, consent, data protection,

participants' participation and health and safety stipulated by the Research Ethics Committee, Welsh School of Architecture; Cardiff University (Iyer, 2012a, 2012b). The semi-structured interviews were conducted as described in the literature review in the settings of the design studio, thus connecting the interviewee's experience to the architecture students' learning context. The steps undertaken including data collection and analysis for this research are explained in Chapter 6, Sub-section 6.9.2.

4.5.6 Phenomenography: Data Analysis and its Reliability

Data collection through semi-structured interviews in the phenomenographic research tradition requires the researcher to focus on the dialogue structure with the interviewee. The question originally posed for the research problem, the functional analysis of various expressions and their intended meanings, together with returning to the question initially posed to the interviewee, is the normal sequence in an interview. The data analysis involves a brief sequence including the subdivision and delimitation of the fragments or sequences of experience from the complete data of transcribed interviews, comparison of these fragments to both the interview and the complete data; with the steps involved in pooling similar sequences and categorizing the variations into the categories of description (Anderberg & Åkerblom, 2011).

Data analysis in phenomenographic research method as described by Dahlgren and Fallsberg (1991) and Åkerlind (2005) includes a series of steps. This commences with the precise transcription of the recorded interview and written notes which prepares the groundwork for the collected data as a whole. The researcher repeatedly reads these transcripts in a process called iteration or familiarizing oneself with this collected data, i.e. the experiences as a whole. This reading also helps in editing and corrections according to the researcher's judgement. The next step involves the phase of compilation and condensing the data where answers to specific questions are grouped together to filter important facets of the phenomenon or the object in question.

The fragments of data in each transcribed interview are compared and classified using other fragments of the whole data. Clusters of fragments or preliminary groups of categorized experiences emerge at this stage. The researcher articulates the emerging categorizations through the repeated process of iteration and preliminary nomenclatures for the identified categories are given. This step is also termed as labelling or coding, using an acceptable analogy or metaphor of the categorized experience. These categorized descriptions of the phenomenon are compared and contrasted in a penultimate stage of iterations and emerge as the final categories of description (Daly, Adams, & Bodner, 2012; Hsu, 2008; Kebaetse, 2010; Risos Rio, 2008; Skavberg Roaldsen, Biguet, & Elfving, 2011), further articulated in Chapter 6, Sub-section 6.9.2.

The importance of certain descriptions in the interviewee's experience that in time develop into categories of description are due to their frequency; but also their position generally at the commencement of the experience; and finally the emphasis given to the description over the entire experience also termed as "*pregnancy*" (Hsu, 2008). The criteria used to rationalize the validity of phenomenographic analysis includes the distinctive characteristics of the identified categories of description and its relationship to the phenomenon in question; the logical connection of these said categories; and a prudent approach towards conclusively identifying the critical variation of these descriptive categories (Marton & Booth, 1997).

Reliability of the phenomenographic research tradition as a methodology within the construct of the epistemological foundations of established qualitative research is considered deficient by some researchers as depicted in Figure 14 (Trigwell, 2006). This has led some researchers more towards the phenomenological ground. Certain quarters within the qualitative tradition question the subjective nature of utilizing the identified categories in phenomenography, with praise for being faithful to the actual data collected during analysis; but criticism for not raising the analysis from the experiential to the abstract level (N. Entwistle, 1997; Kebaetse, 2010).

The yardsticks in establishing the phenomenographic research method through exemplar research studies includes the following: acknowledgement of the researcher's background for the phenomenon being studied; the attributes of the research participants and correlation to related contexts; justification for the questionnaire design; steps to enable unbiased data collection; avoidance of presuppositions such as a framework for the phenomenon, and approaching research analysis critically; explaining data analysis with controls and checks while interpreting the phenomenon; and allow other researchers to scrutinize the phenomenographic results using extracts of the analyzed experience (Marton & Booth, 1997).

Reliability within the construct of replication in phenomenography as a qualitative methodology is another criticism, which is countered by the argument of phenomenographic analysis being a process of discovery. This is extended further in reliability at the level of codification, categorization and the actual analysis. But these questions on reliability have presented an excellent grounding for phenomenography as a research method and its effectiveness as a process of discovery and unravelling approaches to learning within the spectrum of educational research. Many of the studies within established educational research using phenomenography have had significant

influences in contemporary educational theory as explained in Chapter 2, suggesting good levels of validity.

This research has adopted phenomenography placing the criticism in perspective from the literature review through the pilot study (Chapter 5) (Iyer & Roberts 2014). This research method has been used in formulating the research question and its elaboration in framing and conducting semi-structured interviews. Further steps were taken for the physical analysis of the collected data and the digital platform in presenting the analysis (Chapter 5).

4.5.7 Phenomenography: The Digital Platform using Qualitative Research Analysis Software

The data analysis within phenomenography and its focus on qualitative rigor places a heavy burden on the individual researcher or the team involved, including the steps involved in the physical process of undertaking the analysis (Chapter-6, Sub-section-6.9.2). Various qualitative research analysis software including Leximancer, Atlas.ti, CATPAC$_{TM}$ (TerraVision package), HOMALS (developed by Department of Data Theory of the University of Leiden using SPPS 8.0), HyperQual2; and various versions of NVivo including NUD*IST (Non-numerical Unstructured Data Indexing Searching and Theorising), NVivo7, NVivo 8TM have been used for phenomenographic research analysis (Ballantyne, Thompson, & Taylor, 1998; Bazeley, 2010; Kebaetse, 2010; MacGillivray, 2010; Mankowski, Slater, & Slater, 2011; Penn-Edwards, 2010; Prinsloo, Slade, & Galpin, 2011; Ryan, 2000; Serig, 2006; Shanahan & Gerber, 2004; Vartiainen, 2010; Zanting, Verloop, & Vermunt, 2001; Zhao, McConnell, & Jiang, 2009).

Phenomenographic analysis is effectively streamlined using the computer-aided platform where there is a large amount of data involved, thus engaging the researcher with an unbiased, reliable and reproducible platform for an iterative and qualitatively rigorous process (Penn-Edwards, 2010). The syntactic properties of the data can be identified and coded using flap boards in Atlas ti or nodes in NVivo as well as network views provided by the computer-aided platform; thus helping in the visualization of the emerging categories. These include multiple coding strategies available in the platform that enables the researcher to visualize the whole data (MacGillivray, 2010; Vartiainen, 2010).

NVivo, a qualitative data analysis software platform, is a widely used platform in the qualitative research tradition. It enables coding possibilities in the platform using the nomenclature of 'nodes' including 'parent and child' nodes. The researcher is in a position to commence with the open coding process and can create an aggregate set of

codes called a 'node tree'. The platform can also represent the identified fragment of description in the context of the individual transcript or that of the cluster of coded fragments within the specific node (Kebaetse, 2010). The platform enables the researcher to analyze transcripts individually and prepare nodes in reference to the object of conception. The codification process within the NVivo platform of creating nodes at multiple levels using work queries gives the researcher an engaging qualitative platform to work on the steps discussed in phenomenographic analysis (Serig, 2006; Shanahan & Gerber, 2004; Zhao et al., 2009).

NVivo-10 has been extensively used in parallel to the physical analysis of the data collected for both the pilot study (Iyer, 2012a; Iyer & Roberts, 2014) and the final study (Iyer, 2012b) of this research. Phenomenography and its role in the current study has been further reviewed through its importance in the field of higher education that has been further extrapolated in Chapter 2.

4.6 Phenomenography & Higher Education

The established research using phenomenography in higher education is based on the seminal research done by Marton & Saljo (1976) as a part of the original Gothenburg research group. Their research helped in looking qualitatively at different levels of understanding and undertaking detailed analysis of the students' descriptions of the treatment of the task which helped in the distinction between deep and surface approaches to learning (N. Entwistle, 1997). This validated qualitative differentiation from phenomenographic research is the starting point in this research based on the students' experiences in understanding their learning approaches in architectural design is central to this research method (Sub-section 4.5.5).

Marton and Saljo (1976) analyzed the responses of several students who were asked to read an extract from a text-book. The students were instructed that questions would be based on their understanding of the text within the extract. The authors found "that while some students tried to make sense of the text, others placed emphasis on memorizing it; these seemingly opposing study strategies were described as deep and surface learning respectively"(Cousin, 2009). Deep and surface approaches as metaphors has had a lasting impact on ongoing research in higher education in the three decades that followed. Cousin (2009) feels that "it is important to note that Marton and Saljo never claimed that deep and surface approaches are innate attributes of students; they accepted that the same student might use both approaches at different times, depending on the task in hand"(Cousin, 2009).

Booth (1997) has stated that in phenomenography, two aspects of learning as a phenomenon are questioned which includes the "What" of learning and the "How" of learning. She goes on the ascribe the "What" as "the conception held of the content of the learning task" and the "How" which "concerns more the nature of the act of tackling the learning task;" further indicating that "the teacher has to take an analytical stance to the phenomena to be taught" and help the learners "reveal their experience of learning"; and also "ensure that the tasks of learning are integrated into that world which the learners experience" (Booth, 1997). The research question for this research is extrapolated in the semi-structured interview, where the 'what' and 'how' of the learning approaches in the design coursework is presented through a series of introductory questions followed by probing into the learning approaches and conceptions. This brings us back towards understanding the importance of phenomenography in research within higher education and moving forward to its relevance in allied design fields including design education, adding further impetus to its role in architectural education.

4.6.1 Allied Design Fields using Phenomenography

A study conducted by Isomäki (2007) on the clarification with reference to "Information Systems (IS) Designers' conceptions of human users (of IS) by drawing on in-depth interviews with 20 designers" reflected on their "lived experiences in the work build up; a continuum of levels of thought, from more limited conceptions to more comprehensive ones reflecting variations of the designers' situated knowledge related to human-centered design. The resulting forms of thought indicate three different but associated levels in conceptualizing users; the separatist form of thought; the functional form of thought and the holistic form of thought"(Isomäki, 2007). This study has presented the creative process in practice-based learning context from a different perspective in comparison to deep and surface approaches of conceptual-to-memorization; applicable to the text-based learning context. The conception of knowledge for designers is correlated from the holistic perspective whether they are catering to technology or at the macro to micro level, to the human-centered environment at large; amalgamating various layers of information systems design.

Zoltowski et al. (2012) have studied the incorporation of human-centered approaches in the subject area of design. The phenomenographic study involved thirty-three student designers and seven categories of description were identified. The categories formed a two-dimensional outcome space; where the two dimensions seem to be indicate "human-centered design approaches" and "progression of design skills and strategies from novice to more expert" correlated with the vertical and the horizontal axis of the said space. "Five of the categories were nested hierarchically. From less comprehensive to more comprehensive, those categories included: Human-centered design as 'User as

Information Source Input to Linear Process,' 'Keep Users' Needs in Mind,' 'Design in Context,' 'Commitment' and 'Empathic Design.' Two categories represented ways of experiencing human-centered design that were distinct: design was not human-centered, but 'Technology-Centered' and human-centered design was not design, but 'Service" (Zoltowski, Oakes, & Cardella, 2012). This study provides a pointer towards the contentious nature within the classification of students' learning approaches in architectural design in this research, which primarily studies human-centric design in architecture.

Kleiman (2008) has studied the conceptions of creativity in higher education by interviewing twelve academics from a range of disciplines. The main question was the 'definition of creativity,' which has manifested through a range of statements; correlative to various manifestos and studies. "Five main categories of description, describing qualitatively different ways of understanding creativity in the context of learning and teaching, were constituted. They focused varyingly on the experience of creativity as a constraint-focused experience; a process-focused experience; a product-focused experience; a transformation-focused experience and a fulfillment-focused experience"(Kleiman, 2008). Kleiman states that the study is "still emergent and requires further analysis and distillation in order to depict both the relational and hierarchical aspects of the variations." He has further elaborated on the emergence of some patterns and relationships in "the five key aspects of variations that, if placed on a continuum of inclusivity, would almost certainly situate creativity as a constraint-focused experience at the 'lower' end, and creativity as a fulfillment-focused experience at the 'higher' end. It would also appear logical that creativity as a process-focused experience ought to precede creativity as a product-focused experience. However that is problematic, as it is clear from the research data that there is a conception of creativity-as-process that is not linked to product"(Kleiman, 2008). This study presents the abstract conception of creativity from a 'constraint, process, product, transformation and fulfillment-focused experience', which has a direct bearing on the design process that the students chart in the architectural design coursework.

Svensson et al. (2010) have explored technological literacy through the use of technological objects, which in today's society "is increasingly integrated with technological systems." Technological literacy has been seen from the question of "how concrete (objects) and abstract levels (systems) are linked"(M. Svensson & Ingerman, 2010). This phenomenographic study has looked into "pupils' experiences of technological systems as embedded in four everyday objects." They have identified "five qualitatively different ways of understanding systems, ranging from a focus on using the

particular objects, over-focusing on the function of objects, seeing objects as part of a process, and seeing objects as system components, to understanding objects as embedded in systems." They further "suggest an educational strategy for teaching about systems in technology education" (M. Svensson & Ingerman, 2010). This study points towards a deeper understanding of the influence of tools ranging from the analogue-to-digital domain traversed by the students' in their learning approaches within architectural design.

4.6.2 Phenomenography and Design Education

Phenomenography has been applied to study qualitatively the teaching and learning approaches of both teachers and students in various fields of design education. The variation in design faculty's approaches to teaching design was carried out by Trigwell (2002) reporting "a significant variation in descriptions of how design teaching is approached but that overall, the approaches adopted by design teachers are described as being more student-focused than most other areas of higher- education teaching." These variations were identified using the Approaches to Teaching Inventory (ATI) and similar variations were found by comparing with studies carried out on qualitative descriptions of design teaching (Trigwell, 2002).

Drew et al. (2001) have explored "issues associated with phenomenographic methodology used in a study to investigate the qualitatively different ways that students approach their learning in the context of first and second year fashion design courses" (Drew et al., 2001). This phenomenographic study has pointed that the process to design followed learning paths within the deep and surface approaches to learning proposed by Marton and Saljo (1976). These categories in fashion design included product-focused strategies with the intention of demonstrating technical competence and developing the design process, process-focused strategies to develop the design process, and concept-focused strategies towards developing one's own conceptions.

Strategy	Intention		
Focus of the learning	Develop technical competence	Develop design process	Develop own conceptions
Making an artefact (product focus)	Approach – A	Approach - B	
Experimenting with process (process focus)		Approach - C	
Visualizing of concepts (concept focus)			Approach - D
Table 8: The strategy and intention dimensions of the categories of approaches to learning fashion courses (Drew et al., 2001)			

The outcome space represented the "focus of the learning," based on "the strategy and intention dimensions" depicted in Table 8 (Drew et al., 2001). They have elaborated on visual metaphor as a fundamental basis in the development of concepts and its prominence in the students' learning approaches in comparison to the process and product-oriented approaches that are generally adopted. Bailey (2002) further studied the fashion design project, explaining that two of the four identified approaches shared features described as deep and the other two shared features with surface approaches. She has embarked on further research in other streams of design education "to discover whether other art and design students show a similar range of variation in approach" (Bailey, 2002).

Structural: focus of the learning	Referential: intention / act of learning		
	To develop technical competence through memorizing and reproducing	To develop one's own design practice through rehearsing and experimenting	To develop one's own conceptions of fashion through seeking meaning
Production of artworks or artefacts Product focus	Approach - A	Approach - B	
Process of designing Process focus		Approach - C	
Visualization of concepts Concept focus			Approach - D

Table 9: Outcome Space of approaches to learning fashion design (Bailey, 2002)

The four different approaches are similar to the earlier study (Drew et al., 2001) but reflect the achievement of empathy and engagement in the learning approaches of fashion design students, thus being in a position "to engage with the student's lived experience" (Ashworth & Lucas, 2000). Bailey (2002) has presented the outcome space in Table 9 pointing towards a deeper range in design education based on the practice-based learning context in comparison with the text-based learning context of deep and surface approaches (Bailey, 2002; Marton & Säljö, 1976). Bailey has addressed the weakness in the earlier phenomenographic study by Linda Drew et al. (2001) by co-relating and comparing each dimension of the learning approaches within the practice-based and the text-based learning context in Tables 10, 11 and 12 (Bailey, 2002; Drew et al., 2001).

In Table 10, "the focus of learning" presents the design process as a distinctive learning approach and the intermediary between "visualization of concepts", which is correlative to deep approach and "task of producing artifact" that correlates to the surface approach.

	Deep--Surface		
Text – based	Meaning of Text		Task of reading text
Practice – based	Visualization of concepts	Design Process	Task of producing artefact

Table 10: The Focus of Learning (Bailey, 2002)

In Table 11, "learning intention;" the students seem to be tending towards developing a higher level of technical competence; with some developing their own design practice and at the highest level; trying "to develop one's own conceptions"(Bailey, 2002). The importance of design as a learning process is brought to the fore in practice-based learning and represents the bridge between the deep and surface approaches related to text-based learning.

	Deep--Surface		
Text – based	To understand		To reproduce
Practice – based	To develop one's own conceptions	To develop one's own design practice	To develop technical competence

Table11: Learning Intention (Bailey, 2002)

In Table 12, Bailey (2002) has presented the learning activities in the practice-based learning context by focusing on design process as a learning approach. "Experimenting with techniques and procedures" and "rehearsing techniques and procedures" being correlative to the approaches adjacent to deep and surface approaches, which in turn seem to be moving towards the conceptual real world experience on one end and "memorizing techniques and procedures" (Bailey, 2002) on the other.

	Deep--Surface			
Text – based	Organizing and integrating content			Memorizing content
Practice – based	Relating fashion to own life world	Experimenting with techniques and procedures	Rehearsing techniques and procedures	Memorizing techniques and procedures

Table12: Learning activities (Bailey, 2002)

The studies by Drew et al. (2001) and Bailey (2002) point to the difference in the learning approaches that need to be adopted in practice-based learning context within design education. Their work constitutes the foundation for this research, which examines the practice-based learning context of architectural education with specific emphasis on the design coursework.

4.7 Summary

This chapter has summarized the importance of phenomenography in the qualitative research tradition, extrapolating on the discussions of whether it falls into the construct of a methodology or has to be presented as a research method. Phenomenography as

the research method has addressed the central question of what are the approaches to learning being adopted by the students in the architectural design coursework by being represented as the starting point within "Progressivism" or learner-focused research (Section 2.2) (Marton & Tsui, 2004). The phenomenographic model has been considered as the core amongst the progressive models in the 20th century in articulating students' approaches to learning (J. B. Biggs, 1994, 2011; Marton & Säljö, 1976).

The further connected question of how students' learning approaches progress from the first year design coursework to subsequent years has been explored through discursive (pure) phenomenography (Section 4.4). This phenomenographic research approach is focusing on the actual experiences of the architecture students at the four institutions as a part of the current research. This in-turn is a digression in comparison to other research models where the focus is on the learning context that includes the teaching pedagogy, architectural curriculum, evaluation and assessment as well as the learning outcomes.

The final research question on how do approaches to learning evolve in the design coursework from the first-to-fifth year of the program has been presented through the phenomenographic categories of description that are depicted within the outcome space (Sub-section 4.5.4). The evolution of the students' learning approaches is phenomenographically analyzed by the interconnected facets that represent the framework of the outcome space through the referential and structural facets (Sub-section 4.5.2) depicted graphically in Chapter 6, Section 6.11.

The various stages within the phenomenographic research method are discussed in detail and an emphasis on both the physical and digital platforms as enablers for the researcher is presented. This research has undertaken phenomenography using the physical process of analysis and also bridged the digital paradigm using NVivo 10. The steps undertaken will be further discussed in the Chapters 5 and 6 through the pilot study together with the final study focusing on the classification of students' learning approaches in architectural design.

Chapter 5: A Phenomenographic Study in Understanding Architecture Students' Approaches to Learning the Coursework of Architectural Design- Pilot Study

The summarization of phenomenography as the research methodology for this research and its role in educational research has been reviewed in Chapter 4. The current chapter presents the earlier pilot study conducted to trial the emerging classification for the overall study on architecture students' approaches to learning, using phenomenography. The pilot study was conducted by the researcher so as to clarify students' approaches to learning in architectural design coursework and to place it in the perspective of phenomenographic studies in higher education and allied fields including design education (J. Biggs, 1979; Drew et al., 2001; Isomäki, 2007; Marton & Säljö, 1976). The phenomenographic research-based framework, data collection through semi-structured interviews and analysis was based on the fashion design studies of students' learning approaches conducted in the United Kingdom in four design departments with a sample of seventeen students (Bailey, 2002; Drew et al., 2001). This pilot study has provided the pedagogical research platform to conduct the overall study on the classification of students' learning approaches in architectural design (Iyer, 2012a, 2012b; Iyer & Roberts, 2014).

The students' approaches to learning between the first and fourth year of their architectural design coursework has been examined by charting the variation, and by exploring the reasons for the differences encountered in the pilot study. Phenomenography has been used in this study in understanding the learning approaches, with the objective of exploring this variation from a qualitative perspective, using the data collected through semi-structured interviews with thirty-nine students at Rizvi College of Architecture, Mumbai and the Faculty of Architecture, Manipal Academy of Higher Education, Mangalore in India. These institutions were identified by the researcher based on their recognition by the Commonwealth Association of Architects (CAA) amongst all the architectural institutions in India. The CAA international accreditation has recognized the international standards of architectural education being offered at both these institutions. A sample of thirty-nine students were interviewed for the pilot study based on the problems listed in the earlier fashion design studies that had a sample of seventeen students (Bailey, 2002; Drew et al., 2001) and the literature review conducted in Chapter 4, Sub-section 4.5.4. The phenomenographic data collection was conducted according to the requirements of the Research Ethics

Committee, Welsh School of Architecture; Cardiff University within the stipulated time period of February to June 2012 (Iyer, 2012a).

Rizvi College of Architecture located in Bandra-West has been affiliated to the University of Mumbai since its establishment in 1992 (RCA, 2004). Faculty of Architecture has, since 1980, become the twenty-second constituent institution of Manipal Academy of Higher Education, the first private university to be established in India in 1953 (MAHE, 2017). Both institutions have been recognized by the Commonwealth Association of Architects for the dissemination of international standards of architectural education since their establishment (MAHE, 2017; RCA, 2004).

The semi-structured interviews conducted at the two institutions have focused on the students' learning approaches in the first and fourth year architectural design coursework, using their design project as the learning context. This study has charted the identified approaches by correlating them to the surface and deeper dimensions (Marton & Säljö, 1976) as-well-as the strategic dimension (J. Biggs, 1979). The pilot study has been conducted on the lines of earlier phenomenographic studies in fashion design, which examined the variation in students' learning approaches in the United Kingdom (Bailey, 2002; Drew et al., 2001; Iyer & Roberts, 2014) (Appendix-III).

5.1 Research Questions & Framework for the Semi-structured Interview

The pilot study aimed to identify the students' approaches to learning in their design project work and evaluate how these change during the first and fourth year. This has been further analyzed through connected questions on why there is a variation in approaches to learning and what are the reasons for differences. These questions have a parallel to the two aspects of learning as a phenomenon described by Booth including the "What" and the "How" of learning (Booth, 1997).

The research question for this study has been further expanded in the semi-structured interview, where the 'what,' 'how' and 'when' of learning in architectural design is presented through a series of introductory questions on learning approaches in the first and fourth year. This is followed by probing into the learning approaches of a specific design project in the first and fourth year. A question asked to fourth year students specifically makes comparison between their first year and current year. The conceptions related to the approaches to learning were part of the final set of questions.

5.2 Approaches to Learning and Architecture Education

Chapter 3 has presented a pedagogical research literature review in architectural education specific to the learning approaches in design coursework. Explored as a

journey through architectural experience (Alexander, 1977; Hertzberger, 2002, 2005; Rasmussen, 1964; Zumthor, 1998), learning approaches are an important facet of reflective practice gained through professional knowledge and the academic journey within the institution (Schon, 1983). They have also been explored through design exercises undertaken by the student and reflected in architectural practice (Unwin, 2009). Pedagogical research within architectural education commonly make a distinction between the design and learning processes that students undertake, and the final output of their work, or the design product.

This evolution from product to process-centric approaches in architecture students' learning experience has been explored in this pilot study using phenomenography. Similar studies in fashion design by Drew et al. comparing students' learning approaches with Marton and Saljo's established deep and surface approaches (Bailey, 2002; Drew et al., 2001; Marton & Säljö, 1976) have been further reviewed in Chapter 4.

Design education from a micro-to-macro perspective amalgamates fields such as product and fashion design, but also examines built environment in the realm of interior design, architecture and planning. Phenomenographic studies in these fields of design education would further widen the scope of research methodology undertaken in earlier studies. As presented in Chapter3 and 4, the research question is explored using phenomenography as there is little published evidence of the chosen methodology being used to investigate the students' approaches to learning in architectural design coursework (A. Iyer, 2015).

5.3 Phenomenography - the Research Method

As indicated in Chapter 4, phenomenography has been presented in the overall study as a research method where the exploration is based on varied experiences of the phenomenon in question. *"Phenomenography is not hypothesis-driven though it always starts with the broad speculation that variation of perception is likely to exist in relation to a given phenomenon"* (Cousin, 2009). The nature of the questions is driven towards exploration of this experience. This is relevant in the pilot study, as phenomenography is used to explore and compare the approaches in the first and fourth year, with a focus on students' learning experiences in architectural design, parallel to the reviews in Chapters 3 and 4. This comparison was necessary to map the changes in students' learning approaches between the first and fourth year, including understanding this evolution.

Phenomenographic studies, involving semi-structured interviews for data collection to map these learning experiences, have been further reviewed in Chapter 4. The sample includes seven to ten interviews, involving a random selection of individuals amongst

the population from which this "sensible minimum" is selected (Cousin, 2009). The interviews are transcribed and the collected data is compared, grouped and physically analyzed by the researcher, using qualitative research analysis software depending on the complexity of the research project. The transcribed data is studied in detail through three to four repetitive iterations to explore the variations, and then filtered into themes. The experiences are decontextualized from their original context and these variations are then categorized into descriptions. The identified categories of description can be hierarchical or have distinctly varied positions that are represented in the final outcome space or findings. These act as the basis for the phenomenographic analysis. The steps for undertaking this analysis have been described in further detail in Chapter 6, Sub-section 6.9.2.

5.4 Pilot Study - Data Collection & Analysis

The data for this phenomenographic study was generated by selecting students on a random basis from the first and fourth year of the two institutions. After an initial discussion with the faculty on the design project for the concerned years, the semi-structured interviews with the students were conducted. These interviews endeavoured to categorize the students' approaches to learning in architectural design through the discussion of their design project by charting their experiences and identifying the underlying conceptions.

The questions were based on the framework of the semi-structured interview questionnaire prepared for the fashion design study, with a set of introductory questions, followed by a probe on the learning approaches and conceptions (Drew et al., 2001).

- The introductory questions asked to the first and fourth year students included a briefing on the architectural design coursework and a discussion on the design project. The students were encouraged to elaborate on their project and on their expectations in undertaking this project.
- The first and fourth year students were further probed on the design process and the approaches in undertaking the design project. The terms expressed by the students on pedagogical research related to architectural design correlating to the elements, principles and process of design, were probed to extrapolate their learning experiences.
- The fourth year students were further questioned for a comparative analysis in their approaches while undertaking the project in their current year in comparison to the first year.

- Finally, the first and fourth year students were probed for the conceptions of the phenomenon in question, approaches to learning in architectural design.

The data collection and interim analysis included the recording, transcription and initial filtration through the iterative process of physically analyzing five interviews each, from the first and fourth year. This analysis on the design process adopted in architectural design were identified as the initial themes or codes. These included,

- To seek direction from the faculty and as a medium of increasing one's knowledge-base of the design process in architectural design.
- To recognize the value of group-collaboration in the design coursework as a medium of increasing one's learning and understanding of the design process.
- To increase one's understanding of the design process through self-analysis.

The interim analysis thus presented three important themes including the role of design faculty in architectural design, collaboration within students' groups and understanding the design process through self-analysis.

These emerging themes from the students' learning experiences revealed further directions in the identification of the final categories of learning approaches. They represent the preoccupation amongst the first year students of approaching architectural design by focusing on the design solution. These product-based approaches were the major themes identified, which focused on the series of steps undertaken by the students and how they followed the instructions of the faculty in the design project. The focus on the process of design amongst the first year students through the instructions provided by the faculty and developing their knowledge-base in the design coursework was represented as a minor theme within the identified approaches.

The major theme discussed amongst the fourth year students was adopting conceptual approaches by exploring the abstract facets of design. The students' experiences were pointing towards the development of their own conceptions; but their focus on final portfolio submissions represented a digression towards product-centric approaches to learning. The interim findings gave a new direction to the practice-based context of students' learning approaches in architectural design. Based on the emerging categories, variations were identified in comparison with the earlier fashion design studies (Bailey, 2002; Drew et al., 2001). There was consistency in the themes that emerged between the first and fourth year in both the schools, and the decontextualized experiences were further analyzed.

5.5 Final Categories of Approaches to Learning

The students' approaches to learning in architectural design, based on their experiences while undertaking the design project are represented through six categories of learning approaches using phenomenographic analysis (Appendix III) (Iyer & Roberts, 2014). The pilot study has identified a wider range, in comparison with the four identified approaches to learning from the earlier fashion design studies (Bailey, 2002; Drew et al., 2001), considered in Chapter 4, Sub-section 4.6.2.

Table 13 depicts these six categories of learning approaches from the pilot study (Iyer & Roberts, 2014). This includes the descriptive and paraphrased, theme-based versions together with the meta-categories based on the emerging classification that is the focus of the final study.

Identified Learning Approaches	Descriptive Paraphrased Theme-based Learning Approaches	Learning Approaches as Meta-categories
Approach-A	Series of steps from introduction to completion with emphasis on presenting a good output	*Product-Based Unidirectional Approach*
Approach-B	Understand architecture using experiences of the faculty as a scaffold to present the learning outcome	*Product-Based Multidirectional Approach*
Approach-C	Evolving perceptions of architecture within design process based on a product-focused outcome	*Dependent & Product-Focused Strategic Approach*
Approach-D	Evolving perceptions of architecture through design process based on a process-focused outcome	*Independent & Process-Focused Schema*
Approach-E	Conceptualizing thought process in evolution of architecture based on perceptual experiences	*Experiential, Practical & Process-Focused Schema*
Approach-F	Conceptual and abstract focus based on creative & experiential level of understanding architecture	*Perceptual, Conceptual & Process-Focused Schema*

Table 13: Final Categories of Approaches to Learning identified in the Pilot Study using Phenomenographic Analysis (Iyer & Roberts, 2014)

These meta-categories represent the approaches to learning from the architectural perspective within the canvas of learning approaches in higher education, allied fields and design education through the surface and deeper dimensions, as well as the strategic dimension explained in Chapter 4, Section 4.6 (Bailey, 2002; J. Biggs, 1979; Drew et al., 2001; Marton & Säljö, 1976).

5.5.1 Approach A: Product-Based Unidirectional Approach

Approach A as the dominant theme focuses on the series of steps taken by the architecture students from the introduction of the design problem to the completion of the final solution. The intention of the first year students is the consistent technical presentation and execution of the solution for the design project. The learning

approaches adopted are product-based with the aim of focusing on the presentation of a good portfolio. Architectural design has been correlated with other coursework in this dominant theme to present functional and technically correct solutions following unidirectional approaches in the first year.

First year student's extract - "…I don't think so. Like in engineering we can learn and study one night and give exam but for architecture we have to study step by step. Like in every class we learn something. We can't miss any class because we have only practical works. We have to make models, we have to make sheets. We learn from those sheets. We have to go for site visits and like if we are studying about doors. We have to see how door works."

This category is represented as a minor theme amongst the fourth year students, who seemed to be pressed for time and wanted to complete their design portfolio and present a technically acceptable solution, thus reinforcing unidirectional approaches in their design coursework.

Fourth year extract - "… understanding of the process will help is come up with better solutions and faster solutions. In the best way possible…"

5.5.2 Approach B: Product-Based Multidirectional Approach

Approach B is the other dominant theme in the first year. This categorized approach has focused on the understanding gained by the students in trying to experience architecture as a design-based process through the instructions provided by faculty in the design studio. The students' intention is to use faculty as a support or a learning scaffold by reflecting on his or her instructions in working out the design solution for the design project and following the product-based approach. Approach B is multi-directional in comparison to the unidirectional characteristics of Approach A, as the students try to evolve their design process based on multiple design experiences communicated by faculty, instead of the series of steps undertaken towards functionally and visually acceptable design solutions. Approach B represents the importance given by the first year students to faculty's instructions in architectural design coursework.

First year extract - "I wouldn't say that I'm 100% sure about my work. Every time I design something, I know it's not 100% right. There are flaws, there are good points too. And coming to faculty and discussing. They do tell you what you could do in order to make it better, so it's never like you are 100% right, you are always learning. Understanding is …basically how you think, how you perceive and how you make the other person believe in the idea. So you have to even convey your idea to the person."

This multidirectional approach is less dominant amongst the fourth year students, being adopted at certain intervals with the intention of satisfying the requirements for the final assessments at the institution, including the submission of their design portfolio.

Fourth year extract - "But that kind of enthusiasm that I used to have to design in general, has really been reduced to a chore, you know, like just finishing it off and you know just coming up with something that the teacher likes and that everyone is happy 'ok my jury will go well' etc. So that passion is there but not as much as I started off with…."

5.5.3 Approach C: Dependent & Product-Focused Strategic Approach

Approach C, a minor theme in the first year, represents the students' focus on evolving their own perceptions of architecture. The students' intentions are based on product-focused approaches by depending on the series of steps needed to be undertaken as a part of the design process. These steps are in contrast to the unidirectional steps undertaken in Approach A. The students are dependent on taking these steps towards the commencement of the process of design in experiencing architecture.

First year extract - "getting more knowledge in terms of architectural design is for the betterment of us. So that we can put our creativity and our knowledge both together, compiling it and we can make a very good design because there is a limit to creativity, there is no limit but when it comes to reality, there is a limit and when this knowledge comes into the reality and combines with creativity, we can have better designs in future."

Few students in the first year adopted this identified category by reflecting on their recent experiential journey in architectural education and the process of understanding design. There was a large quantum of fourth year students who have adopted Approach C. The question of why are they are taking this product-focused approach required a complete cross-sectional analysis of the five-year architecture program that is being undertaken for the final study of this research. Approach C has presented an optimal resolution of two important aspects in architectural design. The students are able to dabble into the perceptual qualities of architecture at a superficial level and balance the criteria set by the faculty and the institution towards the final submission of the design project.

Fourth year extract - "But….it means a lot. I've… One aspect of it is design; the other aspect of it would…design of spaces, physical spaces. The other aspect would also be to do with philosophy, what is my philosophy, what am I communicating to people."

5.5.4 Approach D: Independent & Process-Focused Schema

Approach D is the dominant theme in the fourth year with the gradual movement from product to process-focused approaches with the students independently adopting the design process instead of following a series of steps representing Approach C. The students' exposure of architecture and the scale of the projects being undertaken at an urban level is distinctive in this identified category. The students have focused on the sensitivities of various aspects of architecture which has represented the underlying intentions within Approach D. Their focus is on sensitizing themselves independently to various aspects of architecture with underlying intentions towards the evolution of their schema-based perceptions in the design project.

Fourth year extract - "everything that you learn registers in a different way, the books that we read. It doesn't come to us when we want... Maybe unconsciously we are using it….somewhere else… because we have read it somewhere... So for me that's the difference… different kinds of learning… some things come to us then and there but some things just come to us, involuntarily… you don't remember where you have read it."

This identified category was consciously applied to the process of design by few first year students representing the limited exposure to architecture in their learning experience that was a barrier to the added sensitivity required.

First year extract - "I think architectural design cannot be taught like a theory subject, it's what, by, when they give us more and more work, we realize, you know, we grow and realize that the changes that could be made and small things that come into our mind which we, you know, keep in mind the next time we are given another project. So, I think that's what learning is. Self-learning, more than being taught."

5.5.5 Approach E: Experiential, Practical & Process-Focused Schema

Approach E is represented as a minor theme amongst the fourth and first year students in architectural design. They are using this learning approach subconsciously by focusing on conceptualizing the thought process and using it in the evolution of their design process. This process-focused approach is based on the students' innate understanding of architecture as the underlying intention directly correlative to their perceptual experiences.

The first year students who portrayed these underlying intentions were not aware that they were experiencing this identified category. A few fourth year students following Approach E were focusing on the experiential and practical facets of large-scale design

projects. This was coupled with submission deadlines given by the institutions that discouraged them from adopting this learning approach.

Fourth year extract - "Nowadays, learning has come up to … just living… we went for a play and we've just noticed some detail here and there and, nowadays I am starting to find that I am learning, you know more…in a open.. It's not learning in a classroom, in a studio, just end up learning wherever you are going, so I think that's how it has changed.."

5.5.6 Approach F: Perceptual, Conceptual & Process-Focused Schema

Approach F represents certain glimpses in the students' learning experiences on the conceptual and abstract-based, perceptual aspects required within the underlying design process. The students' innately creative and experiential level of understanding architecture was reflected amongst few fourth and first year students who explained their lived experiences in the design project. The aspirations and expectations of learning outcomes under the directions of the design faculty were seen to be inhibitors in the direction of Approach E and Approach F, with many students tending to move backwards towards the product-driven and faculty-oriented approaches represented by Approaches C and D.

Fourth year extract - "to me…Architectural design is something... O... on the lines of daily life. It started off in the first year as a very... You know…very particular subject, you had to do …..And you go to college... And now... as time has progressed... It's sort of become … like... a daily thing... That...Wherever you look, you are …… something... Wherever… like even as you walk down the streets, you're looking at stuff and... So, this could have been...in that way and we do that and … before you realize…and you actually realize...It's sort of taken over everything and sort off... you are doing... So that what architectural design is. What counts as understanding… I would say... understanding counts as…basically an acceptance... when you talked about knowledge…it's when we talked about awareness and when we are gaining, we are ……., we are aware…mind is open to different things…that's just knowledge.. It just about how you choose…to deal with it, your understanding of it. Your acceptance of it.."

The students' approaches to learning adopted in the first year is predominantly product-focused, dependent and unidirectional learning strategies whereas the fourth year students are predominantly following process-focused, independent and multidirectional learning strategies leading to a few depicting practical and experiential, perceptual and conceptual, schema-based strategies in the architectural design coursework.

5.6 Discussion on the Pilot Study

The pilot study has presented the emerging classification of learning approaches adopted by the first and fourth year students of the architecture program with a variation between product and process-focused approaches to learning, moving towards the independent and schema-based approaches. The experiential and practical together with the conceptual and perceptual facets of the design process through the six identified approaches to learning are represented within the matrix depicted in Figure 15.

(Product-Focus)
Unidirectional & Multi-directional
Approach-A
Approach-B

(Product-Focus)
Dependent Strategy
Approach-C

Approaches to Learning -
Coursework of
Architectural Design

(Process-Focus)
Independent Schema
Approach-C
Approach-D

(Concept-Focus)
Experiential & Practical
Perceptual & Conceptual
Approach-E
Approach-F
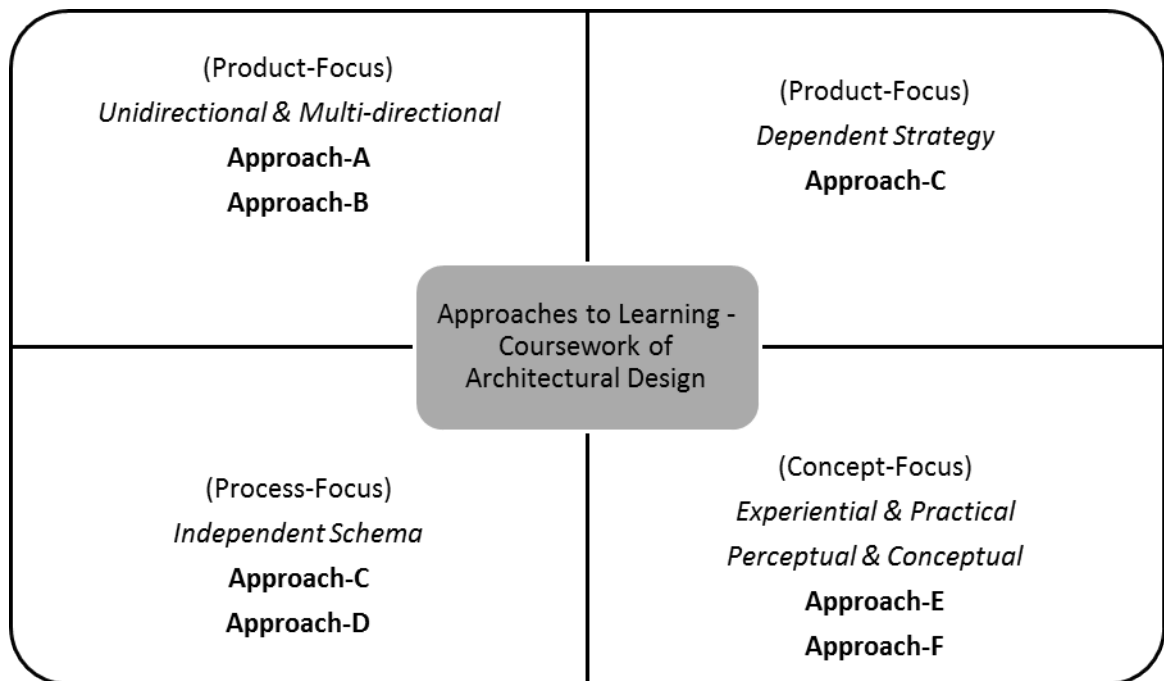
Figure 15: Matrix depicting the categories of description with reference to the approaches to learning adapted within the outcome space using the phenomenographic approach

This matrix (Figure 15) represents the identified approaches to learning relating it to the students' intentions towards the act of the learning depicted in Table 14. The range of qualitative differences in the students' learning approaches from these findings represents both practice-based learning context and the depth of understanding required in perceiving the architectural design coursework. The pilot study findings represent a wider range of identified categories in architectural design in comparison to the earlier fashion design and text-based studies within the established surface and deeper dimensions (Bailey, 2002; Drew et al., 2001; Marton & Säljö, 1976).

The relational order of the categories have presented Approaches A and B as product-focused, with the students attempting to undertake the design project following a series of steps using unidirectional and multi-directional learning strategies towards solution-centered learning outcomes representing the surface dimension. Approach C varies from Approaches A and B as the experiential nature of understanding architecture is

slowly being grounded in the students' experience, but they are still dependent on product-focused strategies. Approaches D and E represent the elevation of students' understanding towards independent experiences based on practical and process-focused schema in architectural design. The learning approaches are evolving into process-focused outcomes and moving towards the conceptual level. Approach F represents the innate characteristics in the students' learning experiences towards understanding the ethos of the design project and being equated with the deeper dimension.

		(Intention) Act of learning			
		Series of steps from introduction to completion of design project	Understanding based on instructions-based scaffold	Evolution in understanding based on independent schema	Self-analysis of architecture based on concept-focused experiential & perceptual
Identified Learning Approaches categories of	**Unidirectional & Multi-directional (Product-focus)**	Approach A	Approach B		
	Production, evolution & execution of design project (Product Focus)			Approach C	
	Process of design based on Independent & Experiential Schema (Process focus)			Approach D	Approach E
	Visualization of Perceptual & conceptual Schema (Concept focus)				Approach F
Table 14: Outcome Space of approaches to learning in the coursework of architectural design					

The question of how the students approached the design coursework in the fourth year in comparison to the first year has been identified in this phenomenographic study through the predominance of product-focused learning approaches demonstrated by the first year students. Approaches A, B and C are the preferred learning approaches and represented the first year students' recent introduction to architectural design. Their intention to follow product-centered approaches, by trying to follow the instructions of the design faculty, is representational of taking multi-directional learning strategies in the practice-based learning context of architectural design. There were few experiences where the first year students followed Approaches D and E that represented the transition towards process-focused approaches and understanding architectural design at a deeper level. The literature review in Chapter 3, Sub-section 3.5 on the skills and craft-based approaches; Sub-section 3.7 on the role of tutor, critique and assessments as-well-as Sub-section 3.6 elaborating the importance of collaborative learning represent the identified Approaches A, B and C in the broader context of pedagogical research in architectural education.

The fourth year students were predominantly adopting Approaches C and D with few of them moving towards Approach E, and Approach F on rare occasions. This represents

the fourth year students' movement in the direction of developing their own conceptions based on the perceptions and experiences of architecture. This transformation in the students' learning approaches was curtailed by the rigours of their final portfolio submissions, moving them back towards the product-centric surface dimension of Approaches A, B and C; away from the process and concept-centric deeper dimension of Approaches D, E and F. Tables15, 16 and 17 co-relate each dimension of the established domains of learning approaches to the identified categories within the practice-based learning context of architectural design and fashion design; placing it in parallel to the text-based learning context by Marton & Saljo (1976).

	Deep_---_Surface			
Text – based	*Meaning of Text*			*Task of reading text*
Practice – based (Fashion Design)	*Visualization of concepts*	*Design Process*		*Task of producing artefact*
Practice – based (Architectural Design)	Perceptual & conceptual Schema **(Approach F)**	Independent & Experiential Schema **(Approaches D&E)**	Production, evolution & execution of design project **(Approach C)**	production & execution of design project **(Approaches A&B)**
Table 15: The Focus on Approach to Learning adapted from Table-4 (Bailey, 2002)				

Table 15, 'The Focus on Approach to Learning' represents the depth of the learning approaches in reference to the design process within architectural design in comparison to fashion design; presented in the overall framework of deep and surface approaches of the text-based learning context. Whereas the text-based studies have identified the students' focus, ranging from the task of reading the extract and moving towards understanding the meaning of the text within the extract (Marton & Säljö, 1976), the practice-based field of fashion design presented a more varied range. The fashion students have been learning design through the three-pronged range from the production of the project, to the actual process of design involved in producing the artefact, to visualizing the conceptual aspects in the production of the fashion design project (Bailey, 2002).

The pilot study represents a wider range through Approaches A and B from producing and execution of the design project to the various steps involved in the design process. Further focus has been given to the evolution within the design process involved in the production to execution represented by Approach C. Approaches D and E represent this wider range further, with students' independently experiencing this schema-based design process. Approach F represents the deeper domain through perceptual conceptualization in the process of design (Iyer & Roberts, 2014).

Table 16, 'The Act of Learning Intention' depicts the macro-to-micro level context of architectural design in comparison to fashion design in the practice-based learning context; within the overall framework of the text-based learning context. Whereas the intentions in the students' act of learning within the text-based fields have ranged between the reproduction and understanding of the extract given representing the surface and deeper domain (Marton & Säljö, 1976), fashion design has presented a wider range from the development of technical competence to the students' evolving their unique practice of undertaking the design process. The fashion students have also developed their own conceptions within the process of design reflecting on the deeper domain (Bailey, 2002).

	Deep_---_Surface			
Text – based	To understand			To reproduce
Practice – based (Fashion Design)	To develop one's own conceptions	To develop one's own design practice		To develop technical competence
Practice – based (Architectural Design)	To develop one's own conceptions of architecture based Perceptual & conceptual Schema (Approach F)	To develop an evolution in understanding based Independent & Experiential Schema (Approaches D&E)	To develop an understanding based on an instruction based scaffold (Approach C)	To develop the series of steps from introduction to completion of design project (Approaches A&B)

Table 16: The Act of Learning Intention adapted from Table 5 (Bailey, 2002)

Tables 15 and 16 have depicted the practice-based field of architectural design representing the students' learning intentions through a broader range in the act of learning. Whereas Approaches A, B and C focus on the design project from commencement to completion, based on development of skills and instructions given by the faculty, and peer-based learning, Approaches D, E and F represent the architecture students' learning intentions of further evolution in the design process. This is represented through the independent learning approaches based on their experiential journey during design coursework. Students have further developed their own conceptions in understanding the architectural design-schema at the perceptual and conceptual level in the deeper domain (Iyer & Roberts, 2014).

Table 17 depicts the identified categories of learning approaches in architectural design from this pilot study, compared with earlier studies in fashion design (Bailey, 2002; Drew et al., 2001) and established research using phenomenographic analysis on deep and

surface approaches to learning (Marton & Säljö, 1976). Tables 15, 16 and 17 represent the emerging dimensions of learning approaches in the practice-based learning context of architectural design through the pilot study.

	Deep --- Surface					
Text – based	Organizing and integrating content					Memorizing content
Practice – based (Fashion Design)	Relating fashion to own life world	Experimenting with techniques and procedures		Rehearsing techniques and procedures		Memorizing techniques and procedures
Practice – based (Architectural Design)	*Perceptual Conceptual & Process-Focused Schema*	*Experiential, Practical & Process-Focused Schema*	*Independent & Process-Focused Schema*	*Dependent & Product-Focused Strategic Approach*	*Product-Based Multidirectional Approach*	*Product-Based Unidirectional Approach*

Table 17: Approaches to Learning activities adapted from Table-6 (Bailey, 2002)

5.7 Emerging Classification of Learning Approaches

The emerging classification is explored for the entire cross-section of the five-year program in the four institutions in Chapter 6. This is in parallel to the review of phenomenography in Chapter 4, approaches to learning in higher education in Chapter 2 and pedagogical research in architectural education in Chapter 3. The six categorized approaches identified in this pilot study have further reflected on the research question and the review in Chapter 3. This review has given a broad canvas to draw upon to define students' learning approaches in architectural design. As a further pointer, the identified approaches in the pilot study fall within the spectrum of surface and deeper dimensions (A. Iyer, 2015; Marton & Säljö, 1976).

The introduction of architectural design coursework in the first year of the program is considered as the stage where the students are going through their formative stages with Approaches A and B representing the series of steps undertaken from the problem to its final solution. These approaches are bordering the surface dimension (Marton & Säljö, 1976). Approaches E and F are being pursued predominantly by fourth year students at the conceptual and perceptual level and are within the parameters of the deeper dimension (Marton & Säljö, 1976). These identified approaches form a framework parallel to the one suggested by Unwin in his work with students in the early stages of architectural education at Welsh School of Architecture (Unwin, 2001).

The research method of phenomenography has been further refined through the findings of the pilot study and the emerging classification of learning approaches for the

final study (Chapter 6). The pilot study has raised further questions on why there is a change in the approaches to learning between the first and fourth year and what aspects of architectural education actually facilitate this change. This study has also raised questions of what makes these changes happen, and why there is a difference; thus bringing us towards understanding what are the enablers and barriers for learning approaches within architectural design.

5.8 Limitations in the Pilot Study

The findings of the pilot study were based on the cross-section of the first and fourth year of architecture (Iyer & Roberts, 2014) (Appendix II). A complete cross-section from first to fifth year used in the final study (Chapter 6) presents a comparison of the current findings and encompasses the learning approaches classification within the entire spectrum of five years of the students' experiences in the design coursework. This pilot study was geographically limited to two architectural institutions in India; whereas the final study is based on the learning context of four institutions, and from an international perspective. The randomization of the participants was based on the willingness shown by the thirty-nine students to be a part of the semi-structured interview process and these stages of phenomenography are further explained in Chapter 6, Sub-section 6.12.1. These points have been duly considered as a part of the collated data in the final study using phenomenography.

Chapter 6: Students' Approaches to Learning in Architectural Design – Phenomenographic Data Collection, Analysis & Classification

6.1 Research Context of the Final Study

Students' approaches to learning in higher education have been expressed in terms of surface and deep approaches (Marton & Säljö, 1976) as-well-as strategic approaches (J. Biggs, 1979). The focus of the final study in this chapter and Chapters 7, 8, 9 and 10 is to explore the classification of students' learning approaches using the qualitative research methodology of *phenomenography* in the design coursework within the larger context of architectural education. Students' approaches to learning have been well-understood in other disciplines including engineering, information technology, mathematics, sciences and allied fields of design (Drew et al., 2001; Isomäki, 2007; Kebaetse, 2010) explained in Chapters 2 and 4, but less-researched within pedagogical research in architectural education reviewed in Chapter 3 (A. Iyer, 2015) (Appendix II). The earlier pilot study presented in Chapter 5 (Iyer & Roberts, 2014) (Appendix-III) and this study endeavour to fill this gap. This study has looked at the wider context of pedagogical research in architecture education (Chapter 3) in developing a taxonomy of students' learning approaches through the first year design coursework, and its impact on the subsequent years.

This study has endeavored to classify the students' learning approaches in their design coursework for the five-year architecture program further explained in this chapter (Iyer, 2012b) (Appendix-IV). The research vehicle for this classification is the first year architectural design coursework.

6.2 Aim

The research aims to compare the students' learning approaches in their first year architectural design coursework with the subsequent years of their program. The data for this study has been collected at four architectural institutions and analyzed using phenomenography. The final categories of description and outcome space of this phenomenographic research have been presented by combining the physical analysis of the collected data and using NVivo 10, a qualitative research analysis software platform, to determine the students' learning approaches in their design coursework. The findings for the four institutions through iterations of decontextualized fragments of the learning experiences have been clustered and presented in Chapter 11 as a series of illustrative case studies of students using these identified learning approaches. The data analysis in this study has enabled the establishment of a series of illustrative and

exemplar student personae that summarize the range of different approaches through the five years of architectural education.

6.3 Contribution to Knowledge

As elaborated in Chapter 2, students' approaches to learning in higher education have been expressed in terms of surface and deep approaches (Marton & Säljö, 1976). These approaches are likely to be influenced by their prior experiences of studying and understanding the key concepts of the subject matter, which is vital to the subsequent approaches to studying and learning outcomes (Prosser & Trigwell, 1999). This study focuses on exploring the architecture students' learning approaches using the qualitative research method of *phenomenography* discussed in Chapter 4.

Phenomenography helps the researcher in mapping the experiences of the research participants, based on their understandings of the phenomenon. It represents these understandings within a limited range or categories of description, helping further in building an outcome space for the phenomenon in question through the final analysis. The approaches to teaching and learning in various fields of higher education and in creative fields within design education have been studied using phenomenography. With an emphasis on design education, the review on phenomenography has indicated further research that needs to be undertaken in the design curricula for architectural education (Chapter 4, Sub-section4.6.2) (Bailey, 2002; Drew et al., 2001; Trigwell, 2002).

The earlier pilot study has provided impetus towards examining a student cross-section in the five-year program for the learning approaches classification in this study. This develops on charting the learning experiences of the first and fourth year student cohort analyzed using phenomenography in the pilot study. The identified approaches adopted by first and fourth year architecture students is connected to how the concepts of deep and surface approaches to learning manifest themselves in architectural education. These point towards a more complex set of learning approaches than just a simple deep and surface division (A. Iyer, 2015; Iyer & Roberts, 2014).

This has further raised the question on whether the categorized approaches form different points on a continuum between deep and surface, or whether some are in a different dimension. The Chapter 3 review on pedagogical research in architectural education has provided further pointers for this study on the classification of students' learning approaches, and their connection with surface and deeper dimensions, through their years of training and reflective practice in architectural education (A. Iyer, 2015).

6.4 Objectives

1. To identify the students' approaches to learning adopted by looking at the first year architectural design coursework and using that as the research vehicle to evaluate their learning approaches in subsequent years of their design coursework.

2. To classify these learning approaches, to understand how they actually manifest themselves in architectural education through data collection and analysis using phenomenography.

3. To categorize the students' approaches to learning in the first year and subsequent years of their architectural design coursework within the outcome space of the phenomenographic research method.

4. To present the outcome of the categories of approaches to learning based on the introduction of the first year design coursework in the subsequent years of their five-year program through the coursework of architectural design.

6.5 Research Question

This study addresses the central research question on,

- What are the approaches to learning being adopted by the students in the architectural design coursework from the first year to the subsequent years of the program?

The students' approaches to learning, i.e. the phenomenon in question have been further explored by understanding,

- How does the introduction of the first year design coursework impact on their learning approaches within architectural design in the subsequent years of their program?

The cross-sectional data collected across the architecture program has presented the platform for the other sub-question in the final study where the focus is on

- How do approaches to learning evolve in the design coursework from the first to the final year of the program?

6.6 Scope and Focus

The students are introduced to various theoretical constructs in the coursework of design as a part of their architecture program. This study examines the framework of the architectural design coursework in the students' first year and using this research vehicle to evaluate their learning approaches in subsequent years. The study has focused on evaluating the students' approaches to learning and its manifestation in the first year architectural design coursework of the curriculum and through the entire duration of the

program. The design coursework-based model for classifying the students' learning approaches is the most appropriate way rather than history & theory or technology, since architectural design plays a central role throughout their years of architectural education.

The academic context has been explored through the literature review of established research in higher education (Chapter 2) and of pedagogical research in architectural education (Chapter 3) (A. Iyer, 2015) by focusing on students' approaches to learning. The Chapter 3 review has explored learning approaches in design coursework (Roberts, 2006; Webster, 2001, 2004), the design studio (Schon, 1985); in addition to the historic and prevailing schools of thought within the architectural curriculum (Bax, 1991; Gulgonen & Laisney, 1982; Littmann, 2000). Phenomenography, the research method used to categorize the learning approaches is reviewed in Chapter 4. The physical domain for this research has been taken by looking at the design curricula of the architecture programs at Welsh School of Architecture, Cardiff, UK, Sir JJ College of Architecture, India; School of Architecture, University of Texas in Austin and School of Architecture, Oklahoma State University, the United States of America.

6.7 Research Framework

The research framework for this study included literature reviews on learning approaches in higher education research (Chapter-2) and within pedagogical research in architectural education (Chapter 3). Chapter 4 has reviewed the learning models with specific emphasis on the qualitative research methodology - *'Phenomenography;'* and differentiated *'phenomenographic approach'* from *'Phenomenology.'* The students' experiences of their approaches to learning emphasizing on learning outcomes, as foreseen by them and the teachers' community as-well-as its relevance in design education and allied fields has been further reviewed from the phenomenographic perspective.

6.7.1 Research Ethics Committee Approval

The semi-structured interview format was based on the earlier pilot study (Chapter 5) (Iyer, 2012a; Iyer & Roberts, 2014) and administered to two architecture students based in Dubai, UAE with the collected data being used to refine the questions. The approval for the final study proposal using phenomenography was obtained from the Research Ethics Committee, Welsh School of Architecture; Cardiff University (Iyer, 2012b) (Appendix IV). The approval was used for the four architectural institutions as the physical domain of this study. The semi-structured interviews were prepared to be conducted on the students' cohort for the entire cross-section of the five-year architecture program to obtain an in-depth perspective of their learning approaches,

using phenomenography by probing on the process, conceptions and difference in their approaches to learning.

6.7.2 Final Study – Data Collection – Phase-1

Phase 1 of the data collection involved a cross-sectional sample of students from the first-to-fifth year to understand their learning approaches in the design coursework and developing the classification. Phase 1 data was generated from two out of the four institutions where this study was conducted. This was done through a series of semi-structured interviews to explore the learning experiences of the sample of students' cohort. Using phenomenography as the research method, the design coursework introduced in the first year together with the second-to-fifth year of the program at Welsh School of Architecture, Cardiff, UK and Sir JJ College of Architecture, India were charted. The semi-structured interviews were conducted on this sample of students, chosen randomly from each year for an entire cross-section of the five year program from the selected institutions (Appendix-IV).

The structure of the semi-structured interviews was based on the framework of the earlier pilot study and the fashion design studies. These included the introductory set of questions focusing on the architectural design coursework, followed by probing the process of design, comparison of this process in the various years of the design coursework from the first-to-fifth year, and finally centered on understanding the conceptions and approaches to learning from the students' learning experiences (Drew et al., 2001; Iyer & Roberts, 2014).

The introductory questions were asked to the students of all the five years. This included a briefing on the architectural design coursework of their specific year as well as the first year of the program. The follow-up questions included a discussion on the design project undertaken in the design coursework together with the process of undertaking this project based on the structure used in the earlier pilot study. The introductory questions included a discussion with second to fifth year students on the impact of the first year architectural design coursework on their current year coursework.

The students from the entire cross-section were further probed on the design process and the approaches in undertaking the design project. This question and the follow-up question on comparative analysis was based on the pilot study. The opening question probed the terms expressed by the students on pedagogical research related to architectural design correlated to the elements, principles, the process and the design product. The second to fourth year students were asked the follow-up question for a

comparative analysis of their learning approaches in undertaking the design project in the current year in comparison to the first year.

The entire cross-section of students were finally probed for their conceptions of the phenomenon in question, approaches learning and its evolution in architectural design from first-to-fifth year of the program.

6.7.3 Final Study - Interim Analysis, Focus Group Discussion & Data Collection – Phase-2

The data collected through semi-structured interviews with the students on a one-to-one basis from Phase 1 were recorded and transcribed as per the guidelines set by the Research Ethics Committee, Welsh School of Architecture; Cardiff University (Iyer, 2012b). The interim phenomenographic qualitative analysis conducted on the students' responses at the architecture faculty in Cardiff University was codified through physical analysis by the researcher and using NVivo-10, a qualitative and data analysis software. The transcripts went through a series of iterations where the experiences of the students in reference to the phenomenon in question were codified and de-contextualized from the original experience. The steps of the phenomenographic analysis for this study have been described in Sub-section 6.9.2.

The role of the researcher in codifying the themes through iterations from the earlier pilot study (Chapter 5) and this study is based on the *definition of phenomenography* and its differentiation from the parallel research tradition of *phenomenology*. The researcher's role in phenomenographic analysis includes the identification of the underlying themes independent of any personal interpretation of the phenomenon termed as '*second-order perspective*.' This iterative process of codifying the collected data of experiences for the phenomenon in question is based on representing 'the variations of an experience' by *'bracketing'* the researcher's experience and filtering it out of the phenomenographic analysis (Kebaetse, 2010; Marton & Booth, 1997).

These codified experiences went through further iterations and were presented as interim categories of identified learning approaches for the five-year architecture program at Welsh School of Architecture. These interim categories were presented to the architecture faculty and research staff in Cardiff University for further direction in the emerging classification of students' learning approaches. Based on the interim analysis, Phase 2 of this study included a focus-group discussion with a group of six to eight students from the five-year cross-section of the program offered at WSA, Cardiff and Sir JJ, India. The focus-group interview questionnaire (Appendix IV) focused on four themes from the interim analysis.

- The design process adopted by the students in the architectural design studio.
- The first year architectural design coursework introduced in the early stages of the first year curriculum and its relevance in the subsequent year of design coursework.
- The role of design faculty, tutors and critique in the architectural design coursework.
- The philosophy of the school and its relevance in the architectural design coursework.

On the similar lines of data collection undertaken in Phase 1; semi-structured interviews were conducted in Phase 2 at School of Architecture, University of Texas in Austin, Texas and School of Architecture, Oklahoma State University, Stillwater, the United States of America (Iyer, 2014-15).

6.8 Learning Context:

The learning context for the final study has been the students' learning experiences in the programs offered at Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ) - Mumbai, India; School of Architecture, Oklahoma State University (OSU) - Stillwater, Oklahoma; School of Architecture, University of Texas at Austin (UTA), Texas, USA and Welsh School of Architecture, Cardiff University (WSA) - Cardiff, UK. These learning experiences that form the physical domain of this study has been collected on the basis of the curricula of the architectural design coursework offered at the four institutions.

The justification for the selection of the four institutions was based on the following points including

- The phenomenographic data collection and analysis conducted by the author of this dissertation and the constraint of the stipulated duration of the doctoral studies prescribed by Cardiff University (July 2011 to June 2018).
- The identification of the international context for this study that covered the European context (United Kingdom), the North-American context and the Indian context. Other international contexts including China, South-East Asia, Australia and South-America were not included in this study but would be considered as a part of further research.
- The identification of four institutions including one each in India and the United Kingdom and two in the United States of America based on their rankings and recognition within the specific international context by relevant accreditation bodies.

Sir JJ College of Architecture is considered as one of the oldest architectural institutions established in the Indian sub-continent by the British in the late nineteenth century (Kabinettal & Karpe, 2012). Sir JJ has been consistently ranked as the best college of architecture in India for the past few years including the Outlook poll of 2013 and 2014 (Kabinettal & Karpe, 2012). The researcher was a full-time faculty at the school in 2002-04. Sir JJ is located in the financial capital of India in Mumbai and is considered as an architectural school of preeminence in the Indian context. The accessibility and ease in obtaining permissions from the authorities at this institution and its connections with the United Arab Emirates where the researcher resides were key factors in selecting this school.

The School of Architecture, Oklahoma State University celebrated its hundredth anniversary in 2009 and has been highly ranked amongst the National Architectural Accrediting Board (NAAB) accredited schools in the past three decades (School of Architecture, 2010). A professor on a sabbatical from School of Architecture, Oklahoma State University to a national university at the United Arab Emirates introduced the researcher to the architectural faculty within the rural heartland of Stillwater, Oklahoma in the United States of America (School of Architecture, 2010). Access to data-collection and analysis including a stay at OSU, Stillwater was facilitated, giving a perspective to the contrast of universities located in the rural vs. urban fabric of architectural education in the United States.

School of Architecture, University of Texas at Austin was chosen as there were parallels to its location in the urban heartland and cultural capital of the state of Texas in the United States, similar to WSA that was selected in the United Kingdom. The institution has been in the top ten rankings of the National Architectural Accrediting Board (NAAB) accredited schools for the past five years in the United States of America (Registrar, 2016). The location of the School and the University within the culturally rich urban suburbs of the City of Austin and obtaining necessary permissions to visit the United Sates as a part of Phase2 of the data collection were key to its selection.

Welsh School of Architecture, Cardiff University located within the culturally rich city-centre of Cardiff, the capital of Wales, and the school's ranking amongst the top schools in the United Kingdom together with world rankings were key to the selection of WSA (Powell, 2009; C. University, 2016). WSA was also selected by the researcher as he has pursued his PhD studies for this current research at the institution since 2011. The collection of data for both, Phase1 and 2 of the study was facilitated by the researcher's association with WSA.

6.9 Phenomenographic Data Collection and Analysis

As explained in Chapter 4, data collection for this study has used the phenomenographic research method. This data collection is based on capturing the subjects' experiences for the phenomenon in question, i.e. approaches to learning with the subjects being students of architecture. Their learning experience has been captured through the series of semi-structured interviews in their living ecosystem—the architectural design studio. The semi-structured interview forms the fundamental tool for capturing the data in phenomenographic research. The data was collected in the form of audio-recordings that were transcribed according to approval given by Research Ethics Committee, Welsh School of Architecture; Cardiff University (Iyer, 2012b) for qualitative analysis based on phenomenography. This was done based on the physical process of iteration of the collected data and structured data analysis using NVivo 10.

Four institutions were identified for this cross-sectional phenomenographic analysis involving all five years of the architecture program. This was based on the duration of six months taken for collecting and analyzing the data of two years of the architecture program (First and fourth year) at the two institutions in the earlier pilot study (Chapter 5). This provided the reflective framework for the author of this study to estimate a duration of four years to collect and analyze the data for the current phenomenographic study.

6.9.1 Semi-structured Interviews and the Phenomenographic Approach

The data collection captured the students' learning experiences through the semi-structured interviews in their architectural institutions, to capture the interviewee's "lived experience" (Ashworth & Lucas, 1998). The key aspect in collecting these learning experiences from the students' cohort was to capture the data through qualitative, positive and experiential, descriptive, open, theme-based and, on a specific line of conservation (Shamblin, 2006), explained in Chapter 4, Sub-section 4.5.4. This was ensured by keeping the students in a comfortable environment—the semi-structured interviews were conducted in and around the design studios and other familiar spaces within the institution. These familiar environments for students form the key spaces of interaction with the faculty and visiting experts.

The semi-structured interviews were conducted by the researcher with a degree of empathy (Ashworth & Lucas, 2000) shown towards each student and has been described in further detail in Sub-section 6.9.2 of this chapter. This interviewing process involved a series of steps, including a summarized introduction to the research being conducted. The students were informed about the code of research ethics stipulated by

Research Ethics Committee, Welsh School of Architecture; Cardiff University and were requested to sign the consent form which ensured the confidentiality of the data collected. It was ensured that the students were comfortable before, during and after the conclusion of the semi-structured interviews. The students were also sent an email within a fortnight thanking them for their support in the data collection process for this study.

6.9.2 Phenomenographic Data-Analysis through Physical Process & NVivo 10 Platform

As elaborated in Chapter 3, the data analysis included ten steps commencing from data collection to presenting the phenomenon in question through the final categories of description and outcome space using phenomenography.

Step 1.   The first step included the collection of primary data through audio recordings through one-to-one semi-structured interviews with a random sample of students' cross-section from the identified four schools of architecture.

Step 2.   The next step in the phenomenographic analysis included the precise transcription of the audio recordings verbatim.

Step 3.   These transcripts were loaded on the NVivo 10 platform and read by the researcher, in both the digital medium as-well-as the printed medium as a part of the familiarization process with collected data.

Step 4.   This included the compilation and condensation of the transcribed data. This included bracketing parts of the transcription explaining the phenomenon in question i.e. approaches to learning, directly. The students' experiences explaining learning or approaches to learning—the phenomenon in question—including terms or terminologies used within the transcribed abstract, were excluded from the final compilation of the data for analysis. The transcriptions for specific questions were grouped together and filtered to show the emphasis on the important facets of the phenomenon in question.

Step 5.   This step involved the process where fragments of the transcription were compared and classified both through the physical process of labelling and by creating the initial codes on NVivo 10, which is fundamental to this qualitative research method.

Step 6.   This initial coding process was built on the NVivo 10 platform, also termed as creating temporary 'nodes.' In the next step, clusters of the fragments of

experiences emerged in the form of preliminary groups of categorized experiences of the pre-classified approaches to learning.

Step 7.   This involved a repetitive process of iteration of these initial codification with preliminary nomenclatures being given to the identified categories.

Step 8.   The pre-final nodes that emerged through to the codification on the NVivo 10 platform were labelled using corresponding metaphors to the phenomenon in question, learning approaches and the categorized experiences emerging from the phenomenographic analysis. This step of labeling, included cross-referencing, using the literature review of previous research together with the emerging approaches to learning.

Step 9.   This step included the comparison and contrast of the emerging categories of learning approaches through a penultimate stage of iterations.

Step 10. The last step included the final categories of description that emerged from the phenomenographic analysis being represented within the outcome space with its referential and structural facets (as is explained in Section 6.11) through the literature review of pedagogical research in architectural education in Chapter 4 and this chapter in Sub-section 6.10.2. This step represents the emerging classification of the phenomenon in question, students' approaches to learning in the architectural design coursework of the four institutions.

6.10 Approaches to Learning – Referential and Structural Facets

The referential and structural facets explained in Chapter 4, Sub-section 4.5.2 form the framework for the outcome space representing the classification of learning approaches in the architectural design coursework depicted in Figure 16. This outcome space is important in the classification of this study, both from the general criteria of universal research in various educational fields' representing *referential* facets as-well-as pedagogical research specific to architectural education presented as structural facets.

6.10.1 Approaches to Learning: Referential Facet

The referential facet refers to the meaning of the phenomena in question; in this case they are the approaches to learning within the various fields of education. Universally this has been identified as surface and deep approaches to learning together with strategic (achieving) approaches (J. B. Biggs, 1987b; Marton & Säljö, 1976; Moon, 2004) explained in Chapter 2, Section 2.5.

Surface approaches to learning are considered as the steps taken by students' to complete the basic tasks required for the coursework in question. These steps undertaken are given in the teaching material or follow the instructions of the faculty coordinator in achieving the minimum requirements towards the completion of the concerned coursework. Hypothetically in architectural terms, these are the students who will follow the various stages of the design process given in the coursework, completing the minimum requirements as per the design brief and requirements.

Deep approaches to learning are considered as the steps taken by students towards a conceptual understanding of the learning process that goes beyond the requirements placed by the teacher and the institution. This process is represented through learning outcomes that go far beyond the requirements placed by the curriculum for the coursework in question. Hypothetically, the students' traverse the design process by imbibing the architectural experience which is reflected not only in the design process, but also in the various stages of design. Deep approaches to learning will be present from the conceptualization to the architectural realization of the design project. In architectural design, deep approaches are represented in the design communication process of the students and in their architectural design portfolio.

Strategic or achieving learning approaches are adopted by students who would like to achieve the learning outcomes representing the deeper domain by traversing the surface approaches to learning. These approaches can be considered as stages of design presented by the students referring to their design strategies that go beyond the framework of the minimum requirements set for architectural design. The students' work on strategies is based on the additional requirements either from the perspective of the design faculty or the pedagogical requirements of the concerned institution. This is a deliberate strategy adopted by students' to fulfil the requirements and achieve good grades during the course of evaluation and assessment.

The referential facets of deep and surface approaches and strategic (achieving) approaches are influenced by the structural facets of learning approaches in the architectural design coursework depicted in Figure 16 based on Figures 10 and 11 in Chapter 3. The referential facets have been depicted within the outcome space in Figure 17 described further in this chapter.

6.10.2 Approaches to Learning: Structural Facet

The structural facet refers to the specific blend of characteristics that has been the focus of this study observed in the students' learning approaches in architectural design.
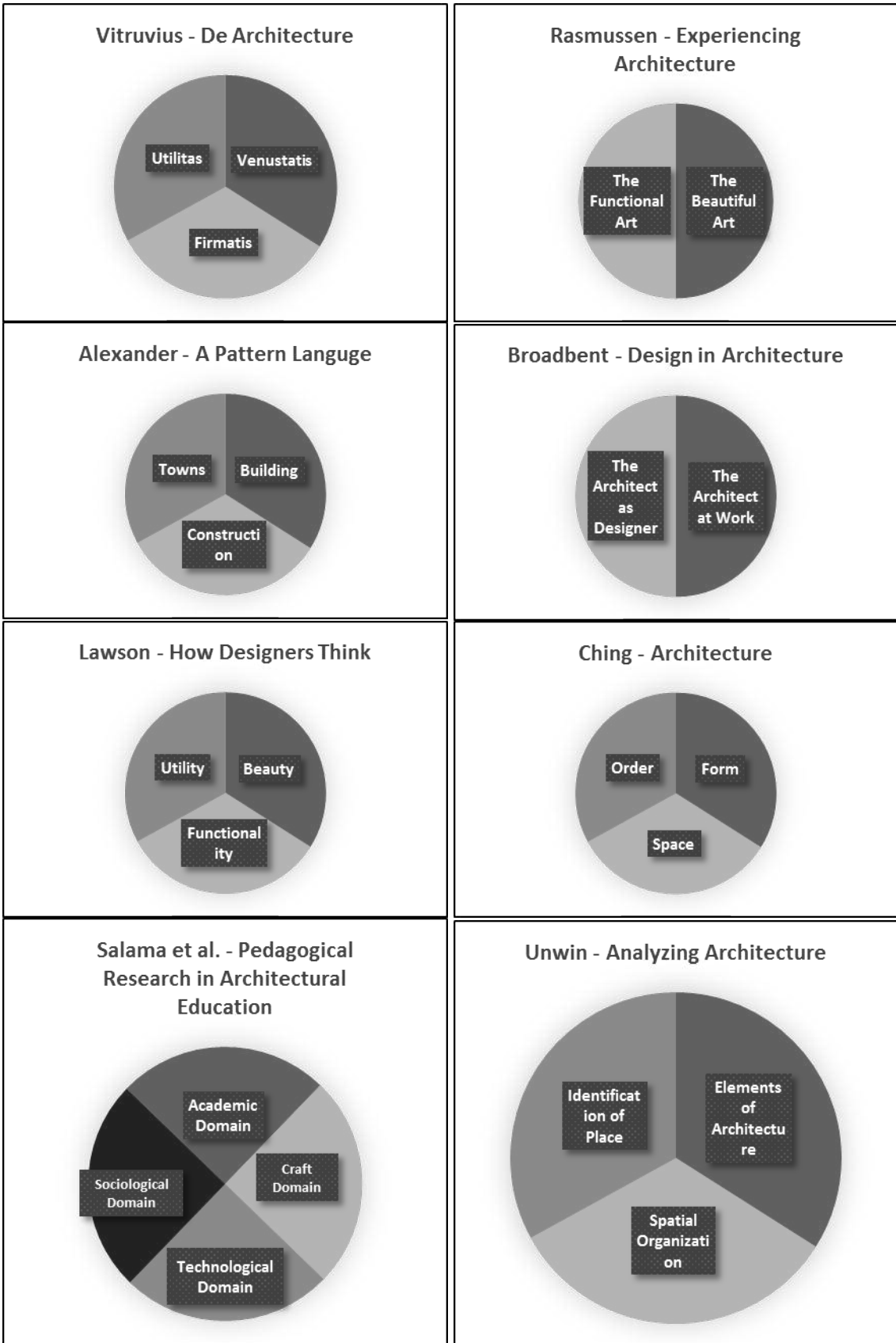
Figure 16: Amalgamated Canvas of Characteristics in Design Coursework encapsulated within Pedagogical Research Approaches in Architectural Education (Alexander, 1977; Broadbent, 1988; Ching, 1996; Haider, 1986; Lawson, 2006; Rasmussen, 1964; A. Salama, 1995; A. M. A. Salama & Wilkinson, 2007; Unwin, 2009; Vitruvius, 1960, 1999)

Figure 16 represents the holistic collage required in both the teaching objectives and

the learning outcomes for design coursework that has posed a major challenge within pedagogical research in architectural education depicted in Figures 10 and 11 (Chapter 3, Section 3.2). The overall amalgamated canvas of characteristics in the design coursework through pedagogical research in architectural education from an historical to the contemporary perspective is representative of the spectrum from Vitruvian triad to Unwin's perspective of architectural analysis (Alexander, 1977; Broadbent, 1988; Ching, 1996; Haider, 1986; Lawson, 2006; Rasmussen, 1964; A. Salama, 1995; A. M. A. Salama & Wilkinson, 2007; Unwin, 2009; Vitruvius, 1960, 1999). From the structural facet of students' learning approaches in architectural design, the four domains of knowledge including academic, craft-based, technological and sociological domains (Haider, 1986; A. Salama, 1995; A. M. A. Salama & Wilkinson, 2007) have been contrasted with the Vitruvian triad of 'utilitas,' 'firmatis,' and 'venustatis;' from the historic perspective, and Unwin's triad of 'identification of place,' 'elements of Architecture' and 'spatial organization' (Unwin, 2009; Vitruvius, 1960, 1999).

The academic, craft-based, technological and sociological domains in the structural facet are encompassed within the historic derivation of the architectural design triad of utility, durability and beauty, and further defined as the beautiful vs. functional form of art (Rasmussen, 1964; A. Salama, 1995; Vitruvius, 1960). Broadbent has focused on the practitioner within architectural design as the designer going through the process of design vs. the professional who is working in the practice (Broadbent, 1988). This is in contrast to Unwin's analysis of architecture focusing on the "identification of place" and correlating it to the elements through the architectural language of "spatial organization" (Unwin, 2009). The emerging structural facet of these domains of knowledge in the architectural design coursework depicted in Figure 16 is counter-analyzed within the referential facet of deep and surface approaches to learning from a pedagogical spectrum to build the outcome space for this study.

The aesthetic means of approaching architectural design academically through the artistic mode includes the domains of knowledge pertaining to visual organization involving the fundamentals of design. The aesthetics of architecture gives a directional pointer to the novice student, with architectural history used as the starting point for many of them in the design coursework. Cognitive psychology and virtual reality go hand-in-hand with digital architecture, and virtual reality playing a central role in the hands-on, craft and skill-based domains of architectural design. These technical means are representative of the scientific mode of exploring the design process in this emerging canvas from the technological and sociological domains.

The technological domain of design includes facets of building sciences progressing to construction technology, environmental control, ecology and the economics involved in the design process traversing the sociological domain depicted in Chapter 3, Figure 10. The various domains of knowledge within architectural design discussed from the technological standpoint are correlated to the sociological domain through user-participation, decision-making, architectural programming, environmental psychology, anthropology and urban design from the viewpoint of the society.

The classification of learning approaches in architectural design is therefore required to resonate with the classical definition described as actions taken by learners while undertaking specific learning tasks, within particular learning contexts. Individual learners require aesthetic and technical domains together with the social perspective, building on the historic triad and amalgamating both the artistic and scientific mode of pursuing architectural design. Through this, they will have the propensity to move towards the deeper dimensions from the surface range based on this established definition (Brockbank & McGill, 2007b; Marton & Säljö, 1976)

6.11 Outcome Space: Classification of Approaches to Learning

The referential and the structural facets represent the overall framework for the 'outcome space' of this emerging classification using phenomenography. Figure 17 depicts the outcome space representing an overall picture of the classified approaches to learning. The referential facet is identified within the outcome space from surface-to-deeper dimensions of the established approaches to learning (Marton & Säljö, 1976) represented by 'white' in the centre depicting deep approaches, to pale grey on the periphery of the circle signifying surface approaches (Figure 17). There is no clear boundary between the surface and deeper range as this is a notional transition that students achieve in their learning experiences within the coursework of their academic program. Some students also traverse the strategic or achieving approaches to learning (J. Biggs, 1979) in the coursework they study, falling within the spectrum of the surface and deeper range depicted as 'darker grey' (Figure 17).

The structural facet is represented as the full circle depicting the architectural education as an ecosystem in Figure 17. This depiction through two halves has referred to Broadbent's designer going through the process of design vs. working in the practice (Broadbent, 1988) and Rasmussen's definitions of experiencing architecture as the 'beautiful' vs. 'functional' art (Rasmussen, 1964). This facet is further represented through three tridents of the Vitruvian-to-Lawson based triad of utility, durability and beauty (Lawson, 2006; Vitruvius, 1960, 1999) moving on to Ching's description of architecture as 'form, space and order' (Ching, 1996), culminating in Unwin's
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architectural analysis (Unwin, 2009). Salama's domains of knowledge are depicted within four quadrants, representing the academic, craft-based, technological and sociological domains (A. Salama, 1995; A. M. A. Salama & Wilkinson, 2007) based on the amalgamated canvas of Figure 16.

DEEP APPROACH (D.A.)

SURFACE APPROACH (S.A.)
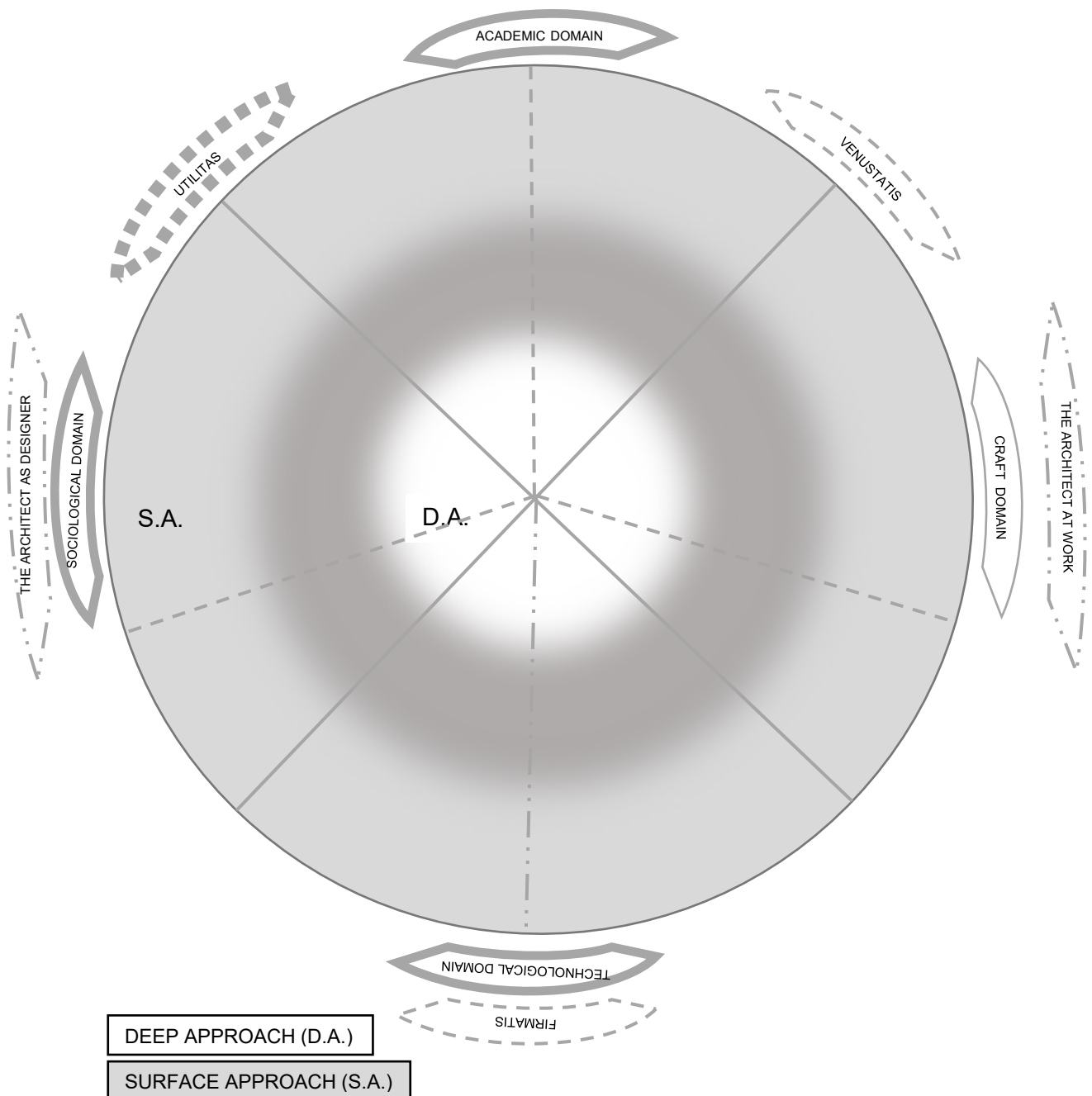
Figure 17: Outcome Space for Classification of Approaches to Learning using Phenomenography

The identified approaches from the categorized experiences are based on the ninth and tenth step as discussed in the data analysis (Sub-section 6.9.2) of this chapter. These learning approaches are placed in the outcome space within the referential and structural facets. The referential facets represents the classification of approaches from a global level or a comparative perspective of approaches to learning identified in other fields of education. Structural facets on the other hand are the representation of the

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above classification of learning approaches from a pedagogical perspective of the design coursework in architectural education. The outcome space for the classified learning approaches represents the journey undertaken by the student of architecture stepping into the portals of architectural education through the coursework of design.

The outcome space signifies this learning experience from the first-to-fifth year of the program based on global as well as architectural significance of the various learning approaches undertaken by the student. To obtain a broader perspective and range of approaches used by various students within the framework of architectural pedagogical research, cross-sectional data from four institutions was collected.

6.12 Data Collection – Four Schools of Architecture

The data for this study was collected from two architectural institutions in the North American context, and one each from the contexts of the United Kingdom and India. The selection of these four institutions included Welsh School of Architecture (WSA) - Cardiff, UK where the author of this thesis has pursued his PhD studies. He is a native of India and Sir Jamshetjee Jeejeebhoy (Sir JJ) College of Architecture was the second school chosen as it is one of the oldest architectural institutions to be established in the Asian subcontinent. The North American context included the two other schools of architecture from University of Texas at Austin (UTA) – Austin, Texas and Oklahoma State University (OSU) - Stillwater, Oklahoma representing a dominant branch of the international perspective within architectural education.

The data collection from the four institutions as case-studies were distinctively different. WSA, Cardiff, UK in comparison to a more intimate Oklahoma context of OSU, Stillwater had very different urban and rural settings within the perspective of the western world. At the same time both UTA – Austin, Texas and WSA – Cardiff have a comparable three-plus-two years structure for the Bachelor of Architecture program and are each located within the city centre that were local capitals of their respective regions/countries. The structure of the five-year programs of Sir JJ, India and OSU, Stillwater were comparable, with a contiguous start-to-end structure, leading to the professional architectural degree.

All four institutions identified for data collection were analyzed from a cross-sectional perspective for that specific academic year when this study was conducted. Data collection using phenomenography through semi-structured interviews was central to this study. As discussed earlier in this chapter, the semi-structured interviews were based on the interview questionnaire that emerged from the earlier pilot study (Chapter 5).

6.12.1 Data Collection through Semi-Structured Interviews

The semi-structured interviews were conducted on a sample of students who were chosen randomly each year from the entire cross-section of the architecture program and based on the research proposal approved by the Research Ethics Committee, Welsh School of Architecture; Cardiff University (Iyer, 2012b).

The random selection was done by the formal introduction of the researcher to the students of architecture by faculty or the faculty coordinator of each year concerned for the specific institution during their formal design studio sessions. The researcher formally approached the students' cohort at an individual level and started the data collection process in the form of semi-structured interviews. The reason for the random selection was to avoid any research-based bias in the form of design faculty favoring a specific cohort of students or gender bias being reflected with male or female students selected in a specific manner. The other reason for the random selection was to avoid any form of pressure created on the student being interviewed through their name list being formally announced by the design faculty or an official mail being distributed on the virtual black board of the institution.

As the students' learning experience was being captured using the qualitative research method of semi-structured interviews, the notion of empathy (Ashworth & Lucas, 2000) was built into the data collection process described earlier in Sub-section 6.9.2 through the ten steps undertaken as a part of the phenomenographic analysis. The semi-structured interviewing process was also based on the experience of data collection conducted in the earlier pilot study (Chapter 5) and was done for the entire cross-section of students for WSA, Sir JJ, UTA and OSU.

This notion of empathy (Ashworth & Lucas, 2000) towards the students' cohort being interviewed included the following steps. A formal introduction of the researcher's profile and a detailed preview to the research being conducted sets the tone for the data collection process. The interviewee was constantly asked about his or her comfort level before the formal interviewing process started. The student was presented the consent form which was duly signed before the actual interview. The interview had to be recorded so the interviewee was familiarized with the audio recording format to alleviate any discomfort due to the equipment being used well before the actual interview process.

The body language of the researcher towards the interviewee throughout this process and during the course of the interview was subdued, clearly reflecting empathy towards the student's learning experience. The importance of body language was promoted in

the seating position for the interview process with the interviewee seated at a higher level in comparison to the researcher or the interviewer. The interviewer was actively listening to the interviewee through the process of engagement, by clarifying certain points during the interview. This included follow-up questions in the form of probe and prompts. At the end of each interview, the students were thanked for sharing their experience, and were sent emails within a fortnight acknowledging their role in the ongoing research. The data that was collected in the form of audio recordings were transcribed and analyzed as discussed in the earlier section.

6.13 Data Collection & Analysis – International Perspective of the Four Schools of Architecture

The data collected through the semi-structured interviewing process is depicted in Table 18. The data collection was carried out in two phases that included three stages. In Phase 1, the first stage included the semi-structured interviews conducted for the entire student cross-section at WSA and Sir JJ in February and August 2013. This stage included the interim analysis of twenty-five interviews of WSA students, which was presented to the staff and post-graduate research students at a research seminar in February 2014.

The interim findings of this analysis focused on four keys aspects of learning approaches within the architectural design coursework described in Sub-section 6.7.5. Phase 2 included focus-group discussions based on these key aspects with each year of the five-year cross-section of students at WSA and Sir JJ, which was conducted in February and March 2014. This data has been further analyzed to reinforce the classification of learning approaches as a part of this study.

The third and final stage as a part of the second phase of data collection included semi-structured interviews that were conducted for the entire cross-section at UTA and OSU in February and March 2015.

As the data collection and phenomenographic analysis progressed through the pilot study in 2012 and as a part of the Phase 1 interim analysis of the final study at WSA in 2013, the saturation of data for the cross-section of each year was obtained in the phenomenographic analysis between the sixth to the seventh interview. This helped the author in consolidating the semi-structured interview process for the second phase of the data collection in North America as there were time-constraints based on the travel grant to visit the identified architectural institutions (Iyer, 2014-15).

S. No.	School of Architecture	Year of Program	Total No. of Semi-structured interviews Conducted	Total No. Semi-structured interviews transcribed and analyzed using Phenomenographic Approach
1	Welsh School of Architecture, Cardiff University, United Kingdom 5 Nos. Focus Group Discussions conducted with groups of 6 to 8 students from each year of the 5 year architecture program Feb.2013 to Feb. 2014	1st Year B.Sc. Arch.	16 Nos.	16 Nos. transcribed and 12 Nos. analyzed
		2nd Year B.Sc. Arch.	16 Nos.	16 Nos. transcribed and 9 Nos. analyzed
		3rd Year B.Sc. Arch.	16 Nos.	16 Nos. transcribed and 9 Nos. analyzed
		1st Year M. Arch.	13 Nos.	13 Nos. transcribed and 9 Nos. analyzed
		2nd Year M. Arch.	16 Nos.	16 Nos. transcribed and 9 Nos. analyzed
2	Sir JJ College of Architecture, University of Mumbai, India 5 Nos. Focus Group Discussions conducted with groups of 6 to 8 students from each year of the 5 year architecture program Aug. 2013 to March 2014	1st Year B. Arch.	15 Nos.	10 Nos. transcribed and analyzed
		2nd Year B. Arch.	15 Nos.	9 Nos. transcribed and analyzed
		3rd Year B. Arch.	15 Nos.	8 Nos. transcribed and analyzed
		4th Year B. Arch.	15 Nos.	8 Nos. transcribed and analyzed
		5th Year B. Arch.	15 Nos.	8 Nos. transcribed and analyzed
3	School of Architecture, the University of Texas at Austin, Texas, USA Feb. 2015	1st Year B. Arch.	9 Nos.	9 Nos. transcribed and 8 Nos. analyzed
		2nd Year B. Arch.	9 Nos.	9 Nos. transcribed and 8 Nos. analyzed
		3rd Year B. Arch.	9 Nos.	9 Nos. transcribed and 8 Nos. analyzed
		4th Year B. Arch.	10 Nos.	10 Nos. transcribed and 8 Nos. analyzed
		5th Year B. Arch.	8 Nos.	8 Nos. transcribed and analyzed
4	School of Architecture, Oklahoma State University, Stillwater, Oklahoma, USA March 2015	1st Year B. Arch.	12 Nos.	12 Nos. transcribed and 8 Nos. analyzed
		2nd Year B. Arch.	10 Nos.	10 Nos. transcribed and 8 Nos. analyzed
		3rd Year B. Arch.	10 Nos.	10 Nos. transcribed and 8 Nos. analyzed
		4th Year B. Arch.	12 nos.	12 Nos. transcribed and 8 Nos. analyzed
		5th Year B. Arch.	9 Nos.	9 Nos. transcribed and 8 Nos. analyzed

Table 18: Data Collection of Students' Cross-section for WSA, Sir JJ, UTA and OSU

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6.14 Summary

This chapter has described the research framework for the current study including the various steps undertaken for the data collection and analysis using phenomenography in the classification of learning approaches for the architectural design coursework. Chapters 7, 8, 9 and 10 present the emerging categories of learning approaches from the data collection and analysis for the four institutions. This chapter has further described the steps undertaken for final analysis including the identification of the categories of learning approaches, outcome space and phenomenographic research analysis conducted through physical analysis and using NVivo-10.

The current chapter has presented the research context through the aim and objectives of this phenomenographic study. The learning context of the four institutions where the data was collected has been juxtaposed with the phenomenographic data collection and analysis described in Section 6.9. The importance of the structural facets within the design coursework reviewed in Chapter 3 focusing on pedagogical research in architectural education has been graphically depicted in Figure 16. The outcome space for the phenomenographic analysis has been derived through the structural and referential facets of the phenomenon in question; the students' approaches to learning depicted in Figure 17. The phenomenographic analysis is presented for the four identified institutions as a part of this study in the following chapters.

Chapter 7: International Perspective: One - Sir JJ College of Architecture, University of Mumbai, India

Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ), University of Mumbai located in Mumbai, India is one of the four institutions covering the international perspective for the current study. Table 19 presents an overall picture of the Bachelor of Architecture programs offered at the four institutions with Sir JJ offering a total of three hundred and forty credits in the five year program and eighty-five courses. The program includes ten semesters with one semester dedicated to internship or professional training and is accredited by the Council of Architecture, New Delhi, India.

Name of Institutions	Total Credits Hours	Equivalent Coursework / Core Modules	Accreditation Body
Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ), University of Mumbai - Mumbai, India	340	85 Courses offered in the 5 Year Program	Council of Architecture (CoA), New Delhi, India https://www.coa.gov.in/
School of Architecture, Oklahoma State University (OSU), USA	154	43 Courses 5 Year Program	National Architectural Accreditation Board (NAAB), United States http://www.naab.org/
School of Architecture, University of Texas at Austin (UTA) – Austin, Texas	161	47 Courses 5 Year Program	
Welsh School of Architecture (WSA) - Cardiff, UK	600	20 Core modules 5 Year Program	Royal Institute of British Architects (RIBA) & Architects Registration Board (ARB)

Table 19: Data Collection at Four Institutions with Highlights of the Architecture Program offered at Sir JJ College of Architecture

7.1 Sir JJ College of Architecture: An Indian Perspective

Sir JJ College of Architecture was first established as a part of the Bombay School of Art & Industry in 1857 and authorized by the British government to grant draughtsman's certificate to registered candidates. It was formally established as a department of architecture in 1913 headed by Prof. Robert Cable (Kabinettal & Karpe, 2012). The 1929 fourteenth edition of the Encyclopedia Britannica has recognized the architecture program offered at this department of Sir JJ School of Art, Bombay as being exempted from the RIBA intermediate examination (AARUK, 2007).

In 1952 the department was officially renamed as Sir Jamshetjee Jeejeebhoy (Sir JJ) College of Architecture under the University of Mumbai. Sir JJ is located in the heart of South Mumbai in a sprawling campus which includes the School of Fine Arts and Applied Arts. Chhatrapati Shivaji Terminus (Victoria Terminus) railway station is the next door landmark to name a few of the well-known heritage structures of Mumbai, marking the importance of its physical location within the city. The college offers the five year

Bachelor of Architecture (B. Arch) program recognized by the Council of Architecture; the official accreditation body established by the Government of India in 1972 to regulate education and practice in the country (Kabinettal & Karpe, 2012; NIC/NICSE & Architecture, 2015).

The professional degree is offered as an Indian credit-based semester and grading system as a part of the University of Mumbai syllabus for the architecture program. The fourth year includes the eighth semester for professional internship applicable to the syllabus that was implemented in the academic year 2012-13. In the earlier syllabus of the university, industry-based internship was offered in the tenth semester of the fifth year. The B. Arch program includes 30% of design-based coursework, 17% of construction & structures-based coursework, 20% of graphical & technical coursework, 18% of other theoretical coursework, 10% as electives and 5% for practical training. An amalgamation of eighteen courses in first year, twenty-one courses in second year, nineteen courses in third year, ten courses in fourth year and seventeen courses in fifth year are offered as a part of the five year program at Sir JJ (Ad-hoc_Board_of_Studies_in_Architecture, 2012). Eighty-five courses in total are offered and distributed in six groups of coursework including architectural design, construction, technical, theory, electives and professional training as depicted in Figure 18.

Figure 18: 5 Years B. Arch Program Syllabus at Sir JJ College of Architecture, Mumbai, India

7.2 Architectural Curriculum at Sir JJ

The curriculum of the five year program offered at Sir JJ College of Architecture including the architectural design coursework has been explained in the introductory summary of the B. Arch syllabus of the University of Mumbai for 2012-13. This summary is focused on architectural practice further highlighted through design and technology. The objectives reflecting this underlying focus includes student-centric attributes towards critical thinking, flexibility in the syllabus, non-linearity in the learning process with greater emphasis on theory, practice and research. The core coursework of architectural design is supplemented by allied design through the introduction of modules described in Sub-section 7.4.1 including visual studies, interior design, landscape design, graphic design, product design and town-planning (Ad-hoc_Board_of_Studies_in_Architecture, 2012).

The underlying structure of the architecture curriculum at Sir JJ has its emphasis on four areas, with design-based coursework being central to the program, effectively representing the structural facet of students' approaches to learning. Technical, craft-based, technological and other theoretical coursework supplement the core design coursework with architectural practice seen as the backdrop to these four domains.

7.3 Architectural Design Learning Context at Sir JJ

Pic 1: Typical View of Architectural Design Studio (Interpreting Ideas Competition- 17th July 2017) (Kabinettal & Karpe, 2012)

Design studios play their role in the architectural design coursework at Sir JJ. These studios have been used by the students from 7.00 AM to 7.00 PM on working days of the week and until 2.00 PM on weekends. The students use these studio facilities for interaction with the design faculty and visiting experts as well as peer-based learning

with senior students of the five year program. These facilities are not used as twenty-four hours, all-day working studios as has been the hallmark in other architectural

Pic 2: View of Main Entrance to Sir JJ College of Architecture (Faculty Photograph with 2018 Pitzker Architecture Prize Winner - Architect B. V. Doshi - 18th December 2015) (Kabinettal & Karpe, 2012)

institutions internationally. The students from the first to fifth year of the architecture program are stationed at various locations in the two buildings and the workshop of Sir JJ College. This learning context at Sir JJ is a reflection of the school's historic relevance, its physical location as well as the architectural pedagogy imparted as a part of the five year program.

Pic 3: Legacy of an Institution – HOD's and Principals of Sir JJ College of Architecture, Mumbai, India, Notice Board at Principal's Office (photograph taken by author on the 6th November 2015)

7.4 Architectural Design Coursework in First Year B. Arch Program at Sir JJ

The architectural design (eight credits) and allied design (eight credits) coursework are spread across the two semesters of the first year program covering 22% of the overall 72 credits. The other coursework offered includes building construction and materials, theory and design of structures, humanities, environmental studies, representation and detailing, college project work and elective coursework that cover 78% of the total credits offered as per Figure 18.

7.4.1 Summarized Discussion: First Year Categories of Learning Approaches at Sir JJ

The collected data suggests that first year students have largely approached their learning through *dependent* strategies focusing on *product-based* approaches to architectural design. There is evidence that the design coursework has centered on beauty and aesthetics as the principal domains of knowledge resulting from design exercises that the students' have done in the parallel coursework of allied design (Approach SJJ1A). This would be seen as students adopting a *surface* approach in their design work.

Categories identified in the 1st Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Allied Design as Product-based Approach through Reinforcement of Aesthetics in Architectural Design	Approach SJJ1A	Product-Based	Surface
Architectural Design Strategies as Product-Based Approach	Approach SJJ1B	Product-Based Strategy	Surface-to-Strategic
Architectural Design Process as Collaboration in Groups & Senior Students	Approach SJJ1C	Dependent & Strategy	Surface-to-Strategic
Architectural Design through Instructions & Directions of Faculty as Product-Based Approach	Approach SJJ1D	Dependent & Strategy	Surface-to-Strategic
Design Project as Step-by-Step Product-Based Approach	Approach SJJ1E	Product-Based	Surface

Table 20: Categorized Approaches to Learning in 1st Year B. Arch – Sir JJ

The data also suggests that this focus on beauty and aesthetics as well as the functional-cum-practical domains has led to students operating a *strategic* approach. These acts of completing the design process by following a series of pre-determined steps signifies students' learning ranging from the *surface-to-strategic* approaches (Approaches SJJ1B and SJJ1E). The data also suggests that students have depended on the faculty as well as collaboration with senior students in developing the various stages towards completion of the design project. These *dependent* and *product-based* Approaches

SJJ1C and SJJ1D have also been classified within the range of *surface-to-strategic* approaches.

Table 20 depicts five identified categories of learning approaches from the experiences of the first year students at Sir JJ, mapped onto the meta-categories identified in the pilot study (Chapter 5, Section 5.5; Table 13). To ensure that the text supporting the meta-categories remains readable, this chapter provides a summary of evidence for the categorized approaches without the frequent inclusion of quotations similar to the earlier pilot study (Chapter 5). The categorized evidence for this chapter can be found in Appendix IV.

These categories have predominantly reflected *dependent* learning strategies with the focus on *product-based* approaches in the students' design coursework. The emerging classification in the first year has shown a connection between Approach SJJ1B, a product-based strategy, and Approach A from the pilot study. This takes the form of a series of steps undertaken by the students in their design work in a singular direction as well as the identified learning approach of 'memorizing techniques and procedures' as per the fashion design studies described in Chapter 5, (Table 17) (Bailey, 2002; Drew et al., 2001; Iyer & Roberts, 2014). Both Approach SJJ1D as well as Approach B from the pilot study show the importance of the role played by faculty in the development of students' learning approaches in architectural design. Approaches A and B, the *directional* and *product-based* categories from the pilot study (Iyer & Roberts, 2014) have represented the emerging classification of students' approaches to learning (Approaches SJJ1A to SJJ1E) in the first year program. This is further illustrated in the two surface approaches of 'memorizing and rehearsing techniques and procedures' from the fashion design studies in Chapter 5, (Table 17) (Bailey, 2002; Drew et al., 2001).

Approaches SJJ1A and SJJ1E are *product-based* categories. In SJJ1A students appeared to focus on the aesthetic aspects of their design, over the deeper meaning, suggesting a *surface learning* approach. SJJ1E is similar to Approach A from the pilot study and the fashion design learning approach of 'memorizing techniques and procedures' from Chapter 5, Table 17 (Bailey, 2002; Drew et al., 2001; Iyer & Roberts, 2014). Both are further representations of surface learning approaches in practice-based fields.

Approaches SJJ1B, SJJ1C and SJJ1D are *product-based*, *dependent* and *strategic* categories where students focus on the process of design, through group-based,

collaborative learning by relying on faculty instructions reflecting strategic learning approaches. Approach B from the pilot study and the fashion design learning approach on 'rehearsing techniques and procedures' from Chapter 5, (Table 17) (Bailey, 2002; Drew et al., 2001; Iyer & Roberts, 2014) represent similar *surface-to-strategic* approaches. The first year students have gained an understanding of the design process through instructions given by the faculty including the work done in groups and strategically completing the design solution representing the range of *surface-to-strategic* learning approaches in architectural design.

7.4.2 Approach SJJ1A: Product-Based Category

Approach SJJ1A has been the dominant theme amongst first year students. This product-based category has been explained through the allied design coursework offered in parallel and as reinforcement of the aesthetics within architectural design. *'Allied Design'* has complemented the design coursework in the first year program at Sir JJ and has been considered as an important influence and starting point in architectural design. Based on the traditions of Bauhaus (Bax, 1991), *allied design* introduces the architecture student to the early-stages of design theory. This coursework has been historically offered under the nomenclature of 'Basic Design' at Sir JJ. A majority of the first year students at Sir JJ have considered allied design as an important starting point, discussing its influence as the main theme for the commencement of an architectural design project.

A major sub-theme that has emerged is the students' usage of the allied design coursework as product-based approaches in completing the design project with the perception of being rewarded in terms of assessment. Another sub-theme to emerge is the superficial focus on aesthetics and rational processes covered in allied design through expressions including 'visually attractive,' 'aesthetically appealing,' 'look better' and 'artistic viewpoint.' A minor sub-theme that has emerged through allied design has been the design faculty and senior students being perceived as directional points in the development of their learning approaches. This identified category has been based on the spectrum of product-centric processes from the commencement to the completion of the design project with the students considering allied design as a learning tool superficially for the aesthetic appearance in undertaking architectural design.

7.4.3 Approach SJJ1B: Product-Based Strategic Category

Approach SJJ1B is a continuation of product-based approaches but is differentiated from the dominant theme of Approach SJJ1A through an emphasis on the functional and practical aspects of design. Students with this approach referred to an understanding of the process of design, its application and practicality, which has been

achieved by focusing on the design solution and evidenced through expressions including 'applying it' and the 'practicality of the method' as well as the 'design project' through the 'viability of design.' The strategy followed in this product-based approach is focused on the functional domain of architectural design as well as the practical aspects in the process of design. The design process has been based on the production of successful design solutions with these product-based strategies representing the starting point in developing further learning approaches.

7.4.4 Approach SJJ1C: Dependent & Strategic Category

Approach SJJ1C, the other product-based category has focused on the students' development of the design process through collaboration with senior students and group work. This strategic categorized approach included the sub-theme of communication with the senior students on the design coursework through 'talking or discussion,' product development in the form of 'discussions about re-doing a design assignment' and direct or indirect encouragement from 'design faculty towards collaboration with seniors.' This dependent category focusing on the design process through group-based collaboration is connected to Approach SJJ1A where allied design has been used as the direction for product-based collaborative learning.

A further sub-theme in Approach SJJ1C is where students claimed to be following instructions of faculty in methods of collaboration with phrases such as 'being told,' 'being asked' or 'teaching teamwork.' Students stressed the importance given to faculty instructions suggesting dependent learning approaches. This category has presented the development of strategic learning approaches through collaboration with senior students in architectural design that is a particular feature encouraged amongst first year students in Sir JJ. Group-work based collaboration amongst the students through dependent strategic learning approaches has been presented in this identified category.

7.4.5 Approach SJJ1D: Dependent & Strategic Category

Approach SJJ1D is a minor theme that runs in parallel with SJJ1A. Students highlighted the centrality of the faculty instructions and directions given in their coursework. This suggests a dependent and strategic approach where students are reliant on the faculty. The expressions including 'teacher or professor making a point' and 'faculty stating or teaching how to work out the design solution' are reflective of the design faculty's position in the evolution of students' learning approaches.

The instructions of the faculty are followed as directions and important steps in completing the project. There was also evidence that students were making use of the advice of senior students. The students' experiences in this category often show their

tendency to focus on the technical domains of architectural development. Approach SJJ1D has also been considered in developing further learning strategies towards collaboration in groups as well as the completion of the design assignment as a product from both the aesthetic and functional domains in architectural design. Though this identified category is represented as minor sub-themes within Approaches SJJ1A, SJJ1B and SJJ1C, faculty instructions and directions in the design coursework has emerged as an important theme amongst the first year Sir JJ students' learning experience.

7.4.6 Approach SJJ1E: Product-Based Category

The final Approach SJJ1E is a minor procedural theme similar to the product-based approaches identified in the earlier categories but where students described a step-by-step design process in the completion of their design assignments. They outlined the completion of a task while explaining the ongoing design process. Evidence of this step-by-step process comes in the form of terms such as 'we are designing,' 'we design,' followed by the project which is a 'swimming pool for kids' and the design goals to be fulfilled including 'color' and 'shape' for the pool. This category has focused on representing the architectural solution as an artifact or a design product by primarily focusing on completing the assignment. Students have a focus on various design ideas with the intention of completing the next step through the various stages of design in a step-by step manner by 'using it in the design process.'

A sub-theme in this identified category and discussed in Approach SJJ1D is the role of faculty as directional pointers for the students in the technical domains of the design process as well as the steps required to complete the project. The underlying expressions of 'the starting-point and end-point in the design process' reflects this step-by-step product-based direction that the students have embarked upon based on their interaction with faculty in the architectural design coursework.

7.5 Architectural Design Coursework in Second Year B. Arch Program at Sir JJ

The architectural design (14 credits) and allied design (6 credits) coursework in the second year cover 28% of the overall 72 credits. The other coursework offered includes building construction, structures, building services, humanities, environmental studies, representation and detailing, architectural theory, college project work and elective coursework that cover 72% of the total credits offered as per Figure 18.

7.5.1 Summarized Discussion: Second Year Students' Learning Approaches at Sir JJ

The data collected amongst the second year students has presented a continued focus of learning approaches towards *dependent* and *product-based* learning strategies with further evolution to *process-based* approaches in architectural design. There is a

continued emphasis on beauty and aesthetics as the principal domains of knowledge in the design project with a balanced focus towards the functional and technical domains in architectural design. There is a transition from the aesthetic-to-functional domain signifying the *surface-to-strategic* range of learning approaches with the focus on the completion of the design project. The data suggests students' continued reliance on faculty instructions and guidance in strategically completing the design project. This is represented in Approach SJJ2C. This category however signifies the transition from *dependent-to-independent* learning strategies within the second year. Approaches SJJ2D and SJJ2E suggest an evolution in the students' learning approaches with a shift of focus from completing of the project towards an understanding of the underlying process of design.

Categories identified in the 2nd Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Allied Design as Reinforcement of Product-Based Approach in Architectural Design	Approach SJJ2A	Product-Based Strategy	Surface-to-Strategic
Architectural Design as Series of Steps using Product-Based Approach	Approach SJJ2B	Product-Based Strategy	Surface-to-Strategic
Architectural Design Process through Faculty Instructions & Guidance	Approach SJJ2C	Dependent & Strategy	Strategic
Architectural & Building Design as Process-Based and Product-Focused Approach	Approach SJJ2D	Product-Focused Strategy	Strategic
Evolving Architectural Design Process as Process-Based Approach	Approach SJJ2E	Process-Based Strategy	Strategic

Table 21: Categorized Approaches to Learning in 2nd Year B. Arch – Sir JJ

Table 21 depicts the five identified categories from the second year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These second year categories are a continued representation of *dependent* and *product-based* learning strategies in architectural design from the first year evolving towards *process-based* strategic approaches in the second year. Approaches B and C, the *dependent, directional* and *product-focused* categories from the pilot study (Iyer & Roberts, 2014) have represented the emerging classification of learning approaches in the second year (Approaches SJJ2A to SJJ2E) with further illustration through the two surface approaches of 'memorizing as well as rehearsing techniques and procedures' from the fashion design studies in Chapter 5, (Table 17) (Bailey, 2002; Drew et al., 2001).

7.5.2 Approach SJJ2A: Product-Based Strategic Category

Approach SJJ2A, the continuation of the product-based strategic category, is discussed amongst the majority of second year students reflecting on the important role played by the first year allied design coursework in architectural design (Approach SJJ1A). The experiences are reminiscent of the beauty and aesthetic domains of knowledge reflected through product-based approaches in the first year of the program. The data suggests that these product-based strategic approaches appear to stem from the aesthetic as well as functional domains in architectural design and are further reinforced by the faculty's directions alongside the allied design coursework.

7.5.3 Approach SJJ2B: Product-Based Strategic Category

Approach SJJ2B is based on the students' description of the design process through the steps undertaken in completing the design project. This identified category represents the students' tendency to continue on the academic domain considered in Chapter 6, Sub-section 6.10.2, Figure 16 through the functionality as well as craft-based domains focusing on beauty in architectural design. The experiences are dominated by expressions about 'the evolution of design from a product-centric perspective' including 'whole design,' 'final product,' or 'final Design' on one end of the spectrum, with further articulation on the actual stages of design development leading to product-based solutions on the other end. This category has signified the students' learning approaches as the basis for developing the final design solution further reflected in the second co-dominant theme of Approach SJJ2C as well as the first year product-based strategic category of Approach SJJ1B.

7.5.4 Approach SJJ2C: Dependent & Strategic Category

Approach SJJ2C with a continuing emphasis on the faculty's instructions and guidance is represented as the post-cursor to independent learning approaches amongst the second year students. A major sub-theme within this category has focused on the design process through the technical and functional domains of architectural design as strategic learning approaches. Faculty instructions in completing the design project in a step-by-step manner represents the connection with the earlier co-dominant theme of Approach SJJ2B as well as the product-based strategic category of Approach SJJ1B from the first year of the program.

The minor but emerging sub-theme of independent learning is the direct as well as indirect encouragement given through faculty instructions and guidance in the second year students' learning experiences. This transition from dependent-to-independent learning is reflected in contrasting expressions including 'being told,' 'being explained' or 'being instructed;' to experiences like 'evaluation of a step,' 'getting to know' or

'understanding something.' This categorized approach represents the stepping-stone for the students in developing their design process.

7.5.5 Approach SJJ2D: Product-Focused Strategic Category

The less dominant but much discussed category of Approach SJJ2D represents the second year students' focus on the product or the final design solution. This identified category is based on the design process and correlated to the earlier product-based and dependent-strategic categories from the first year focusing on the allied design coursework (Approach SJJ1A), completion of the design solution (Approach SJJ1B) and product-based approaches on collaboration-cum-group work (Approach SJJ1C). The students' learning experiences represent the academic-cum-aesthetic domain in parallel to the craft-based and functional domains in architectural design (Chapter 6, Sub-section 6.10.2; Figure 16). The focus on developing the design solution of the building or the architectural development is considered as the central task representing product-focused approaches in the design process.

This building-centric design process is reflected through expressions including 'the visual, technical and construction-based aspects of the building typology;' but also mapping the basis underlying this process. The category includes a minor sub-theme on the students' reflection of understanding design as process-based approaches. Approach SJJ2D has represented the balance of process-based as well as product-focused approaches and considered as a precursor for the second year students embarking on process-focused learning approaches.

7.5.6 Approach SJJ2E - Process-Based Strategy

Approach SJJ2E, a minor theme has presented the evolving process of design. This category includes experiences of the design process undertaken as well as those foreseen by the students during the course of their architecture program. A key sub-theme identified is the strategic understanding of the design process across the architecture program and in the profession. The other sub-theme includes the development of strategies for architectural and building design and the centrality of this coursework within the program. Though this identified category represents strategic learning approaches, the students' focus on the design process has been linked to Approach C reflecting on the evolving perceptions of the design process from dependent and product-focused categories identified in the earlier pilot study as well as the two surface approaches of 'memorizing, together with rehearsing techniques and procedures' from the fashion design studies (Chapter 5, Table 13) (Bailey, 2002; Drew et al., 2001; Iyer & Roberts, 2014).

7.6 Architectural Design Coursework in Third Year B. Arch Program at Sir JJ

The architectural design (16 credits) and allied design (6 credits) coursework in the third year cover 31% of the overall 72 credits. The other coursework offered includes building construction, structures, building services, humanities, representation and detailing, architectural theory, college project work and elective coursework that cover 69% of the total credits offered in the third year as per Figure 18.

7.6.1 Summarized Discussion: Third Year Students' Learning Approaches at Sir JJ

The data collected from the third year students has suggested the emphasis on the design product through *process-based strategic* approaches towards the completion of the design solution. The continued reinforcement on the design process centered on building design within the architectural development has been the dominant theme through Approach SJJ3A, the *product-focused* and *process-based strategic* category. The faculty instructions and guidance categorized in Approach SJJ3B, the *independent* and strategic category and Approach SJJ3D, the *uncritical* and strategic category have signified the building design process-centric approaches representing the development of independent learning approaches.

Categories identified in the 3rd Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural & Building Design as Process-Based and Product-Focused Approach	Approach SJJ3A	Product-Focused & Process-Based Strategy	Strategic
Architectural Design as Practical & Product-Focused Approach through Faculty Instructions & Guidance	Approach SJJ3B	Independent & Strategy	Strategic
Allied Design as Process-Based & Product-Focused Approach in Architectural Design	Approach SJJ3C	Product-Focused & Process-Based Strategy	Strategic
Architectural & Building Design as Process-Focused Approach	Approach SJJ3D	Process-Focused & Uncritical-Strategy	Strategic

Table 22: Categorized Approaches to Learning in 3rd Year B. Arch – Sir JJ

The four categorized approaches are dominated by the focus given to the completion of the building design, the development of *independent* approaches emphasizing functionality and practicality without looking critically into the process of design representing *strategic* learning approaches. Approach SJJ3C, the other *product-focused* and *process-based strategic* category has reflected on the first year allied design coursework and the steps undertaken in completing the design solution.

Table 22 depicts the four identified categories from the third year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These categories represent the evolution of *product to process-focused*, *independent* and *uncritical, strategic* learning approaches. The evolving third year classification is a continued representation of Approach C based on *dependent, product-focused strategies* moving in the direction of *independent, process-focused* learning approaches reflected in Approach D from the pilot study (Iyer & Roberts, 2014), further illustrative of the surface to strategic range identified in the learning approaches of 'rehearsing as well as experimenting techniques and procedures' from the fashion design studies (Chapter 5, Table 17) (Bailey, 2002; Drew et al., 2001).

7.6.2 Approach SJJ3A: Product-Focused & Process-Based Strategic Category

The dominant theme of Approach SJJ3A reflects the continued focus given to building design in the architectural development. The third year students are undertaking the process of design by focusing on developing the design solution in this identified category. The learning experiences are based on 'the specific design project' and 'the steps involved in completing the project.' There is further emphasis given to the design process through product-focused outcomes. The students have reflected on the evolution of this design process by connecting it to the final portfolio. The evolving design process is a minor sub-theme and connected to the profession through the design of the building leading to the final solution. The design process has centered on craft-based and technological as well as functional domains of architectural design in this strategic categorized approach.

7.6.3 Approach SJJ3B: Independent & Strategic Category

One of the two lesser dominant themes, Approach SJJ3B is a continuing third year category discussing the role of faculty instructions and guidance. Two sub-themes that have emerged are the product-centric approaches and independent-learning strategies that evolve within the students' experiences. The role of the faculty and their directions in the development of product-centric practical solutions by focusing on the functional domain of architectural design at various stages of the design process is reinforced in this identified category.

Approach SJJ3B represents the evolution in the students' learning experience towards independent and strategic approaches based on the faculty instructions and guidance focusing on the design solution from a practical perspective. This category provides further indicators of independent learning being encouraged amongst the students including their 'ability to understand,' 'ability to undertake specific tasks' and their 'ability to think in a certain direction.'

7.6.4 Approach SJJ3C: Product-Focused & Process-Based Strategic Category

Approach SJJ3C, the other less dominant category, is the continued emphasis on the first year allied design coursework within third year architectural design. A major sub-theme of discussion is the product-focused approaches based on the experience of undertaking allied design projects. A minor sub-theme is the process-based approaches in architectural design connected to allied design projects.

Expressions pertaining to product-focused approaches include 'the building form, both two-dimensional and three dimensional,' the technical requirements for the design coursework including 'plan, elevation and section,' and the various 'design elements and principles' linked to allied design. The students have further explained 'spatial experiences' and 'understanding of various design interventions and its effect on the human senses' depicting the process-based perspective. Approach SJJ3C is a balance between product-focused learning strategies through allied design coursework and the indirect encouragement to undertake design through process-based approaches.

7.6.5 Approach SJJ3D: Process-Focused & Uncritical-Strategic Category

The minor but forcefully discussed theme of Approach SJJ3D is centered on the focus being given to the process of design. This process-focused strategic category is centered on the process of designing the building and the architectural development. The evolving design process is discussed through 'the process of design,' 'the development of architectural design,' and also 'its influence and repercussions on society.'

An important aspect of these process-focused approaches is its connection to the profession. Approach SJJ3D reflects the independent learning approaches being encouraged to be undertaken in the design coursework. This identified category is a further reflection on the faculty's role explained in Approach SJJ3B, the independent and strategic category, on their influence towards process-focused, uncritical and strategic learning approaches.

7.7 Architectural Design Coursework in Fourth Year B. Arch Program at Sir JJ

The architectural design (8 credits) and allied design (4 credits) coursework in the fourth year cover 23% of the overall 52 credits. The other coursework offered includes building construction, structures, building services, representation and detailing, professional practice, college project work and elective coursework that cover 46% with the rest of the 31% of the total credits offered as professional training for sixteen weeks (Figure 18).

7.7.1 Summarized Discussion: Fourth Year Students' Learning Approaches at Sir JJ

The data collected amongst the fourth year students presented a balance in the *product* as well as *process* of design through *independent* and *critical* approaches. The design of the building within the architectural development is based on the *schematic* process of understanding design (Frederick, 2007). Approaches SJJ4A, SJJ4B and SJJ4C as *product* and *process-focused* categories represent *schema-based* learning approaches undertaken in the completion of the building design in the architectural development. Whereas the design solution is central within both SJJ4A and SJJ4B, Approach SJJ4C has focused on the process of design through the first year allied design coursework.

Approaches SJJ4D and SJJ4E represent the *independent* and *critical* approaches being developed in the fourth year with the emphasis on the functional domain of architectural design through practical experiences of the profession. These identified categories represents the evolution in the fourth year in comparison to the earlier years with students approaching learning in architectural design by *critically* understanding the design process. In Approach SJJ4D, independent learning is triggered through the faculty's, as well as professional experts', instructions and guidance, whereas Approach SJJ4E represents the students' critical ways of approaching the design based on *schema* through the practical experience of their four years in the program.

Categories identified in the 4th Year	Nomenclature	Meta-categories	Position in Outcome Space
Architectural & Building Design as Process-Based and Product-Focused Approach	Approach SJJ4A	Product-Focused & Process-Based	Strategic
Architectural & Building Design as Process-Focused Approach	Approach SJJ4B	Process-Focused Schema	Strategic
Allied Design as Evolution of Process-Based Product-Focused Approach in Architectural Design	Approach SJJ4C	Product-Focused & Process-Based Schema	Strategic
Architectural Design as Profession & Process-Based & Product-Focused Approach through Faculty & External Experts Instructions & Guidance	Approach SJJ4D	Independent & Schema	Strategic
Architectural Design as Process-Focused Experiential Approach	Approach SJJ4E	Process-Focused & Critical - Experiential Schema	Strategic-to-Deep

Table 23: Categorized Approaches to Learning in 4th Year B. Arch. – Sir JJ

Table 23 depicts the five identified categories of fourth year students' learning approaches as meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These identified categories have a predominant focus on the process of design

through *critical, schema-based strategies* by undertaking the design brief given in architectural design. This process has focused on the architectural development and design of the building in-specific. These building-centric categorized approaches have reflected the pedagogical nature of the design coursework at Sir JJ College of Architecture. The classification of the fourth year learning approaches has represented the connection with Approach D, which is based on *independent* and *process-focused* categories as well as the *critical* and *schema-based* categories of Approach E from the earlier pilot study in Table 13 (Iyer & Roberts, 2014). The fourth year classification further illustrates the strategic range of the learning approaches on 'experimenting techniques and procedures' from the fashion design studies (Chapter 5, Table 17) (Bailey, 2002; Drew et al., 2001).

7.7.2 Approach SJJ4A: Product-Focused & Process-Based Category

Approach SJJ4A is the dominant theme in the fourth year parallel to Approach SJJ3A from the third year. This category has represented the product-focused and process-based categories of students' learning approaches undertaken with the focus on the design solution. The first two major sub-themes have focused on presenting the architectural development as building designs based on the schematic design and development process pertaining to the completion of the design solution.

The minor but well-articulated sub-theme has focused on the architectural profession representing the direction taken by students as they traverse the five year program to graduate and transition to professional practice. This identified category has reflected on the pedagogical nature of architectural design at Sir JJ from the first to fourth year of the program where the centrality is on the design of the architectural development, with the building in specific focus. Approach SJJ4A has a direct connection to the Approach SJJ3A, the product-focused and process-based strategic category as well as to Approach SJJ3D, the process-focused and uncritical-cum-strategic category from the third year of the program. The second year Approach SJJ2D representing the product-focused strategic category as well as the first year product-based category of Approach SJJ1E have further reinforced this connection to the evolving learning approaches from first to fourth year of the program. Whereas the design development in the first and second year has focused on the step-by-step process of completing the design solution by focusing on the aesthetic and functional domains, the third and fourth year have represented the transition of these product-focused approaches through the process of design based on the functional and utility domains of architectural design and further correlating the learning approaches to the profession.

7.7.3 Approach SJJ4B: Process-Focused, Schema-Based Category

Approach SJJ4B as one of the two less dominant themes is linked to Approach SJJ3D, the process-focused and uncritical-cum-strategic category from the third year as well as the earlier discussed category of Approach SJJ4A. This category has focused on the design process within the architectural development as schema-based approaches in the design of the building. Whereas the central focus of the two main sub-themes in the earlier category, Approach SJJ4A, related to the design process of the architectural development, the key sub-themes in this identified category have focused on the design process and its impact on the architectural profession with similar undertones of the third year Approach SJJ3D.

The point of differentiation within this identified category from Approach SJJ3D has been the transition of building design towards the architectural development as schema-based learning experiences reflected as the minor sub-theme. The students' have focused on the development in architectural development from the schematics of concept to the holistic design solution. Approach SJJ4B has represented the transition from third-to-fourth year focusing on the design process but remaining centered on the architectural development.

7.7.4 Approach SJJ4C: Product-Focused & Process-Based, Schema-Based Category

Approach SJJ4C, as the second of the less dominant categories, has been interconnected with Approach SJJ3C, the product-focused and process-based strategic category from the third year. Both categories have looked at the role played by the first year allied design coursework in the evolution of the design process. A dominant sub-theme is the continued focus on the process leading to the final product through schema-based design of the building in the architectural development.

The other minor sub-theme in line with Approach SJJ3D, the process-focused and uncritical-cum-strategic category in the third year, is centered on the process of design. The transition from the third-to-fourth year has been based on the evolution of the design process centered on schema-based approaches. This transition through expressions including 'site analysis in the larger context' and 'correlating architectural experiences to the design process' and referencing it to the design of the building within the architectural development is the progression of Approach SJJ4C from the similar third year category, Approach SJJ3C.

7.7.5 Approach SJJ4D: Independent & Schema-Based Category

Approach SJJ4D as the minor fourth year theme has been dominant in the third year Approach SJJ3B, the independent and strategic category as well as Approach SJJ2C,

the dependent and strategic category in second year. This categorized approach has evolved with the two major sub-themes including faculty instructions and guidance focusing on the design process, as well as continuation of product-centric facets of developing the design solution. The transition of design pedagogy towards the demands of the architectural profession is the third minor sub-theme, where the faculty as well as external experts have been orienting the students to the practicality of design solutions and profession-based independent approaches to design.

7.7.6 Approach SJJ4E: Process-Focused & Critical, Experiential, Schema-Based Category

Approach SJJ4E as a minor theme is the evolution in the learning experiences of a few students towards understanding the experiential facets of architectural design and its incorporation within the process of design as critical and schema-based approaches. This identified category has presented glimpses of students delving into the deeper domain of learning approaches through aesthetics and beauty in the academic domain as well as functionality and utility in the craft-based and technological domains of architectural design.

7.8 Architectural Design Coursework in Fifth Year B. Arch Program at Sir JJ

The architectural design (8 credits), design dissertation (20 credits) and allied design (5 credits) coursework in the fifth year covering 46% of the overall 72 credits. The other coursework offered includes building construction, structures, building services, environmental studies, representation and detailing, professional practice, advanced theories and elective coursework that cover 54% of the total credits offered as per Figure 18.

7.8.1 Summarized Discussion: Fifth Year Students' Learning Approaches at Sir JJ

The data collected in the fifth year is represented through similar lines of learning experiences in continuation with the fourth year focusing on the product as well as process of design through *independent, critical* and *schema-based* approaches. Approaches-SJJ5A, SJJ5B and SJJ5E, the *product* as well as *process-focused* categories involving *schema-based* categorized approaches have represented the students' learning from the perspective of building design within the architectural development. Approach-SJJ5B has depicted the *product* as well as *process* in design through the students' *experiential* journey of architecture and correlating it to the first year coursework of allied design. Approaches-SJJ5C and SJJ5D are *independent* and *critical, schema-based* learning categories focusing on the architectural profession in continuation from Approaches SJJ4D and SJJ4E from the fourth year. Approach SJJ5E represents the summation of the five year program as a reinforcement of the design pedagogy followed in architectural design at Sir JJ.

Categories identified in the 5th Year	Nomenclature	Meta-categories	Position in Outcome Space
Architectural & Building Design as Process-Based and Product-Focused Approach	Approach SJJ5A	Product-Focused & Process-Based Schema	Strategic
Allied Design as Evolution of Experiential Design Process-Based Product-Focused Approach in Architectural Design	Approach SJJ5B	Product-Focused & Process-Based, Experiential, Schema	Strategic-to-Deep
Architectural & Building Design as Process-Focused Profession-Based Approach	Approach SJJ5C	Process-Focused Critical - Schema	Strategic
Architectural Design as Profession, Process-Based & Product-Focused Approach through Faculty & External Experts Instructions & Guidance	Approach SJJ5D	Independent & Schema	Strategic
Architectural Design Pedagogy at Sir JJ College	Approach SJJ5E	Product & Process-Focused Schema	Strategic
Table 24: Categorized Approaches to Learning in 5th Year B. Arch – Sir JJ			

Table 24 depicts the five identified categories from the experiences of the fifth year students at Sir JJ, mapped onto meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13. These building-centric categories have represented the pedagogical standpoint at Sir JJ College of Architecture for the design coursework. The classification of the fifth year learning approaches is a reinforcement of the connection with Approaches D, E and F, the *perceptual, experiential, practical, independent* and *process-focused, schema-based* approaches from the earlier pilot study (Chapter 5, Table 15) (Iyer & Roberts, 2014). The classification of learning approaches at Sir JJ are also represented through the four surface-to-deep approaches of 'relating fashion to own life world as well as experimenting, rehearsing and memorizing techniques and procedures' from the fashion design studies (Chapter 5, Table 17) (Bailey, 2002; Drew et al., 2001).

7.8.2 Approach SJJ5A: Product-Focused & Process-Based, Schema-Based Category

The dominant fifth year category of Approach SJJ5A is parallel to Approach SJJ4A as well as SJJ3A from the fourth and third year with both being product-focused and process-based categories through schema-based and strategic approaches. Approach SJJ5A has been represented through two major sub-themes focusing on the architectural development through schema-based categorized approaches pertaining to the design brief with the minor sub-theme focusing on the profession. The fifth year students' transition into the industry is presented in the learning experiences of this identified category.

Approach SJJ5A has reflected the pedagogy followed in fifth year architectural design at Sir JJ with a continued emphasis on the design brief with building typology in specific focus. This identified category represents the learning curve that a large cohort of students have undertaken, and is further connected to Approaches SJJ4A and SJJ4B, the product-focused, process-based as well as schema-based categories in the fourth year. Approaches SJJ3A and SJJ3D, the product and process-focused, uncritical-strategic categories in the third year as well as Approaches SJJ2D and SJJ1E, the product-focused, strategic categories from the second and first year of the architecture program, represent this connection in the fifth year.

7.8.3 Approach SJJ5B: Product-Focused & Process-Based, Experiential, Schema-Based Category

Approach SJJ5B is represented on similar lines to Approach SJJ3C from the third year as well as Approach SJJ4C from the fourth year on product-focused and process-based strategic as well as schema-based categorized approaches. The first of the two lesser dominant themes, this identified category has focused on the first year allied design coursework in the evolution of the design process, as an experiential journey in architectural design through the fourth year Approach SJJ4E, the process-focused and critical, schema-based category. The dominant sub-theme in Approach SJJ5B has focused on the design process as the final design solution. This fifth year category represents the continuing evolution of the design process as schema-based categorized approaches in the experiential journey of architecture in line with the fourth year category.

The predominance of *allied design* and its connection to their experiential journey in understanding architecture sets Approach SJJ5B as well as Approach SJJ4E apart from other categories of the first-to-fifth year. These categorized approaches have represented the connection to Approaches E and F, the experiential and practical, process-focused, schema-based categories evolving towards perceptual and conceptual categories that has been identified in the pilot study, Table 13.

7.8.4 Approach SJJ5C: Process-Focused, Critical, Schema-Based Category

Approach SJJ5C as a continuation of Approach SJJ4A from the fourth year and Approach SJJ3D from the third year have focused on the process as well as the design product through schema-based and strategic learning approaches. This identified category, the second of the two lesser dominant themes has focused on the process of design and its expansive role related to the design brief and centered on the architectural profession. Approach SJJ5C has been considered as a continuation to the earlier

category of Approach SJJ5A representing the learning experiences of a large cohort of students.

7.8.5 Approach SJJ5D: Independent & Schema-Based Category

Approach SJJ5D is represented on similar lines to the fourth year Approach SJJ4D as independent and schema-based category. As a minor theme in the fifth year, Approach SJJ5D represents the faculty's role as instructors, guides and facilitators as well as a window into the architectural profession. This categorized approach has further explained on the focus given to the design solution based on the evolving process at one end of the spectrum and emphasizing on the role of faculty and external experts at the other end. This role is discussed in terms of the practicality of design and its basis within the profession. Approach SJJ5D represents the diminishing role of faculty as well as external experts in architectural design as the students' progress from the first-to-fifth year. It exemplifies the architectural development as schema-based and evolution of independent learning approaches through five years of the program.

7.8.6 Approach SJJ5E: Product & Process-Focused Schema-Based Category

The minor category of Approach SJJ5E has focused on the architectural design pedagogy at Sir JJ College of Architecture. Based on the students' experiences during their professional training and its connection to architectural design, a large cohort of students opposed the design studio-based work environment at Sir JJ. This was based on the meager provision of infrastructure that has been further extrapolated in the architectural design learning context at Sir JJ in Section 7.3. Students who discussed various aspects of the design studio focused on the direction taken in the design coursework towards process-based, product-centric and profession-focused learning approaches.

7.9 Outcome Space: Classification of Approaches to Learning for the B. Arch Program at Sir JJ College of Architecture, Mumbai - India

The outcome space for the five year learning approaches classification in architectural design at Sir JJ is depicted in Figure 19. The Structural and Referential facets of the outcome space are based on Chapter 6, Section 6.11; Figure 17. The categories of learning approaches for Sir JJ are depicted as metacategories in Tables 20, 21, 22, 23 and 24, identified using phenomenographic analysis explained in Appendix V.

The categories represent the evolution from product-based, dependent learning strategies in the first year; to product and process-focused, dependent learning strategies in the second year. These learning approaches have further evolved to process-focused, independent learning and uncritical strategies in the third year;

eventually leading to process-focused, independent learning and critical strategies as well as schema-based approaches in the fourth and fifth year of the program.
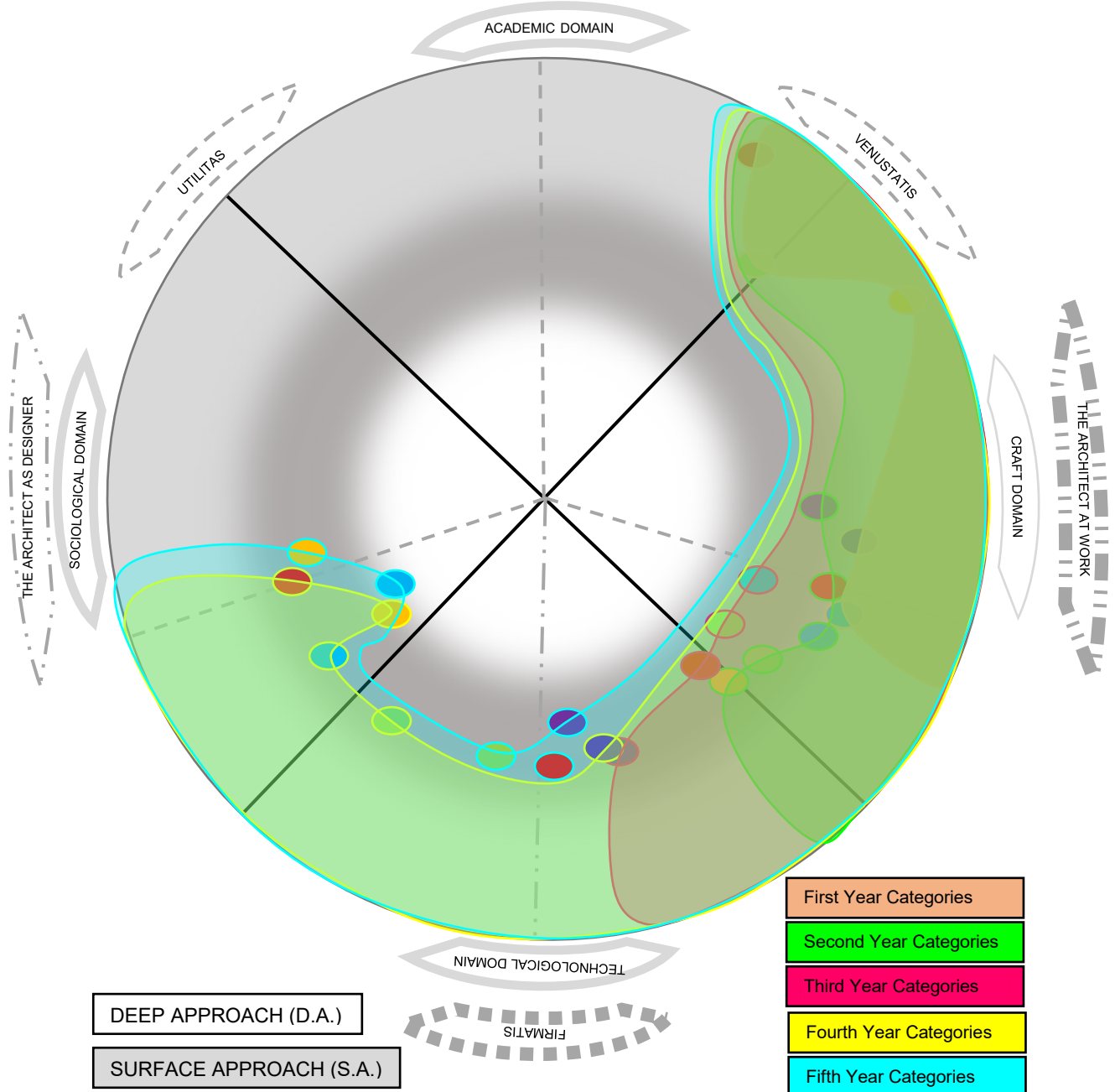
Figure 19: Outcome Space for Classification of Approaches to Learning in the B. Arch Program at Sir JJ College of Architecture, Mumbai, India

These categorized approaches are placed in the outcome space in Figure 19 depicting the overall pedagogy of architectural design across the five year B. Arch program at Sir JJ. Based on the overall summation of meta-categories at Sir JJ depicted in Table 25 and the outcome space in Figure 19, the focus of architectural design is largely centered on the design and development of the building in the context of the design brief. The students are focusing on the academic and craft-based domains through beauty and aesthetics of the design project as well as the functionality of the building design through the technical and technological domains in architectural design. The underlying intent of

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these identified categories represent the production of technical and completed design solutions. The sociological domain focusing on the utility as well as functional parameters of architectural design from the user's perspective are seldom explored within the students' learning experiences.

The question of why the outcome space at Sir JJ has developed (Figure 19), as well as the influence of the curriculum and design pedagogy, is explained through illustrative accounts of the approaches of learning undertaken by nine architecture students in Chapter 11. These classified meta-categories at Sir JJ have been further reflected as summarized architectural experiences of students in Chapter 12, Section 12.4.

The outcome space diagram depicted in Figure 19 has been drawn based on the overall summation of meta-categories and the detailed categories of approaches to learning in architectural design coursework of the five-year B. Arch program at Sir JJ depicted in Table 25 (End of the Chapter). The have depicted the categorized approaches representing their placement in Figure 19 (outcome space) and Figure 20 (meta-categories) with each year depicted in specific colors. Each detailed category and meta-category has also been correlated to the *referential* and *structural* facet of the architectural design coursework used to build the outcome space diagram within Table 25. The outcome space diagrams for the other three institutions have been drawn on similar lines in the subsequent Chapters 8 to 10.

Figure 20 depicts the learning approaches classification of at Sir JJ and is further correlated to the six categorized approaches from the earlier pilot study (Chapter 5, Table 13) (Iyer & Roberts, 2014). There is further comparison with the fashion design studies (Bailey, 2002; Drew et al., 2001) and the initial phenomenographic text-based studies at the University of Gothenburg on deep and surface approaches to learning (Chapter 5, Table 13) (Marton & Säljö, 1976). The Sir JJ classification as well as the six learning approaches identified in the earlier pilot study based on the comparison of first and fourth year architectural design coursework are represented through a similar mapping of meta-categories explaining the surface and deep dimensions of students' approaches to learning. This similarity is based on the learning context for the architectural design coursework at the two Indian schools identified in the pilot study as well as at Sir JJ College of Architecture.

Deep

Surface

Row 1 (Deep side):
- Experiential - Independent Schema-Based Category
- Experiential Schema-Based Category
- Independent Critical Schema-Based Strategic Category
- Process-Focused Uncritical Strategic Category

Row 1 (Surface side):
- Process-Based Strategic Category
- Product-Focused Strategic Category
- Dependent Strategic Category
- Product-Based Strategic Category
- Product-Based Category

Row 2 (Deep side):
- **Approach F** Perceptual Conceptual & Process-Focused Schema
- **Approach E** *Experiential, Practical & Process-Focused Schema*
- **Approach D** *Independent & Process-Focused Schema*

Row 2 (Surface side):
- **Approach C** *Dependent & Product-Focused Strategic Approach*
- **Approach B** *Product-Based Multidirectional Approach*
- **Approach A** *Product-Based Unidirectional Approach*

Row 3 (Deep side):
- Relating fashion to own life world
- Experimenting with techniques and procedures

Row 3 (Surface side):
- Rehearsing techniques and procedures
- Memorizing techniques and procedures

Row 4:
- Organizing and integrating content
- Memorizing content

Legend: TEXT-BASED FIELD | FASHION-DESIGN FIELD | PILOT STUDY | FIRST YEAR | SECOND YEAR | THIRD YEAR | FOURTH YEAR | FIFTH YEAR

Figure 20: Chart explaining Classification of Approaches to Learning from Text-Based Fields (Marton & Säljö, 1976), Fashion Design (Bailey, 2002; Drew et al., 2001), the Earlier Pilot Study (Iyer & Roberts, 2014) and Emerging Classification based Figure-19 Outcome Space of the Five-Year Design Coursework (First, Second, Third, Fourth, Fifth) at Sir JJ College of Architecture, Mumbai, India

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Year	Approach	Category	Sub-theme Description Major to Minor	Meta-Category	Structural Facet (Domain)	Referential Facet (Approaches)
1	SJJ1A	Allied Design as Product-based Approach through Reinforcement of Aesthetics in Architectural Design	Use of allied design in completion of project / Superficial focus on aesthetics and rational processes in allied design / Faculty and senior students as directional points	Product-Based	Beauty Aesthetics	Surface
	SJJ1B	Architectural Design Strategies as Product-Based Approach	Emphasis on functional and practical aspects of Design / Successful design solution	Product-Based Strategy	Functionality	Surface/Strategic
	SJJ1C	Architectural Design Process as Collaboration in Groups & Senior Students	Communication with senior students / Group-based collaboration / Faculty instructions	Dependent & Strategy	Academic Aesthetics	Surface/Strategic
	SJJ1D	Architectural Design through Instructions & Directions of Faculty & Design In-charge as Product-Based Approach	faculty instructions as steps to complete project / Collaboration with senior students and group-work based on faculty instructions	Dependent & Strategy	Aesthetics Technical Functionality	Surface/Strategic
	SJJ1E	Design Assignment as Step-by-Step Product-Based Approach	Step-by-step design process / faculty instructions as steps to complete project	Product-Based	Aesthetics Technical	Surface
2	SJJ2A	Allied Design as Reinforcement of Product-Based Approach in Architectural Design	Role of first year allied design / Faculty instructions	Product-Based Strategy	Aesthetics Functionallity	Surface-to-Strategic
	SJJ2B	Architectural Design as Series of Steps using Product-Based Approach	Steps undertaken to complete design / Faculty Instructions towards design solution	Product-Based Strategy	Academic Functionality Craft-Based	Surface-to-Strategic
	SJJ2C	Architectural Design Process through Faculty Instructions & Guidance	Step-by-step design process / Direct-indirect encouragement to independent learning	Dependent & Strategy	Technical - Functionality	Strategic
	SJJ2D	Architectural & Building Design as Process-based and Product-Focused Approach	Develop building design / architectural development / Understanding design process-based approach	Product-Focused Strategy	Academic Aesthetics Craft-Based Functionality	Strategic
	SJJ2E	Evolving Architectural Design Process as Process-Based Approach	Undertaking the design process / Design process and architectural profession	Process-Based Strategy	Technical Functionality	Strategic
3	SJJ3A	Architectural & Building Design as Process-Based and Product-Focused Approach	Process-based building design in architectural development / Product-focused outcomes – final portfolio	Product-Focused & Process-Based Strategy	Craft-Based Technological Functionality	Strategic
	SJJ3B	Architectural Design as Practical & Product-Focused Approach through Faculty Instructions & Guidance	Product-centric approaches through faculty instructions & guidance / Evolution of independent learning strategies	Independent & Strategy	Functionality	Strategic
	SJJ3C	Allied Design as Process-Based & Product-Focused Approach in Architectural Design	Product-focused approaches correlated to allied design / Process-based approaches through allied design-based projects	Product-Focused & Process-Based Strategy	Technical Craft-Based	Strategic
	SJJ3D	Architectural & Building Design as Process-Focused Approach	Process of designing the building and architectural development / Faculty's role - independent approaches -uncritical – strategies - profession	Process-Focused & Uncritical-Strategy	Architect at work Functionality	Strategic
4	SJJ4A	Architectural & Building Design as Process-Based and Product-Focused Approach	Architectural development as building designs based on schematic development / Completion of design solution / Transition to professional practice	Product-Focused & Process-Based	Functionality Utility	Strategic
	SJJ4B	Architectural & Building Design as Process-Focused Approach	Architectural development as schema-based / Design process and impact on profession	Process-Focused Schema	Functionality Technological	Strategic
	SJJ4C	Allied Design as Evolution of Process-Based Product-Focused Approach in Architectural Design	Evolution of schema-based design process leading to final solution / Process of design transitioning to architectural experiences	Product-Focused & Process-Based Schema	Functionality Technological	Strategic
	SJJ4D	Architectural Design as Profession & Process-Based & Product-Focused Approach through Faculty & External Experts Instructions & Guidance	Schema-based design process / Product-centric design solution / Transition of design pedagogy – schema-based design process – architectural profession	Independent & Schema	Architect at work Functionality Technological	Strategic
	SJJ4E	Architectural Design as Process-Focused Experiential Approach	Experiential facets of architectural design	Process-Focused & Critical - Experiential Schema	Aesthetics Academic Functionality Utility	Strategic to-Deep
5	SJJ5A	Architectural & Building Design as Process-Based and Product-Focused Approach	Architectural development as design solution / Design process based on schema-based approaches – design brief / Transition to architectural profession	Product-Focused & Process-Based Schema	Architect at work Functionality Technological	Strategic
	SJJ5B	Allied Design as Evolution of Experiential Design Process-Based Product-Focused Approach in Architectural Design	Design process as schema-based design solution / Experiential facets of architectural design	Product-Focused & Process-Based, Experiential, Schema	Aesthetics Academic Functionality Utility	Strategic-to-Deep
	SJJ5C	Architectural & Building Design as Process-Focused Profession-Based Approach	Design process based on schema-based approaches – design brief – architectural profession	Process-Focused Critical - Schema	Architect at work Functionality Technological	Strategic
	SJJ5D	Architectural Design as Profession, Process-Based & Product-Focused Approach through Faculty & External Experts Instructions & Guidance	design pedagogy as schema-based design process and window into architectural profession / Process-centric design solution as Independent learning	Independent & Schema	Architect at work Functionality Technological	Strategic
	SJJ5E	Architectural Design Studio Pedagogy at Sir JJ College	Professional training & architectural design / Design studio and architectural design learning context	Product & Process-Focused Schema	Utility Functionality	Strategic

Table 25: Summation of Meta-Categories and Categorized Approaches to Learning in Architectural Design Coursework from 1st to 5th Year of B. Arch at Sir JJ College of Architecture

(The colors depicting categorized approaches represent their placement in Figure 19 (Outcome space) and Figure 20 (Meta-categories) with each year depicted in specific colors. Major-to-Minor Sub-themes are depicted in Grey-scale)

Chapter 8: International Perspective: Two - School of Architecture, Oklahoma State University, Stillwater, USA

Oklahoma State University (OSU) - Stillwater located in Oklahoma State of the United States of America is one of the four institutions covered in the current study. Representing a dominant branch of architectural education internationally, the more intimate context of OSU within Stillwater in the American rural settings is in contrast to University of Texas at Austin (UTA), that has inherited the rich cultural urban ambience of the north-American context. Table 26 presents an overall picture of the programs offered at the four institutions with the School of Architecture at OSU offering a total of one hundred and fifty-four credits in the five year B. Arch program and forty-three courses.

Name of Institution	Total Credits Hours	Equivalent Coursework / Core Modules	Accreditation Body
Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ) India	340	85 Courses 5 Year Program	Council of Architecture (CoA), India https://www.coa.gov.in/
School of Architecture, Oklahoma State University (OSU) - Stillwater, Oklahoma, USA	154	43 Courses offered in the 5 Year Program	National Architectural Accreditation Board (NAAB), United States http://www.naab.org/
School of Architecture, University of Texas at Austin (UTA) – Austin, Texas	161	47 Courses 5 Year Program	
Welsh School of Architecture (WSA) - Cardiff, UK	600	20 Core modules 5 Year Program	Royal Institute of British Architects (RIBA) & Architects Registration Board (ARB)
Table 26: Data Collection at Four Institutions with Highlights of the Architecture Program offered at School of Architecture, Oklahoma State University			

The school is part of the College of Engineering, Architecture and Technology (CEAT) at OSU and offers the five-year professional degree program in architecture and architectural engineering that are accredited by the National Architectural Accrediting Board (NAAB) and the Accrediting Board for Engineering & Technology (ABET). The program includes ten semesters of coursework with 104 credits for the required courses including electives with architectural content for all students and rest of the 50 credits offered as general (non-architecture) studies (CEAT, OSU, & Architecture, 2010; University, 2015).

8.1 School of Architecture, Oklahoma State University: A North American Perspective

The School of Architecture at Oklahoma State University - Stillwater was first established in 1909 as the Department of Architectural Engineering within the College of Engineering. The Bachelor of Architecture program at OSU went through its first NAAB

review in 1949. The five-year professional degree programs in both architecture and architectural engineering subscribe to the school's philosophical doctrine for professional education (CEAT et al., 2010).
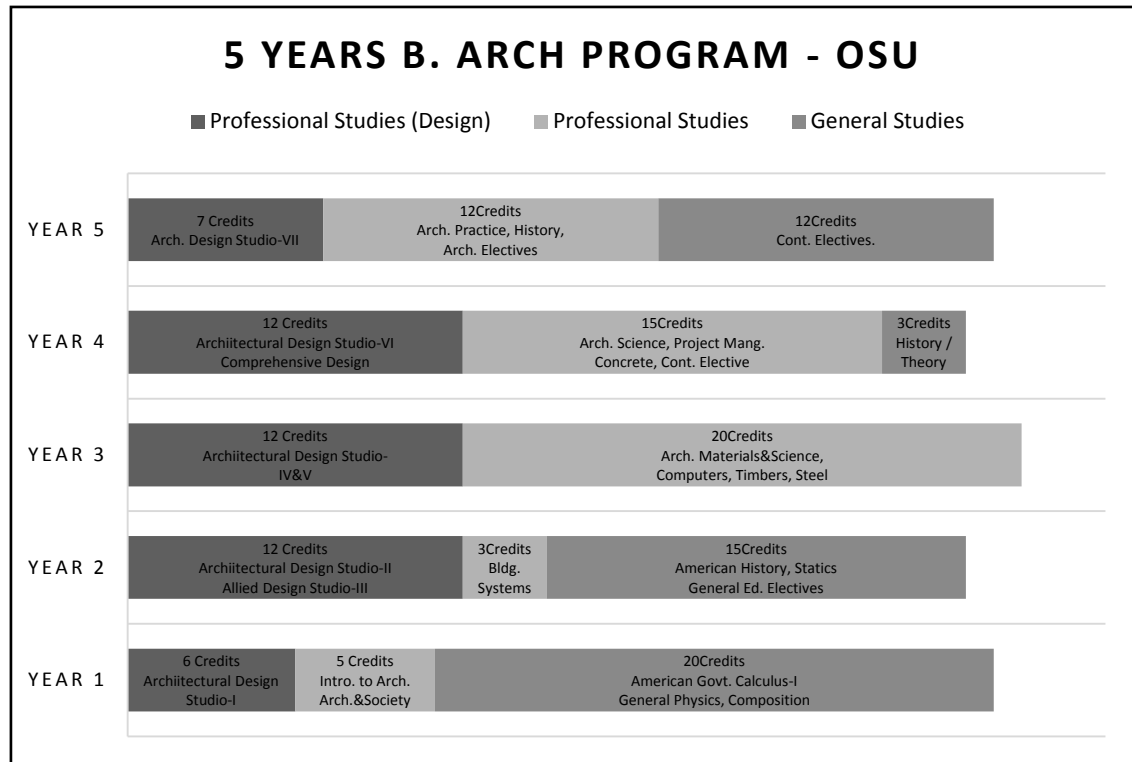
Figure 21: 5 Years B. Arch Program Curriculum at School of Architecture, Oklahoma State University, Stillwater, USA

The curriculum of the B. Arch program includes a sequence of three phases as depicted in Figure 21. The first phase or the Lower Division includes four semesters with coursework in general studies offered from a university-wide selection to architecture-specific courses focusing on the professional studies of design, theory and technology. In this phase of studies, the students are provided the experience of understanding various coursework of architecture and architectural engineering. This phase helps the students in choosing either from a stream, or from a combination of both, towards fulfilling their objectives both in education and career. This is followed by admission to the next phase termed as Upper Division. The third year of the B. Arch program includes the core architecture courses required for the design studio and professional studies. The fourth and fifth year, also known as the final phase or the Professional School, has a reduced focus on the required architectural coursework with increased availability of credit-hours for professional practice-based elective coursework. The School of Architecture, OSU has designed these three phases as a sequential experience in architectural education termed as "finding out," "fundamentals," and "development/specialization" (CEAT et al., 2010).

8.2 Architectural Curriculum at the School of Architecture, OSU

The architectural curriculum at the School of Architecture, OSU is based on the pursuit of high levels of quality in liberal and professional education. These include an integration of the elements required in the lifetime as a citizen of the world "and for achievement in the private practice of architecture: strong design ability, solid technical skills, clear understanding of ethical issues and management/practice aspects of architecture, and a liberal education sufficiently broad to engender understanding of the larger societal context of the profession" (CEAT et al., 2010). The curriculum has been formulated by integrating these elements as a continuation from the first to fifth year by gradually raising the scope and the complexities of the program to match the progression of the students. This continuum of the curriculum is reflected in the specificity of the courses offered in various years under a closely monitored teaching pedagogy delivered by the OSU faculty under the umbrella of the 'learning culture' initiated in 2010 as well as 'design studio: the integrative experience' (ARCHITECTURE, 2014; CEAT et al., 2010; O. S. University, 2016).

8.3 Architectural Design Learning Context at OSU

Pic 4: First year architectural design studio work environment at Oklahoma State University, the United States of America (photograph taken by author on the 7th of March 2015)

Architectural design in the first year includes the introduction of the principles and communication of design, whereas second and third year studios are focused on large-

scale and technically advanced architectural projects emphasizing on "creative problem-solving, relationship to context, sustainability, and systems and materials integration" (O. S. University, 2016). Computer-aided design through a design-build experience leads towards deeper understanding of the design process. Materials, hands-on construction and field trips give the students a firsthand experience of architecture. The fourth and fifth year design coursework is focused on integrating the built environment with building systems and a deeper understanding of architecture in urban environments (O. S. University, 2016). The learning context for architectural design at OSU is represented within the learning ecosystem through the student-cum-faculty driven studio culture where the solution-based, functional and aesthetically oriented sensitivity to the built-environment is inculcated in the five year program (ARCHITECTURE, 2014).
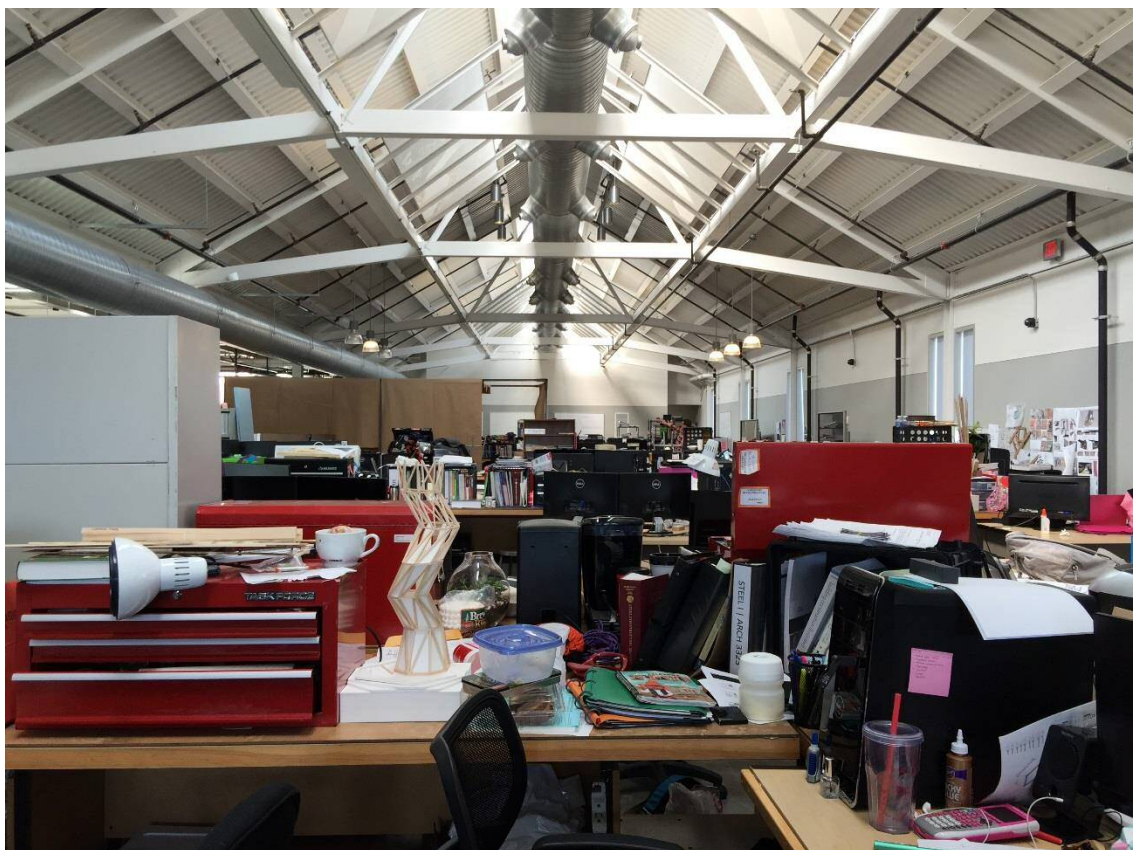
Pic 5: Third year architectural design studio work environment at Oklahoma State University, the United States of America (photograph taken by author on the 7th of March 2015)

8.4 Architectural Design Coursework in First Year B. Arch Program at OSU

The architectural design (6 credits) and theory (5 credits) coursework are offered as professional studies in the fall and spring semester of the first year program covering 36% of the overall 31 credits. The other general studies coursework offered includes freshman composition, general physics, calculus, American government, and general education electives that cover 64% of the total credits offered as per Figure 21. The first phase of architectural education at OSU is known as 'lower division' and is part of the

sequence of educational experiences termed as 'finding out', that extends to the second year (CEAT et al., 2010).

8.4.1 Summarized Discussion: First Year Categories of Learning Approaches at OSU

The data collected from first year OSU students suggests *product* as well as *process-focused strategic* approaches that are dependent on faculty instructions in architectural design. There is evidence that the design coursework has been balanced between the beauty and aesthetics domain as well as skills and craft-based domain with the focus on the design project (Approach OSU1A). The students are strategically undertaking the design project based on the instructions of the faculty by focusing on the design solution through the *dependent* and product-centric Approach OSU1B. Both OSU1A and OSU1B represent the range from *surface-to-strategic* learning approaches. The *strategic* approaches to learning are signified within Approach OSU1C where the focus is on developing the process of design.

Categories identified in the 1st Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Process-Based Product-Focused Approach	Approach OSU1A	Product-Focused & Process-Based Strategy	Surface-to-Strategic
Architectural Design through Faculty Instructions & Direction as Process-based Product-Focused Approach	Approach OSU1B	Product-Focused & Process-Based Dependent - Strategy	Surface-to-Strategic
Architectural Design as Process-Focused Approach	Approach OSU1C	Process-Focused Strategy	Strategic

Table 27: Categorized Approaches to Learning in 1st Year B. Arch – OSU

Table 27 depicts the three identified categories of learning approaches from the experiences of the first year students at OSU, mapped onto meta-categories identified in the earlier pilot study (Chapter 5, Section 5.5; Table 13). As explained in the earlier Chapter 7 to ensure that the text supporting the meta-categories remain readable, the categorized evidence of quotations for this chapter can be found in Appendix VI.

These categorized approaches have focused on the design solution transitioning towards the process in architectural design using *dependent* learning strategies in the first year of the program. Approaches OSU1A and OSU1B, the *product* as well as *process-focused, dependent* categories, represent the *surface-to-strategic* range of learning approaches parallel to Approaches A and B in the pilot study (Chapter 5, Table 13) (Iyer & Roberts, 2014). These categorized approaches are further amalgamated into Approach OSU1C, the *process-focused* category and its connection to Approaches C and D, the product and process-focused, dependent strategies leading to independent learning categories in the pilot study (Chapter 5, Table 13) (Iyer & Roberts, 2014). The

first year classification is further connected to the three identified approaches of 'memorizing and rehearsing' and 'experimenting techniques and procedures' from the earlier fashion design studies (Chapter 5, Table 17) (Bailey, 2002; Drew et al., 2001).

8.4.2 Approach OSU1A: Product Focused & Process Based Strategic Category

Approach OSU1A, one of the two dominant themes in the first year has its basis in the process of design by focusing on the final design solution. This category has emphasized on acquiring the skills and techniques required in architectural design. The design process is based on 'the nature and sequences of the spatial experiences,' 'finding or exploring a system,' and 'collaboration towards actual application.' These experiences have reverted to product-focused expressions including 'building,' 'constructing,' and 'creating' in addition to the visual and aesthetic domains including 'being attractive,' 'looking good' and a focus on 'the making' and 'finishing' the design solution. There is further reinforcement on this sub-theme with the focus on skills and craft-based domains depicting its importance in architectural design (Chapter 3, Section 3.5). These sub-themes represent further connections to Schon's expression of 'learning by doing' and the importance given to skills and techniques captured through the discussions between students and design faculty (Chapter 3, Figure 13) (Schon, 1983, 1987).

8.4.3 Approach OSU1B: Product-Focused & Process-Based, Dependent Strategic Category

Approach OSU1B, the other dominant theme in the faculty's role in architectural design, is represented by three sub-themes, including the emphasis given to the design process, but also focusing on the completion of the final solution. The students have further reflected on using the faculty's instructions and directions as learning strategies in understanding the process of design. The directional quality, including expressions like 'to be presented,' 'to be given' and 'to get a feedback', depict the instructional nature of the faculty.

Approach OSU1B has represented the role played by the design faculty in the studio elaborated in Chapter 3, Section 3.7 as well as Schon's description of the students and faculty-based discussions in Chapter 3, Figure 13 (Schon, 1983, 1987). In addition Approach SJJ1D, the dependent and strategic category from the first year of Sir JJ classification (Chapter 7, Sub-section 7.4.4) and Approach B, the product-based multidirectional category from the pilot study (Chapter 5, Table 13) (Iyer & Roberts, 2014) represent variations of the faculty's role in the design coursework.

8.4.4 Approach OSU1C: Process- Focused Strategic Category

Approach OSU1C, a less-dominant but much discussed theme, has focused on the process of design. The nature of architectural design, where the focus of the pedagogy in first year OSU is based on the introduction of design fundamentals in addition to inculcation of skills and technical requirements, plays an important role in this identified category. The students' expressions including 'to conceptualize,' 'to absorb,' 'to approach,' 'a different perspective,' 'to develop,' 'to extrapolate …design technique… design theory,' 'prior experience,' 'architecture and limitations' and 'human standpoint as well as logical standpoint' are reflections of this transformation in their learning experiences from the product-focused outlook towards understanding the process of design.

8.5 Architectural Design Coursework in Second Year B. Arch Program at OSU

The architectural design (12 credits) and theory (3 credits) coursework are offered as professional studies in the second year program cover 50% of the overall 30 credits. The other general studies coursework offered includes statistics and education-based electives that cover the rest of the 50% of the total credits as per Figure 21. The second year at OSU is based on the continuation of the first phase known as 'lower division' and is part of the sequence of educational experiences termed as 'finding out' (CEAT et al., 2010).

8.5.1 Summarized Discussion: Second Year Students' Learning Approaches at OSU

The collected data suggests that the second year students have focused on the product as well as process through *dependent* and *independent strategic* categories in the design coursework. They have been focusing on the completion of the design solution through *process-based* learning strategies that has depended on the various technical steps taken during the development of the design explained in Approach OSU2A. The students have undertaken the design project through *independent strategies* based on the faculty instructions by focusing on the process of design through *product-focused* approaches as discussed in Approach OSU2B. Approaches OSU2C and OSU2D have further represented product-centric approaches with a basis on the process of design centred on the program offered in architectural design. These identified categories have reflected *unidirectional* and *practice-based* learning approaches as well as the *collaborative, strategic* learning approaches.

Table 28 depicts the four identified categories from the second year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These second year categories are *product-focused* progressively moving towards *process-focused* approaches. The *unidirectional* emphasis on the design

program, centered on architectural practice through *independent* learning strategies, has been the highlight in the second year.

Categories identified in the 2nd Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Program-Focused, Process-Based and Product-Focused Approach	Approach OSU2A	Product-Focused & Process-Based Dependent - Strategy	Surface-to-Strategic
Architectural Design as Process-Based and Product-Focused, Instructions and Guidance of Faculty & Crit	Approach OSU2B	Product-Focused & Process-Based Independent - Strategy	Strategic
Architectural Design as Design Program and Process-Focused, Practice-Based Approach	Approach OSU2C	Process-Focused & Unidirectional - Strategy	Strategic
Architectural Design as Collaborative, Skills and Craft-Based Approach	Approach OSU2D	Product-Focused & Process-Based Strategy	Surface-to-Strategic

Table-28: Categorized Approaches to Learning in 2nd Year B. Arch – OSU

The emerging classification in the second year at OSU continues to represent Approaches A, B and C, the *product-focused, unidirectional* as well as *multidirectional, dependent* and *strategic* categories identified in the earlier pilot study (Chapter 5, Table 13). The evolving process-focused, independent, unidirectional and strategic categories of OSU2B and OSU2C are further connected to Approach D, the independent and process-focused, schema-based category from the pilot study (Iyer & Roberts, 2014).

8.5.2 Approach OSU2A: Product-Focused & Process-Based, Dependent & Strategic Category

The dominant second year theme, Approach OSU2A is represented by three sub-themes including the focus given to the design program offered in architectural design. The second sub-theme has centered on the technical requirements in the development of the final product. Whereas in the earlier sub-theme, the focus is on 'the design project and the developmental aspects around it,' the product-focused sub-theme has centered on 'the various stages of architecturally developing the solution as an architectural portfolio.' The students' focus on the process of design is in continuation to the evolving learning experiences from the first year categories including Approaches OSU1A and OSU1C, the product as well as process-focused strategic approaches. Approach OSU2A has represented the process-based, dependent strategic category centered towards solution-centric approaches.

8.5.3 Approach OSU2B: Product-Focused & Process-Based, Independent & Strategic Category

One of two less dominant themes in the second year, Approach OSU2B explains the role of the design faculty and of crit in architectural design. This category is based on independent learning strategies correlated to the earlier product-focused and process-based, dependent strategic category from the first year (Approach OSU1B). A prominent sub-theme in this identified category has focused on the design process and the technical input given by faculty. This process-focused and product-centric category includes expressions in reference 'to be given an idea,' 'to give directions on the skill-based and technical aspects of Design' and 'to explain visual and aesthetic aspects moving towards a design solution or product.' The faculty's formal instructions are considered as important steps in developing the independent learning process differentiating Approach OSU2B from the first year Approach OSU1B. A minor sub-theme in this category reverts to the product-focused strategies adopted by students since the first year.

8.5.4 Approach OSU2C: Process-Focused & Unidirectional, Strategic Category

The less dominant second theme of Approach OSU2C has focused on the process, with the emphasis on the design program offered in architectural design. The students' experiences based on this emphasis centered on the 'discussion around the design program focusing on the particular project elaborating various facets of the design,' 'stages of the design process and correlating it with architectural practice,' and 'elaborating on one architectural element/principle relevant to the design project.' There was further emphasis given to the design process through the program offered as a strategic learning approach. The design process focused on current architectural practice represented as a minor theme in this unidirectional, strategic category.

8.5.5 Approach OSU2D: Product-Focused & Process-Based Strategic Category

Approach OSU2D, a minor theme, has presented the students' collaborative learning experiences with continued emphasis on the skills and craft-based domain. Group-based learning is encouraged in architectural design. This identified category represents the product-focused directions undertaken by the students through process-based strategic approaches in architectural design.

8.6 Architectural Design Coursework in Third Year B. Arch Program at OSU

The architectural design coursework of 12 credits in the third year covers 38% of the overall 32 credits. The other professional studies coursework offered includes architectural materials, architecture and society, architectural science and computers coursework that cover 62% of the total credits as per Figure 21. The third year design coursework at OSU is the continuation of the second phase known as 'upper division'

and is part of the sequence of educational experiences termed as 'fundamental' (CEAT et al., 2010).

8.6.1 Summarized Discussion: Third Year Students' Learning Approaches at OSU

The data collected from third year students has suggested the continued focus on the product as well as process of design through *dependent-cum-independent, multidirectional* and *uncritical, strategic* approaches in architectural design. The students' focus on the transition from the analogue-to-digital domain through process-based learning strategies that are *dependent* on the completion of the design solution, is elaborated in Approach OSU3A. Approaches OSU3B and OSU3D represent the third year students' focus on the design process through *multidirectional* and *strategic* approaches of engaging with the design program offered.

Collaborative learning as *uncritical strategic* approaches through group work is encouraged in architectural design and further elaborated in Approach OSU3D. Approach OSU3C has elaborated on students' experience of the faculty instructions in undertaking the project through *independent strategies* focusing on the process of design and its relevance to current practice. These categorized approaches represent the importance given to practice-based strategies, as well as group-work and collaborative learning strategies.

Categories identified in the 3rd Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Transition from Analogue-to-Digital, Process-Based, Program-Specific and Product-Focused Approach	Approach OSU3A	Product-Focused & Process-Based Dependent - Strategy	Strategic
Architectural Design as Design Program-Specific, Process-Focused and Practice-Based Approach	Approach OSU3B	Process-Focused Multidirectional - Strategy	Strategic-to-Deep
Architectural Design as Practice& Process-Based with Transitionary Role of Faculty-Crit from Instructor and Guide to Collaborator	Approach OSU3C	Product-Focused & Process-Based Independent - Strategy	Strategic-to-Deep
Architectural Design as Collaborative Group Learning	Approach OSU3D	Product-Focused & Process-Based Uncritical - Strategy	Strategic

Table 29: Categorized Approaches to Learning in 3rd Year B. Arch – OSU

Table 29 depicts the four identified categories from the third year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These categories have focused on the design solution with group-based learning formally structured as a part of the program offered in architectural design. There is further focus given to the process of design through *multidirectional strategies* with prominence on the transition from analogue-to-digital medium in the context of

current architectural practice using uncritical learning strategies. The third year classification represents the continuing evolution from *dependent, product-focused strategies* to *independent, process-focused, multidirectional strategies*. This represents a continuing connection to Approaches C and D, the product as well as process focused, dependent and independent strategic categories identified in the earlier pilot study (Chapter 5, Table 13) (Iyer & Roberts, 2014). The third year classification is further connected to the strategic range moving towards deeper approaches in 'experimenting as well as rehearsing with techniques and procedures' identified in the fashion design studies (Bailey, 2002; Drew et al., 2001).

8.6.2 Approach OSU3A: Product-Focused & Process-Based, Dependent - Strategic Category

The dominant theme of Approach OSU3A represents the transition from the analogue-to-digital domain as well as the evolution of the design process through the development of the design solution. The first of two major sub-themes is connected to first year architectural design and its impact on the design process. The other major sub-theme is the continued focus on the design program offered. A minor sub-theme represents the connection to the product-centric nature of architectural design through the transition from the analogue-to-digital domain and its impact on the process of design. Approach OSU3A represents the continued dependence on the practice-based design pedagogy in architectural design and strategically ties into the mission and vision of the School explained in Section 8.2.

8.6.3 Approach OSU3B: Process-Focused, Multidirectional, Strategic Category

As one of the less dominant but much discussed themes, Approach OSU3B represents the continued focus on the design program offered, with the process taking prominence. This identified category depicts multidirectional and strategic approaches undertaken by students connected to the issues discussed in current architectural practice. The multidirectional approaches adopted by the third year students represents the steps being undertaken by them at various stages of the design process at specific moments which is part of their group-work-based collaborative learning process inculcated at OSU.

Approach OSU3B represents the continuation of Approach OSU2C, the process-focused and unidirectional, strategic category from the second year. This category addresses the focus on the process of design from the conceptual level to its impact on practice, further explained in the product-focused and dependent strategic category of Approach OSU3A.

8.6.4 Approach OSU3C: Product-Focused & Process-Based, Independent Strategic Category

The other less dominant theme of Approach OSU3C represents the transition in the role of faculty and of crit, from the mode of giving instructions and guidance to being the design collaborator. This identified category is in continuation of Approach OSU2B, the product-focused and process-based, independent strategic category from the second year. This collaborative role focuses on the professional relationship in current practice and is replicated within third year architectural design. This transformational relationship with the faculty represents the development of independent learning approaches amongst the students' cohort as they transition into the fourth and fifth year of the program.

8.6.5 Approach OSU3D: Product-Focused & Process-Based, Uncritical Strategic Category

The minor theme of Approach OSU3D represents the continued focus on the program offered in third year architectural design where students are required to work in groups. This identified category is considered as a continuation of Approach OSU2D, the product-focused and process-based strategic category from the second year. This requirement within the design studio represents the starting point for inculcating collaborative group learning amongst students through uncritical strategic approaches. The focus in this categorized approach is on the process of design moving towards the final solution with current architecture practice representing the backdrop in the design coursework.

8.7 Architectural Design Coursework in Fourth Year B. Arch Program at OSU

The architectural design and comprehensive design coursework of 12 credits in the fourth year cover 40% of the overall 30 credits. The other professional studies coursework offered includes architectural materials, architectural project management, architectural science, seminar and controlled electives that cover 60% of the total credits as per Figure 21. The fourth year design coursework is based on the third and final phase known as 'professional school' and is part of the sequence of educational experiences termed as 'development / specialization' that includes the fifth year (CEAT et al., 2010).

8.7.1 Summarized Discussion: Fourth Year Students' Learning Approaches at OSU

The collected data amongst fourth year students have evolved into *independent* and *multidirectional, critical* and *schema-based* learning approaches representing these categories as the differentiator in fourth year architectural design. These identified categories have continued their focus on the *product* as well as *process* of design using *strategic* approaches from the third year. Approaches OSU4A, OSU4B and OSU4C are

focusing on the transition from the *product* to *process-based* learning strategies in completing the design solution, and on the importance given to practice.

Approach OSU4D presents the design process through *independent, schema-based* approaches reinforcing the importance given to the transitionary role of the analogue-to-digital domain. Approach OSU4E represents the transformational role of faculty as collaborators in the *independent learning* approaches undertaken by students in the design process and its relevance to current practice.

Categories identified in the 4th Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Process-Focused, Design Program and Practice-Focused Approach	Approach OSU4A	Process-Focused Critical - Schema	Strategic-to-Deep
Architectural Design as Product-Focused, Design Program and Process-Based Approach	Approach OSU4B	Product-Focused & Process-Based Independent - Strategy	Strategic
Architectural Design Process as Transition from Abstract- to-Technical	Approach OSU4C	Product-Focused & Process-Based Multidirectional - Strategy	Strategic
Architectural Design Process as Transition from Analogue-to-Digital	Approach OSU4D	Process-Focused Independent - Schema	Strategic
Faculty as Collaborator through Crit in Architectural Design	Approach OSU4E	Process-Focused Independent - Schema	Strategic-to-Deep

Table 30: Categorized Approaches to Learning in 4th Year B. Arch – OSU

Table 30 depicts the five identified categories from the experiences of fourth year students at OSU, mapped onto meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These identified categories reflect the design process-centric nature of the learning experiences connected to current practice through the design program offered. Prominence is given to the design solution reflected in the *multidirectional* and *independent* transition of the design process from abstraction to its technical detail. Architectural design is being understood through critical and *schema-based, strategized* approaches representing the transition from the analogue-to-digital domain from the perspective of the design solution.

The fourth year classification represents the connection to Approaches D and E based on *independent* and *process-focused strategies* and on students' *practical-cum-schema-based* approaches from the earlier pilot study in Table 13 (Iyer & Roberts, 2014). Approaches OSU4C, OSU4D and OSU4E further illustrate the strategic-to-deep range of the learning approaches on 'experimenting techniques and procedures' to

'relating fashion to own life world' from the fashion design studies (Chapter 5, Table 17) (Bailey, 2002; Drew et al., 2001).

8.7.2 Approach OSU4A: Process-Focused, Critical Schema-Based Category

One of the three dominant themes in the fourth year, the process-focused category of Approach OSU4A is centered on the design program offered and its connection to architectural practice. This identified category represents the continuation from Approaches OSU3B and OSU2C, the process-focused, multi as well as unidirectional strategic categories from the third and second year. The design program is undertaken as a part of the process through the practical-utility and technical domains of architectural design as schema-based approaches.

8.7.3 Approach OSU4B: Product-Focused & Process-Based, Independent Strategic Category

The other dominant theme of Approach OSU4B represents the continued connection with Approach OSU4A, the process-focused, critical and schema-based category that is centred on the process of design through the program offered in the backdrop of architectural practice. This category presents the solution-driven experiences focusing on the final product. Approach OSU4B has emphasized the final design solution through independent and strategic approaches.

8.7.4 Approach OSU4C: Product-Focused & Process-Based, Multidirectional Strategic Category

Approach OSU4C as another dominant theme represents the product-centric process of design through the connection between technical and abstract domains in architectural design. This identified category is connected to the earlier categorized Approach OSU4B as well as Approach OSU3A, the product-focused and process-based, dependent and strategic category from the third year. Approach OSU4C represents the multidirectional and strategic approaches undertaken by the students towards producing technically completed design solutions. An important sub-theme discussed is the relevance of first year architectural design in the fourth year.

8.7.5 Approach OSU4D: Process-Focused, Independent Schema-Based Category

Approach OSU4D as the minor theme has explained the importance given to the analogue process in design and its transition towards the digital domain which is an underlying requirement in architectural practice. This identified category has a connection with the dependent Approach OSU3A, the product-focused and process-based, strategic category from the third year. Approach OSU4D is a feature of the solution-centric, schema-based, independent learning experiences undertaken by the fourth year students.

8.7.6 Approach OSU4E: Process-Focused, Independent Schema-Based Category

The minor and less discussed category of Approach OSU4E represents the evolving role of faculty from an instruction-based perspective to a collaborator in the development of independent and schema-based, process-focused strategic approaches in architectural design.

8.8 Architectural Design Coursework in Fifth Year B. Arch Program at OSU

The architectural design coursework of 7 credits is offered in the fall semester of the fifth year program covering 22% of the overall 31 credits. The other professional studies coursework offered in the fall and spring semester includes management of architectural practice and a series of theory and controlled electives that cover 78% of the total credits offered as per Figure 21. The fifth year design coursework is also based on this final phase known as 'professional school' which is a continuation from the fourth year and is part of the sequence of educational experiences termed as 'development/specialization' (CEAT et al., 2010).

8.8.1 Summarized Discussion: Fifth Year Students' Learning Approaches at OSU

The data collected in the fifth year represents the continuation of the product as well as process-focused learning approaches from the third and fourth year. These *independent* and *multidirectional, critical* as well as *schema-based* learning categories are the differentiator between previous years and the fourth and fifth year at OSU. Approaches OSU5A, OSU5B and OSU5C represent the continued focus on architectural practice, the transition from the conceptual-to-technical domains in design and the collaborative role played by faculty as the direct connection with the client. The students' experiences are based on the pedagogical requirements in the third and fifth year design coursework at OSU focusing on *collaborative* and *peer-based learning* approaches represented by Approach OSU5D.

Categories identified in the 5th Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Process-Focused, Design Program and Practice-Focused Approach	Approach OSU5A	Process-Focused Critical - Schema	Strategic-to-Deep
Architectural Design Process as Transition from Conceptual-to-Technical and Practical	Approach OSU5B	Product-Focused & Process-Based Multidirectional - Strategy	Strategic
Architectural Design Process as Professional Collaboration with Faulty and Client	Approach OSU5C	Process-Focused Independent - Schema	Strategic-to-Deep
Architectural Design Process as Peer-Based Collaborative Learning	Approach OSU5D	Process-Focused Independent - Schema	Strategic
Table 31: Categorized Approaches to Learning in 5th Year B. Arch – OSU			

Table 31 depicts the four identified categories from the fifth year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These identified categories are a continuation of the fourth year categorized approaches focusing on the design process connected to architectural practice. The prominent *multidirectional* and *design process-based strategic* approaches focusing on the abstract and technical domains of architectural design are balanced by *critical* and *schema-based* categorized approaches. The fifth year classification is a further reinforcement to Approaches D and E which are based on independent and process-focused strategies as well as practical-cum-schema-based approaches in the pilot study (Chapter 5, Table 13) (Iyer & Roberts, 2014). Approach F representing the perceptual and conceptual as well as schema-based category from the pilot study is not represented in the OSU classification of learning approaches; this reflects on the school's physical context within Stillwater in an American rural setting, as discussed in the introduction to the current chapter.

8.8.2 Approach OSU5A: Process-Focused, Critical Schema-Based Category

The dominant fifth year category of Approach OSU5A represents the continuation of Approach OSU4A, the process-focused, critical and schema-based fourth year category. Approaches OSU3B and OSU2C, the process-focused, multidirectional and unidirectional strategic categories from the third and second year are represented as further connections to the four years of architectural design. The design program offered, with an emphasis on current practice, is the reinforcing factor in this process-focused, critical and schema-based category.

8.8.3 Approach OSU5B: Product-Focused & Process-Based, Multidirectional Strategic Category

The less dominant theme of Approach OSU5B represents the focus given to the design process as multidirectional design strategies. This identified category connects the aesthetic and abstract domains to the technical domain in architectural design as product-centric workable solutions. Approach OSU5B represents the continuation of OSU4C and OSU3A, the product-focused and process-based, multidirectional and dependent, strategic categories from the fourth and third year. This identified category has presented the transition in the process leading to the design solution.

8.8.4 Approach OSU5C: Process-Focused, Independent Schema-Based Category

The minor but important theme of Approach OSU5C represents the collaboration established by the students with the design faculty and the client in the current architectural practice. This categorized approach is a continuation of Approach OSU4E, the process-focused, independent schema-based category from the fourth year. This category represents the evolving role of the faculty and the independent learning

approaches undertaken by students' through schema-based approaches. Approach OSU5C further presents the pedagogical direction taken in architectural design at OSU.

8.8.5 Approach OSU5D: Process-Focused, Independent Schema-Based Category

The other minor theme of Approach OSU5D represents the focus given to collaborative learning among the student cohort through peer-based learning approaches. This category represents a continuation from Approach OSU3E, the product-focused and process-based, uncritical strategic category from the third year. Architectural design at OSU has inculcated peer-based learning through an array of group-based projects from the third year to the fifth year. The students' experiences based on the requirements of the academic curriculum represent the transformation to collaborative and independent, schema-based learning approaches.

8.9 Outcome Space: Classification of Approaches to Learning at School of Architecture, Oklahoma State University

The outcome space for the five year learning approaches classification in architectural design at OSU is depicted in Figure 22. The Structural and Referential facets of the outcome space are based on Chapter 6, Section 6.11; Figure 17. The categories of learning approaches for OSU are depicted as meta-categories in Tables 27, 28, 29, 30 and 31, identified using phenomenographic analysis explained in Appendix V.

The categories depicted in Figure 22 represents the overall pedagogy of the five year design coursework at OSU based on the overall summation of meta-categories in Table 32. These identified categories have evolved from product-focused and process-based, dependent learning strategies in the first year, to product and process-focused, unidirectional and independent learning strategies in the second year. These learning approaches are further evolving to multidirectional and independent, uncritical strategies in the third year, leading to independent, critical and schema-based strategies in the fourth as well as fifth year of the program. The three phases of the architectural curriculum at OSU has focused on the design coursework and the program offered through current architectural practice centered on group-based collaborative learning.

The focus on the process of design and development of the building within the context of current practice has been central to the brief provided. Whereas the first year learning categories have focused on the academic as well as aesthetic domains, the second to fifth year have represented the transition within the craft-based and technological domains focusing on the underlying intent of producing technical, functional and constructional design solution relevant to current practice. The sociological domain, reflecting the utility and identity of architectural design, is seldom explored.

The question of why the outcome space at OSU (Figure 22) has developed as well as the influence of the curriculum and design pedagogy is explained through illustrative accounts of the approaches of learning undertaken by nine architecture students in Chapter 11. These classified meta-categories at OSU have been further reflected as summarized architectural experiences of students in Chapter 12, Section 12.4.
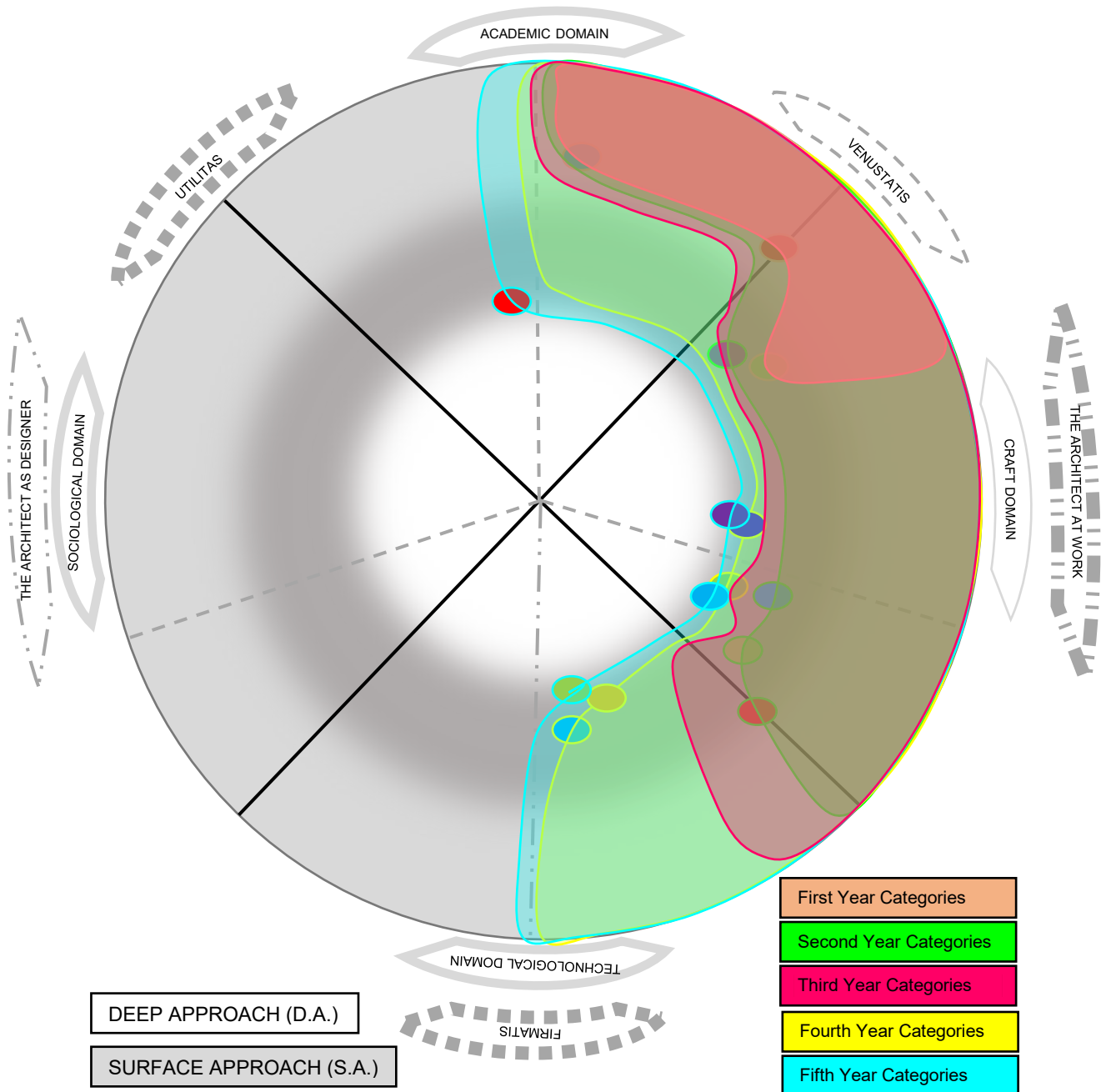
Figure 22: Outcome Space for Classification of Approaches to Learning in the B. Arch Program at School of Architecture, Oklahoma State University, Stillwater, Oklahoma

Figure 23 depicts the learning approaches classification of the School of Architecture, OSU, and is further correlated with the six categorized approaches from the earlier pilot study (Chapter 5, Table 13) (Iyer & Roberts, 2014). There is further comparison with the fashion design studies (Bailey, 2002; Drew et al., 2001) and the initial

phenomenographic text-based studies at the University of Gothenburg (Marton & Säljö, 1976) on deep and surface approaches to learning.

Deep

Independent Critical Multidirectional Schema-Based Category

Independent Critical Schema-Based Strategic Category

Process-Focused Uncritical Strategic Category

Approach-F
Perceptual Conceptual & Process-Focused Schema

Approach-E
Experiential, Practical & Process-Focused Schema

Approach-D
Independent & Process-Focused Schema

Relating fashion to own life world

Experimenting with techniques and procedures

Organizing and integrating content

Surface

Process-Focused Multidirectional Strategic Category

Process-Focused Unidirectional Strategic Category

Process-Focused Independent Strategic Category

Product-Focused Process-Based Dependent Strategic Category

Product-Focused & Process-Based Category

Approach-C
Dependent & Product-Focused Strategic Approach

Approach-B
Product-Based Multidirectional Approach

Approach-A
Product-Based Unidirectional Approach

Rehearsing techniques and procedures

Memorizing techniques and procedures

Memorizing content

Figure 23: Chart explaining Classification of Approaches to Learning from Text-Based Fields (Marton & Säljö, 1976), Fashion Design (Bailey, 2002; Drew et al., 2001), the Earlier Pilot Study (Iyer & Roberts, 2014) and Emerging Classification based Figure 22 Outcome Space of the Five-Year Design Coursework (First, Second, Third, Fourth, Fifth) at School of Architecture, Oklahoma State University, USA

| TEXT-BASED FIELD | FASHION-DESIGN FIELD | PILOT STUDY | FIRST YEAR | SECOND YEAR | THIRD YEAR | FOURTH YEAR | FIFTH YEAR |

Year	Approach	Category	Sub Theme Description Major to Minor	Meta-Category	Structural Facet (Domain)	Referential Facet (Approaches)
1	OSU1A	Architectural Design as Process-Based Product-Focused Approach	Process-based design strategy / Product-focused design solution / Importance to skills and techniques in architectural design	Product-Focused & Process-Based Strategy	Aesthetic Craft-based	Surface-to-Strategic
1	OSU1B	Architectural Design through Faculty Instructions & Direction as Process-based Product-Focused Approach	Understanding the design process / Focus on completing design solution / Faculty instructions and directions as learning strategies	Product-Focused & Process-Based Dependent - Strategy	Aesthetic Academic	Surface-to-Strategic
1	OSU1C	Architectural Design as Process-Focused Approach	Understanding the process of design	Process-Focused Strategy	Craft-Based Technical	Strategic
2	OSU2A	Architectural Design as Program-Focused, Process-Based and Product-Focused Approach	Focus given to the design program / Technical requirements in developing final product / Focus on the process of design	Product-Focused & Process-Based Dependent - Strategy	Craft-Based Technical Functionality	Surface-to-Strategic
2	OSU2B	Architectural Design as Process-Based and Product-Focused, Instructions and Guidance of Faculty & Crit	Design process and faculty's technical input / Independent learning process / Product-focused strategy	Product-Focused & Process-Based Independent - Strategy	Aesthetic Craft-Based Technical Functionality	Strategic
2	OSU2C	Architectural Design as Design Program and Process-Focused, Practice-Based Approach	Emphasis on design process through design program offered / Design Process focused on architectural practice	Process-Focused & Unidirectional - Strategy	Craft-Based Technical Functionality	Strategic
2	OSU2D	Architectural Design as Collaborative, Skills and Craft-Based Approach	Product-focused collaborative learning / Process-based group work	Product-Focused & Process-Based Strategy	Aesthetic Craft-Based Technical	Surface-to-Strategic
3	OSU3A	Architectural Design as Transition from Analogue-to-Digital, Process-Based, Program-Specific and Product-Focused Approach	Impact of first year architectural design on the design process / Focus on the design program and practice-based design pedagogy / Transition from analogue-to-digital domain	Product-Focused & Process-Based Dependent - Strategy	Craft-Based Technical Functionality	Strategic
3	OSU3B	Architectural Design as Design Program-Specific, Process-Focused and Practice-Based Approach	Design process from conceptual level to its impact on practice	Process-Focused Multidirectional - Strategy	Craft-Based Technical Functionality Technological	Strategic-to-Deep
3	OSU3C	Architectural Design as Practice & Process-Based with Transitionary Role of Faculty-Crit from Instructor and Guide to Collaborator	Faculty and crit as design collaborator	Product-Focused & Process-Based Independent - Strategy	Craft-Based Technical Functionality Technological	Strategic-to-Deep
3	OSU3D	Architectural Design as Collaborative Group Learning	Group-work requirement - starting point - inculcating collaborative group learning	Product-Focused & Process-Based Uncritical - Strategy	Craft-Based Technical	Strategic
4	OSU4A	Architectural Design as Process-Focused, Design Program and Practice-Focused Approach	Design process through program offered connected to architectural practice	Process-Focused Critical - Schema	Practical - Utility Technical	Strategic-to-Deep
4	OSU4B	Architectural Design as Product-Focused, Design Program and Process-Based Approach	Design product through program offered connected to architectural practice	Product-Focused & Process-Based Independent - Strategy	Functionality Technological The Architect at Work	Strategic
4	OSU4C	Architectural Design Process as Transition from Abstract- to-Technical	Connection of technical and abstract domains / Relevance of first year architectural design	Product-Focused & Process-Based Multidirectional - Strategy	Technical Functionality	Strategic
4	OSU4D	Architectural Design Process as Transition from Analogue-to-Digital	Analogue-to-digital domain	Process-Focused Independent - Schema	Aesthetic Craft-Based Technical	Strategic
4	OSU4E	Faculty as Collaborator through Crit in Architectural Design	Evolution from Instructor to Collaborator	Process-Focused Independent - Schema	Functionality Technological The Architect at Work	Strategic-to-Deep
5	OSU5A	Architectural Design as Process-Focused, Design Program and Practice-Focused Approach	Design process through program offered connected to architectural practice	Process-Focused Critical - Schema	Practical Utility Technical	Strategic-to-Deep
5	OSU5B	Architectural Design Process as Transition from Conceptual-to-Technical and Practical	aesthetic and abstract-to-technical domains in architectural design / Transition of Process to Design Solution	Product-Focused & Process-Based Multidirectional - Strategy	Technical Functionality	Strategic
5	OSU5C	Architectural Design Process as Professional Collaboration with Faulty and Client	Faculty as Collaborator and connection to Client	Process-Focused Independent - Schema	Functionality Technological The Architect at Work	Strategic-to-Deep
5	OSU5D	Architectural Design Process as Peer-Based Collaborative Learning	Group-based collaborative learning as art of academic requirements	Process-Focused Independent - Schema	Craft-Based Technical Functionality	Strategic

Table 32: Summation of Meta-Categories and Categorized Approaches to Learning in Architectural Design Coursework from 1st to 5th Year of B. Arch at The School of Architecture, OSU

(The colors depicting categorized approaches represent their placement in Figure 22 (Outcome space) and Figure 23 (Meta-categories) with each year depicted in specific colors. Major-to-Minor Sub-themes are depicted in Grey-scale)

Chapter 9: International Perspective: Three - School of Architecture, University of Texas in Austin, Texas, USA

School of Architecture, University of Texas at Austin (UTA), United States of America is one of the four institutions covered in the current study. Table 33 presents an overall picture of the Bachelor of Architecture programs offered at the four institutions with UTA offering a total of one hundred and sixty one credits in the five year program, and forty-seven courses.

Name of Institution	Total Credits Hours	Equivalent Coursework / Core Modules	Accreditation Body
Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ), India	340	85 Courses 5 Year Program	Council of Architecture (CoA), India
School of Architecture, Oklahoma State University (OSU), USA	154	43 Courses 5 Year Program	National Architectural Accreditation Board (NAAB), United States http://www.naab.org/
School of Architecture, University of Texas at Austin (UTA) – Austin, Texas	161	47 Courses offered in the 5 Year Program	
Welsh School of Architecture (WSA) - Cardiff, UK	600	20 Core modules 5 Year Program	Royal Institute of British Architects (RIBA) & Architects Registration Board (ARB)
Table 33: Data Collection at Four Institutions with Highlights of the Architecture Program offered at School of Architecture, University of Texas in Austin			

School of Architecture, University of Texas at Austin (UTA), Texas has inherited the rich cultural urban ambience of the North American context through the city of Austin. The five years program offered includes ten semesters. The school is located within the University of Texas at Austin campus "in four adjacent buildings: the historically significant Battle Hall (1911); Sutton Hall (1918, renovated in 1982), designed by distinguished American architect Cass Gilbert; Goldsmith Hall (1933, expanded and renovated in 1988), designed by noted architect Paul Philippe Cret, one of the primary planners of the forty-acre campus; and the West Mall Office Building (1961)" (Registrar, 2016). The Architecture and Planning Library and the Alexander Architectural Archive, located in the Battle Hall building, are the other significant features of the school.

9.1 School of Architecture, University of Texas in Austin: A North American Perspective

Professional architectural degrees have been offered at the University of Texas in Austin (UTA) since 1910. First established as a part of the Department of Engineering, the School of Architecture - UTA became an independent division in 1948 under the College of Engineering and was granted full autonomy by the university in September 1951. As a member of the Association of Collegiate Schools of Architecture and the Association

of Collegiate Schools of Planning, the undergraduate and postgraduate programs at the school of architecture are accredited by the National Architectural Accrediting Board and satisfy the registration requirements of the Texas Board of Architectural Examiners (Registrar, 2016).

Figure 24: 5 Years B. Arch Program Curriculum at School of Architecture, University of Texas at Austin, Texas, USA (Registrar, 2016)

The Bachelor of Architecture is a five-year professional degree program and has been offered since 1910. The focus of this program is "a rigorous design-oriented curriculum with a solid foundation in technology and the history and theory of architecture" (Registrar, 2016). The curriculum is structured to give a grounding to the students in architectural professional practice. The five year program has a total of 161 credit hours that includes 44 hours of design coursework, 11 hours of visual communication coursework, 21 hours of history-based coursework, 31 hours of construction - environmental controls - site design - professional practice and 54 hours of other courses in addition to electives as well as additional coursework as per the core curriculum depicted in Figure 24. This undergraduate program is structured with 32 credit hours in the first year, 31 hours in the second year, 30 hours in the third year and 34 hours each in the fourth and fifth year. The school also offers a six-year dual/twin professional degree in the Bachelor of Architecture and Bachelor of Science in Architectural Engineering with a total of 197 credits amalgamating the students' interest in both architectural and engineering facets of the built environment; in addition it offer the Bachelor of Architecture and Bachelor of Arts - Plan II Dual Degree Program with a

total of 186 credits amalgamating architectural education and liberal arts (Registrar, 2016).

9.2 Architectural Curriculum at the School of Architecture, UTA

The curriculum of the program at the School of Architecture, UTA reflects the exhaustive orientation towards the coursework of architectural design. This is coupled through a sound platform in construction technology, in addition to architectural history and theory as the focus of this program (Registrar, 2016). The central focus of the architectural curriculum pertains to the coursework of design with '*advanced design studios'* (Section 9.7) being offered in the fourth and fifth year of the program. History is also emphasized, both from a world-view perspective as well as a focus on American history including architecture and society with community and regional planning; this, represents the second major strand that is offered in parallel to the design coursework. Construction technology including coursework on environmental controls, site design and professional practice forms the third major strand of the curriculum (Registrar, 2016).

9.3 Architectural Design Learning Context at UTA

Pic 6: Students working in the fifth year architectural design studio in the historic Goldsmith Hall Building, University of Texas in Austin, (photograph taken by author, 25th Feb. 2015)

The three major strands of the curriculum—'design,' 'history' and 'construction technology' —are amalgamated in architectural design, and play an important role in the students' learning process at UTA. The mission of the School is in providing a platform

"to develop knowledge, sensitivity, and skill in design, planning, and construction" in the quest for future architects, interior design and planning consultants, towards improving the built environment for humanity.

Pic 7: First year architectural design studio in the historic Sutton Hall Building, University of Texas in Austin, (photograph taken by author 25th Feb. 2015)

Pic 8: Main Building of University of Texas in Austin, the United States of America (photograph taken by author 25th of Feb. 2015)
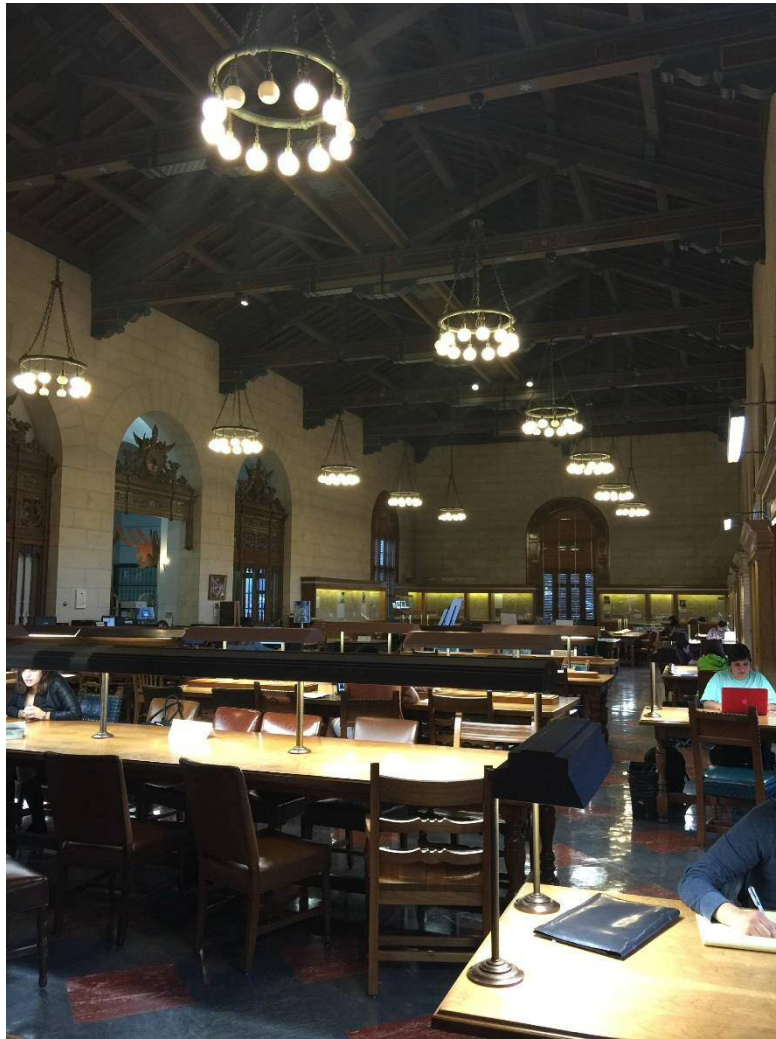
The architectural curriculum also provides a broad educational spectrum of professional courses within the field of arts and humanities. The school has pursued the enhancement of architectural knowledge and skills of the students by reinforcing their exposure to "actual and theoretical problems, necessary to link understanding to experience, theory to practice, and art to science in ways that respond to human needs, aspirations, and sensibilities" (Registrar, 2016). Architectural design is offered through a series of six design courses in the first three years followed by four advanced design courses offered in the fourth and fifth year of the program.

9.4 Architectural Design Coursework in First Year B. Arch. Program at UTA

Architectural design, visual communication and history coursework with an equivalent 18 credit hours is offered across the first and second semester of the first year program covering 56% of the overall 32 credits. Other required coursework including physical sciences, mathematics, approved electives and core curriculum courses of 14 credits are offered as per Figure 24. Architectural design offered in parallel to the Visual

Communication coursework, popularly termed as 'Viscom' by students and faculty has been the highlight of the first year program. The first year at UTA has a focus on two out of the three major strands of the architectural curriculum including design and history.

9.4.1 Summarized Discussion: First Year Students' Learning Approaches at UTA

The data collected from first year UTA students suggests *product as well as process-focused, independent strategic* approaches in the design coursework. Though the dominant Approach UTA1A represents the *product-centric* approaches adopted through *unidirectional strategies* in completing the design solution, the students have based their learning approaches on the process of design. Both UTA1B and UTA1C fall in the range of *surface-to-strategic* learning approaches centered on the coursework of Viscom conducted in parallel with architectural design. These *product-cum-process focused strategic* categories look into the role played by Viscom and faculty in developing the process of design. Approaches UTA1D and UTA1E have focused on the process of design as *independent* and *analytic* learning strategies by focusing on the project offered in architectural design and collaboration in the design studio.

Categories identified in the 1st Year	Nomenclature	Meta-categories	Position within Referential Facet in Outcome Space
Architectural Design as Series of Steps-Based Process-Based Product-Focused Approach	Approach UTA1A	Product-Focused & Process-Based Unidirectional Strategy	Surface-to-Strategic
Viscom in Architectural Design as Process & Product-Focused Approach	Approach UTA1B	Product-Focused & Process-Based Dependent - Strategy	Surface-to-Strategic
Role of Viscom & Design Faculty in the Architectural Design Process	Approach UTA1C	Product & Process-Focused Dependent-Strategy	Strategic
Architectural Design as Project-Based & Process-Focused Approach	Approach UTA1D	Process-Focused Analytic & Independent Strategy	Strategic
Design Studio as Collaborative & Process-Focused Approach	Approach UTA1E	Process-Focused Independent - Strategy	Strategic
Table 34: Categorized Approaches to Learning in 1st Year B. Arch – UTA			

Table 34 depicts the five identified categories of learning approaches from the experiences of the first year students at UTA, mapped onto meta-categories identified in the earlier pilot study (Chapter 5, Section 5.5; Table 13). As explained in Chapters 7 and 8 to ensure that the text supporting the meta-categories remains readable, the categorized evidence of quotations for this chapter can be found in Appendix VII.

These categorized approaches have evolved from *product-based, dependent* and *unidirectional strategic* categories transitioning to *process-focused, independent* and *analytic* strategies. The first year design coursework represents the *project-centric*

perspective with the students being oriented to the process of design. The first year classification of Approaches UTA1A, UTA1B and UTA1C are in parallel to Approaches A, B and C, the *unidirectional-cum-dependent, product-focused* approaches identified in the pilot study (Chapter 5, Section 5.5; Table 13) (Iyer & Roberts, 2014). The *surface-to-strategic* range of approaches from the UTA classification differ from the pilot study through the process-centric strategies that have developed within UTA1A, UTA1B and UTA1C. There is further contrast represented in the less dominant themes of Approaches UTA1D and UTA1E, the *analytic-cum-independent, process-focused* learning strategies. These categories are connected to the *strategic* range of Approaches D and E, the independent, experiential and practical, process-focused categories in the pilot study (Chapter 5, Section 5.5; Table 13) (Iyer & Roberts, 2014).

9.4.2 Approach UTA1A: Product-Focused & Process-Based Unidirectional Strategic Category

Approach UTA1A as the dominant theme is based on the process of design with the focus on the final design solution. Emphasis is given to the steps taken as *unidirectional strategic* approaches in this product-focused category. Though the focus is on arriving at the design solution, the students undertake these steps by understanding the underlying process of design. Expressions of taking certain steps including 'to build,' 'to draw,' 'to develop' or 'to work' is focused on the completion of the design solution. The underlying process of communicating design is discussed through terms specific to the technical domain in architectural design includes 'various ways of approaching architectural drawings,' as well as the process of design through expressions such as 'stereotomic,' 'tectonic,' 'abstraction,' 'subtraction,' and 'dissection.'

9.4.3 Approach UTA1B: Product-Focused & Process-Based Dependent − Strategic Category

Approach UTA1B elaborates on the role played by the visual communication coursework, popularly known as *'Viscom',* which is offered in parallel with architectural design in the first year at UTA and was one of the three less-dominant themes of discussion. There was a consensus amongst students on a balanced emphasis given to both the design process with a dependence on strategically completion of the design solution. This identified category underlines the balance of process and product where Viscom has played an important role in propagating the students' focus towards the underlying process of design. Whereas the product-focused expressions were centered on 'the technicalities of developing two-dimensional and three-dimensional aspects of architecture,' the process-based expressions included 'bridging the process' or 'transitioning into Design' and the dialogue between 'analogue-vs-digital.'

9.4.4 Approach UTA1C: Product & Process-Focused Dependent-Strategic Category

Another less-dominant theme of Approach UTA1C has presented the importance of the first year Viscom coursework running in parallel with architectural design. The importance of Viscom is also discussed through Approach UTA1B as well as the dominant first year category, Approach UTA1A. A major sub-theme is the faculty's role in both these coursework aspects reinforcing their interconnection as dependent and strategic learning approaches. Expressions including 'we are taught to think in a specific way' and 'what they have been … and showing us, and re-sculpting our minds to think things differently' have focused on the design process as well as the product, dependent on the faculty instructions as strategies for learning architectural design.

9.4.5 Approach UTA1D: Process-Focused Analytic & Independent Strategic Category

The third less-dominant theme of Approach UTA1D has focused on the process of design through the project offered in architectural design. The students' focus throughout the design project has permeated through *analytic* expressions including 'the cultural facets of the urbanity of ….(the city).. and its connection to Architecture' leading to independent learning strategies. This categorized approach has further reinforced the advance in the process of design in the first year cohort. Approach UTA1D represents the learning curve achieved through the focus on 'the various stages of the design process' to 'its interconnection with the given design project' and permeating further to the 'social and cultural aspects embedded within the process of design.'

9.4.6 Approach UTA1E: Process-Focused Independent – Strategic Category

The minor theme of Approach UTA1E has emerged through the collaborative nature of the design coursework at UTA and the continued emphasis on the process of design. Students have expressed this collaborative process as 'excellent culture' and 'friendly atmosphere' and the 'development of technical, drafting and drawing skills,' as well as 'the huge learning curve' attained in the first year. This identified category represents the importance given to collaborative learning as independent strategies that go beyond attaining new skills towards peer-based learning and self-introspection.

9.5 Architectural Design Coursework in Second Year B. Arch. Program at UTA

Architectural design and Viscom for 10 credit hours, with construction-based and history coursework for 14 credit hours is offered in the second year covering 78% of the overall 31 credits. Other required coursework including physical sciences and core curriculum courses of 7 credits are offered as per Figure 24. Architectural design is amalgamated with the two other important strands of the curriculum including construction and history, representing the thrust for the second year at UTA.

9.5.1 Summarized Discussion: Second Year Students' Learning Approaches at UTA

The collected data suggests that the second year students have focused both on the *product* as well as the *process of design* through *analytic* and *independent learning strategies*. These *multidirectional* and *schema-based* approaches have focused on the aesthetics as well as craft-based domains of the design project using the *strategic-to-deeper* range of learning approaches. Approaches UTA2B, UTA2C, UTA2D and UTA2F have focused on the academic and aesthetic domains as well as the craft-based and technical domains of architectural design in the strategic range of learning approaches. This has included the transition from the analogue-to-digital domain with a key focus on the Viscom coursework, the faculty's role in inculcating *process-based* approaches as well as the emergence of studio culture. Approaches UTA2A and UTA2E represent the *strategic-to-deeper* range by looking into the development of *schema* and understanding the *experiential* approaches of learning architectural design.

Categories identified in the 2nd Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Project & Process-Focused Approach	Approach UTA2A	Process-Focused Analytic & Independent Schema	Strategic-to-Deep
Viscom in Architectural Design as Process & Product-Focused Analogue-to-Digital Approach	Approach UTA2B	Product & Process-Focused Independent - Strategy	Strategic
Architectural Design as Series of Steps-Based Process & Product-Focused Approach	Approach UTA2C	Product & Process-Focused Multidirectional Strategy	Strategic
Role of Design Faculty in Architectural Design as Process & Product-Focused Approach	Approach UTA2D	Product & Process-Focused Independent-Strategy	Strategic
Architectural Design as Process-Focused Experiential Approach	Approach UTA2E	Process-Focused Analytic & Independent Multidirectional Schema	Strategic-to-Deep
Studio Culture as Part of Architectural Design Process-Focused Approach	Approach UTA2F	Process-Focused Independent & Analytic Strategy	Strategic

Table 35: Categorized Approaches to Learning in 2nd Year B. Arch –UTA

Table 35 depicts the six identified categories from the second year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13) (Iyer & Roberts, 2014). These second year categories present the development of *process-focused, independent, analytic* and *multidirectional strategies* with emphasis on the design project offered. The learning approaches classification have presented the transformation with marked similarity to Approaches D, E and F from the pilot study of process-focused strategies developing into independent and analytic, schema-based approaches (Chapter 5, Table 13) (Iyer & Roberts, 2014).

9.5.2 Approach UTA2A: Process-Focused, Analytic & Independent Schema-Based Category

One of the two dominant themes, Approach UTA2A has focused on the process of design and its advancement within the project offered in architectural design through independent analysis as schema-based approaches. Two major sub-themes includes the focus being centered on the design project offered and the continued emphasis on process-centric analytic approaches. The second year students have focused on the design process through independent learning approaches based on these process-centric as well as project-focused schemas.

9.5.3 Approach UTA2B: Product & Process-Focused, Independent & Strategic Category

Approach UTA2B, the other dominant theme has discussed the role of visual communication coursework in architectural design. Popularly known as Viscom in UTA and offered in the second year by focusing on the transition from the analogue-to-digital domain, this independent strategy is a major sub-theme. This identified category in parallel to Approach UTA2A represents the centrality of process-focused approaches traversed in second year architectural design. The strategic balance of product-focused aspects of design in correlation with the design process are two other sub-themes.

9.5.4 Approach UTA2C: Product & Process-Focused, Multidirectional Strategic Category

The less-dominant but much discussed theme of Approach UTA2C represents the steps undertaken towards the final design solution. Two sub-themes that have emerged reflect the second year pedagogy of focusing on the process of design as *multidirectional* and *strategic* approaches to undertake the final product. The underlying design process has focused on the transition from the analogue-to-digital domain presented in Approach UTA2B.

9.5.5 Approach UTA2D: Product & Process-Focused Independent, Strategic Category

Approach UTA2D as the other less-dominant theme is the continuing discussion on the faculty's role in the design process undertaken towards the final solution. This identified category represents the impact on the design process as well as the product-centric aspects being reinforced by the faculty as independent strategic approaches. This category in parallel to Approaches UTA2A, UTA2B and UTA2C represents the process-focused strategies traversed within architectural design, based on the project offered, with a continued emphasis on the final solution.

9.5.6 Approach UTA2E: Process-Focused, Analytic & Independent, Multidirectional Schema-Based Strategic Category

One of the two minor themes, Approach UTA2E discusses the process of design being elevated through analytic as well as independent strategies towards experiential

learning in architectural design. These multidirectional strategies have been explored through schema-based approaches going beyond the requirements of the design project offered.

9.5.7 Approach UTA2F: Process-Focused, Independent & Analytic Strategic Category

The other minor theme of Approach UTA2F presents the importance of studio culture in inculcating process-focused, independent and analytic strategies amongst the students' cohort. This minor category has also portrayed the importance of collaborative learning in the design studio at UTA.

9.6 Architectural Design Coursework in Third Year B. Arch. Program at UTA

Architectural design for 10 credit hours, with construction-based and history coursework for 17 credit hours is offered in the third year covering 90% of the overall 30 credits. Additional coursework from the core curriculum for 3 credits is also offered as per Figure 24. The design coursework termed as "sound building' studio" (i.e one which addresses the requirements of buildings that are sound —their programmatic, spatial, and tectonic resolution and their relationships to the physical and social context of the site, all taught in a studio format) is further reinforced through construction-based coursework in addition to history, continuing the thrust of the undergraduate architecture program into the third year at UTA (Registrar, 2016).

9.6.1 Summarized Discussion: Third Year Students' Learning Approaches at UTA

The data collected from the third year students suggests the continued focus on the process of design through the program offered in the *sound-building studio*. Approaches UTA3B, UTA3C and UTA3F explore the role played by the first and second year Viscom coursework discussing the transition from analogue-to-digital domain, the *theoretical* aspects covered in various stages of design as well as the collaborative learning process as *independent, multidirectional* and *strategic* learning approaches. Approaches UTA3A, UTA3D and UTA3E represent the *strategic-to-deeper* range of learning approaches by focusing on the schema-based process of design developed for the program offered, the faculty's role in inculcating *theoretical* as well as *pragmatic* approaches, and continuing the process of understanding the *experiential* facets of architectural design.

Table 36 depicts the six identified categories of learning approaches from third year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13) (Iyer & Roberts, 2014). These identified categories represent *process-focused, independent and analytic, theoretical and pragmatic, experiential and multidirectional, schema-based* approaches and learning strategies. The third year classification of *strategic-to-deeper* range of learning approaches represents the parallel

to Approaches D, E and F, the *independent and analytic, process-focused strategies* as well as *theoretical and pragmatic, multidirectional and schema-based* categories identified in the earlier pilot study (Chapter 5, Section 5.5; Table 13) (Iyer & Roberts,

Categories identified in the 3rd Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Program & Process-Focused Approach	Approach UTA3A	Process-Focused Analytic & Independent Schema	Strategic-to-Deep
Viscom in Architectural Design as Process-Focused Analogue-to-Digital Approach	Approach UTA3B	Process-Focused Independent - Strategy	Strategic
Architectural Design as Stages of Process & Program-Focused Approach	Approach UTA3C	Process-Focused Multidirectional & Theoretical Independent-Strategy	Strategic
Role of Design Faculty in Architectural Design as Process-Focused Approach	Approach UTA3D	Process-Focused Theoretical & Pragmatic Independent-Schema	Strategic-to-Deep
Architectural Design as Process-Focused Experiential Approach	Approach UTA3E	Process-Focused Analytic & Independent Experiential Schema	Strategic-to-Deep
Architectural Design Studio as Collaborative Learning Approach	Approach UTA3F	Process-Focused Independent & Analytic Strategy	Strategic

Table 36: Categorized Approaches to Learning in 3rd Year B. Arch – UTA

2014). The third year UTA classification is further differentiated from the *strategic-to-deeper* range of learning approaches within the pilot study as Approaches D, E and F are predominantly adopted by only a small cohort of fourth year students.

9.6.2 Approach UTA3A: Process-Focused, Analytic & Independent Schema-Based Category

The dominant theme of Approach UTA3A has looked at the focus given to the process surrounding the design program offered in the sound building studio. The advancement in the design process as analytic and independent, schema-based approaches is reflected by the strong emphasis on construction and technology in the second and third year of the architecture program. This categorized approach represents the transition to reflective learning and independence in the steps taken towards the advancement of the design process. The transition in the three sub-themes of focusing on the design process and the design program with an advancement towards analytic as well as independent learning and schema-based approaches are represented in Approach UTA3A.

9.6.3 Approach UTA3B: Process-Focused, Independent Strategic Category

Approach UTA3B, the first of four less-dominant themes is the continued discussion on the important role of the first and second year Viscom coursework. This identified category has focused on the process of design undertaken through independent learning strategies. The transition from analogue-to-the digital domain in the design studio as an important aspect of the design process is the core sub-theme of discussion.

9.6.4 Approach UTA3C: Process-Focused, Multidirectional & Theoretical, Independent-Strategic Category

Approach UTA3C, the other less-dominant theme has focused on the various stages undertaken by the students in the program offered, based on the underlying development of the design process as multidirectional as well as theoretical strategies. These independent learning strategies represent the continued focus given to the process of design within the framework of the program offered in the sound building studio.

9.6.5 Approach UTA3D: Process-Focused, Theoretical & Pragmatic, Independent Schema-Based Category

Approach UTA3D, the third of the four less-dominant themes has looked into the continuing and evolving role of the faculty. This identified category has mapped the transition of the student's focus on the process of design through independent ways of approaching architectural design from theoretical and pragmatic as well as schema-based learning approaches.

9.6.6 Approach UTA3E: Process-Focused, Analytic & Independent, Experiential Schema-Based Category

Approach UTA3E, the fourth less-dominant theme represents the process of design being transcended analytically and independently through experiential facets of understanding architectural design. This identified category represents the transformational nature of exploring the design process as reflective learning amongst the students' cohort.

9.6.7 Approach UTA3F: Process-Focused, Independent & Analytic Strategic Category

The minor theme of Approach UTA3F signifies the continued development of studio culture through collaborative learning including peer-based discussions as independent and analytic, strategic learning approaches amongst the students' cohort.

9.7 Architectural Design Coursework in Fourth Year B. Arch. Program at UTA

Architectural design as "Advanced Design" studio and technical communication coursework for 13 credit hours, with construction-based and history coursework for 9 credit hours is offered in the fourth year covering 62% of the overall 34 credits. Additional coursework from the core curriculum and electives for 12 credits is also offered as per Figure 24. The design coursework termed as *"Advanced Design"* (comprehensive studio to develop the student's ability to combine the elements of a thorough building design) is the vertical studio offered across the fourth and fifth year of the undergraduate program at UTA (Registrar, 2016).

9.7.1 Summarized Discussion: Fourth Year Students' Learning Approaches at UTA

The collected data from the fourth year students suggests the importance given to the design process through *strategic* and *schema-based* approaches in the advance design studio. Approaches UTA4A, UTA4C, UTA4D, UTA4E and UTA4F represent the *strategic-to-deeper* range of learning in architectural design. The focus on the program offered in the advanced design studio is centred on the process of design from *holistic* and *idealistic, experiential* and *schema-based* approaches following the known themes

Categories identified in the 4th Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Program & Process-Focused Approach	Approach UTA4A	Process-Focused Holistic & Idealistic Independent Schema	Strategic-to-Deep
Architectural Design as Stages of Program & Process-Focused Approach	Approach UTA4B	Process-Focused Multidirectional & Intellectual Independent-Schema	Strategic
Viscom in Architectural Design as Process-Focused Analogue-to-Digital Approach	Approach UTA4C	Process-Focused Analytic & Independent - Strategy	Strategic-to-Deep
Architectural Design Studio as Collaborative Learning Approach	Approach UTA4D	Process-Focused Independent & Analytic Schema	Strategic-to-Deep
Architectural Design as Process-Focused Experiential & Conceptual Approach	Approach UTA4E	Process-Focused Holistic & Independent Experiential Schema	Strategic-to-Deep
Integral Role of Design Faculty's Studio in Architectural Design as Process-Focused Approach	Approach UTA4F	Process-Focused Holistic & Independent Perceptual Schema	Strategic-to-Deep
Identifying with Design Process of Architectural Design Studio at UTA	Approach UTA4G	Process-Focused Independent & Analytic Strategy	Strategic

Table 37: Categorized Approaches to Learning in 4th Year B. Arch – UTA

including the role of Viscom, collaborative learning and importance of design faculty. The strategic range of Approaches UTA4A and UTA4G have focused on various stages in the process of design based on the program offered, as well as identifying the design process as an integral part of the studio culture at UTA.

Table 37 depicts the seven identified categories from the fourth year students' learning experiences as meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These identified categories focus on the design program offered in the advanced design studio through *process-focused, independent* and *holistic, analytic* and *intellectual, perceptual* and *experiential, multidirectional, schema-based* approaches and *strategies* representing the *strategic-to-deeper* range of approaches. The fourth year classification has its starting point represented by Approach F identified in the pilot study centered on process-focused, perceptual-cum-conceptual, schema-based approaches (Iyer & Roberts, 2014). The fourth year UTA *strategic-to-deeper* range signifies a wider spectrum in comparison to the range identified in the earlier pilot study and depicted in Figure 26.

9.7.2 Approach UTA4A: Process-Focused, Holistic & Idealistic, Independent Schema-Based Category

Approach UTA4A, the most discussed theme, centres on the design program offered in the advance design studio through holistic and idealistic approaches. The continued focus on the design process through the program offered varies from conceptual-to-perceptual-to-experiential approaches depending on the emphasis of the particular studio for which students opt in the fourth and fifth year. The nature of these advanced design studios with renewed focus on the design process as independent and schema-based approaches is represented in this identified category. The range of the programs offered in the various design studios and the consecutive focus on the process of design are the dominant sub-themes.

9.7.3 Approach UTA4B: Process-Focused, Multidirectional & Intellectual, Independent Schema-Based Category

Approach UTA4B, the first of the three less-dominant themes is a continued representation on the various design stages undertaken by the students' cohort as multidirectional, intellectual, independent and schema-based approaches in the program offered. This identified category is focused on the process of design centred on the specific advanced design studio. This focus has continued based on the various stages through the range of programs offered.

9.7.4 Approach UTA4C: Process-Focused, Analytic & Independent Strategic Category

Approach UTA4C, the other less-dominant theme has focused on the role played by the first and second year Viscom coursework in architectural design with a continued emphasis on the process of design as independent and strategic approaches. This identified category has further looked into the transition from the analogue-to-digital domain through the role played by Viscom.

9.7.5 Approach UTA4D: Process-Focused, Independent & Analytic Schema-Based Category

Approach UTA4D, the third less-dominant theme represents the importance given to the collaborative learning process as independent and analytic, schema-based learning approaches in architectural design. This identified category has focused on the process of design within the program being offered in specific advanced design studios.

9.7.6 Approach UTA4E: Process-Focused, Holistic & Independent, Experiential Schema-Based Category

One of the three minor themes, Approach UTA4E represents the continuing connection of the transition within the process of design as holistic and independent approaches. This process has developed within the design program offered in the advance design

studio through conceptual and experiential, schema-based approaches towards understanding architecture. This identified category presents the strategic-to-deeper range of learning experiences through the students' conceptual and experiential journey of understanding architecture.

9.7.7 Approach UTA4F: Process-Focused, Holistic & Independent, Perceptual Schema-Based Category

Approach UTA4F, the other minor theme is a continued representation of the role played by the faculty in architectural design towards the evolving holistic and independent, perceptual and schema-based learning approaches. This identified category depicts the role of individual faculty members as the nucleus for each advance design studio and being the interface for the students' cohort.

9.7.8 Approach UTA4G: Process-Focused, Independent & Analytic Strategic Category

The third minor theme of Approach UTA4G describes the nature of specific advance design studios with the focus on the process of design. This identified category represents independent and analytic, strategic approaches incorporated within the design process based on the program offered.

9.8 Architectural Design Coursework in Fifth Year B. Arch. Program at UTA

Advance design studio for 10 credit hours, with professional practice and history coursework for 6 credit hours is offered in the fifth year covering 47% of the overall 34 credits. Additional coursework from the core curriculum and electives for 18 credits is also offered as per Figure 24. 'Advance Design' as the vertical studio offered across the fourth and fifth year of the undergraduate architecture program is the key feature of School of Architecture, UTA.

9.8.1 Summarized Discussion: Fifth Year Students' Learning Approaches at UTA

The data collected from the fifth year students suggests the continued importance given to the process of design through *schema-based* approaches in the advance design studio. Approaches UTA5A, UTA5B and UTA5C represent the *deeper range* of learning in the advance design studio. There is a continued focus on the program as well as the process of design through the continuing themes including the role of first and second year Viscom. The strategic-to-deeper range including UTA5D, UTA5E and UTA5F have focused on the integral role played by the faculty in the advance design studio, *collaborative learning strategies* and importance of *experiential learning* approaches in architectural design at UTA.

Table 38 depicts the six identified categories drawn from the experiences of fifth year students at UTA, mapped onto meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These identified categories represent the continued focus on the

design program offered in the advance design studio from the fourth to the fifth year as a transformation in students' learning experiences through *process-focused, independent* and *holistic, intellectual* and *perceptual, idealistic* and *multidirectional schema-based* approaches and strategies. The fifth year classification has identified

Categories identified in the 5th Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Advanced Design Studio-Based Process-Focused Approach	Approach UTA5A	Process-Focused Holistic & Idealistic Intellectual Schema	Deep
Architectural Design as Stages of Program & Process-Focused Approach	Approach UTA5B	Process-Focused Multidirectional & Intellectual Independent-Schema	Deep
Viscom in Architectural Design as Process-Focused Analogue-to-Digital Approach	Approach UTA5C	Process-Focused Holistic & Independent - Schema	Deep
Integral Role of Design Faculty's Studio Philosophy in Architectural Design as Process-Focused Approach	Approach UTA5D	Process-Focused Holistic & Independent Perceptual Schema	Strategic-to-Deep
Architectural Design Studio as Collaborative Learning Approach	Approach UTA5E	Process-Focused Independent & Holistic Schema	Strategic-to-Deep
Architectural Design as Perceptual, Experiential & Abstract-Based Process-Focused Approach	Approach UTA5F	Process-Focused Holistic & Perceptual Intellectual Schema	Strategic-to-Deep

Table 38: Categorized Approaches to Learning in 5th Year B. Arch – UTA

dimensions of approaches to learning in architectural design going beyond the classification range in the earlier pilot study, including holistic, idealistic and intellectual approaches through the continuation of the advance design studio from the fourth year at UTA.

9.8.2 Approach UTA5A: Process-Focused, Holistic & Idealistic, Intellectual Schema-Based Category

Approach UTA5A, the first of the two dominant themes represents students' learning experiences based on holistic and idealistic, intellectual and schema-based approaches in the program offered. There is a continued focus on the process of design within the advance design studios providing a wide range programs for the fifth year students. The learning experiences traversed based on the offered range of programs is centered on the process of design.

9.8.3 Approach UTA5B: Process-Focused, Multidirectional & Intellectual, Independent Schema-Based Category

Approach UTA5B, the other dominant theme presents the various stages of design through multidirectional and intellectual-cum-independent, schema-based approaches. This identified category has focused on undertaking the process of design through the program offered in the advanced design studio. The students' learning experiences

amalgamates all the stages of the design process represented through advanced design.

9.8.4 Approach UTA5C: Process-Focused, Holistic & Independent, Schema-Based Category

Approach UTA5C, one of the two less-dominant themes has elaborated on the continuing role played by the first and second year coursework of Viscom in the advance design studio. This identified category has emphasized the design process as holistic and independent, schema-based approaches. The focus on process-centric approaches in the design program is further elaborated, based on the role played by the Viscom coursework including the transition from the analogue-to-digital domain.

9.8.5 Approach UTA5D: Process-Focused, Holistic & Independent, Perceptual Schema-Based Category

Approach UTA5D, the other less-dominant theme continues to represent the centrality of the design faculty as the nucleus for each advanced design studio. Though the experiences are centered on the process of design as holistic and independent, perceptual and schema-based approaches, the integral role played by the faculty is the central aspect in the program offered.

9.8.6 Approach UTA5E: Process-Focused, Independent & Holistic, Schema-Based Category

Approach UTA5E as one of the two minor themes presents the continued importance given to the collaborative learning process in the development of independent and holistic, schema-based approaches in the advance design studio.

9.8.7 Approach UTA5F: Process-Focused, Holistic & Perceptual, Intellectual Schema-Based Category

Approach UTA5F, the other minor theme presents the continued transition in the process of design in the program offered through holistic, perceptual, intellectual and schema-based approaches.

9.9 Outcome Space: Classification of Approaches to Learning at School of Architecture, University of Texas at Austin

The outcome space for the five year learning approaches classification in architectural design at UTA is depicted in Figure 25. The Structural and Referential facets of the outcome space are based on Chapter 6, Section 6.11; Figure 17. The categories of learning approaches are depicted in Tables 34, 35, 36, 37 and 38, identified using phenomenographic analysis for UTA, as explained in Appendix VI.
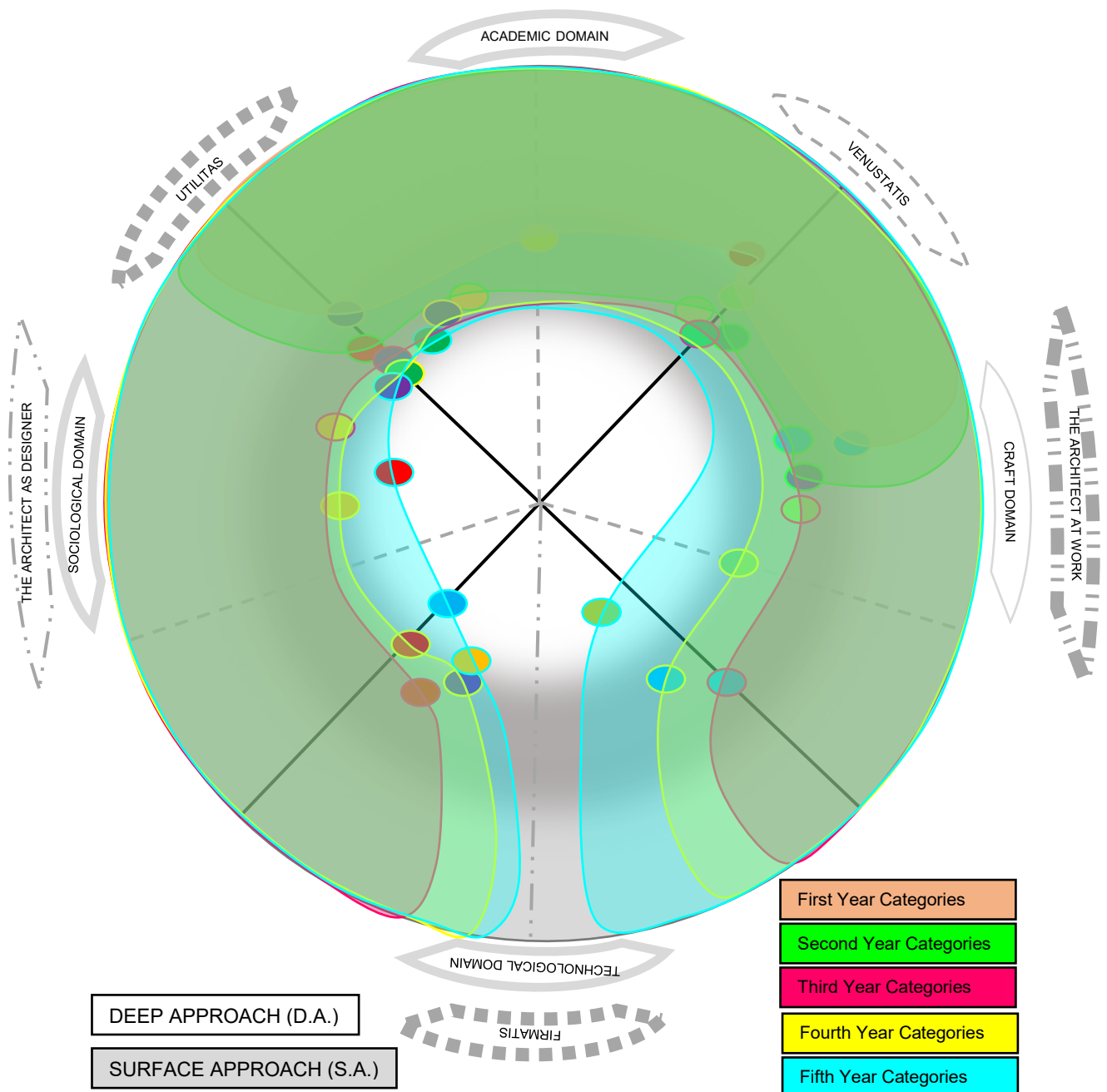
Figure 25: Outcome Space for Classification of Approaches to Learning in the B. Arch Program at School of Architecture, University of Texas at Austin, Texas

The categorized approaches depicted in Figure 25 represents the overall pedagogy of the five year design coursework at UTA based on the overall summation of meta-categories in Table 39. These identified categories have evolved from product-focused, dependent and unidirectional approaches to process-focused, independent and analytic strategies in the first year, developing towards process-focused, independent, analytic and multidirectional strategies in the second year of the program. The third year sound-building studio has led to process-focused, independent and analytic, theoretical and pragmatic, experiential and multidirectional schema-based approaches and strategies. The fourth year advance design studio represents the evolution of the categorized approaches towards process-focused, independent and holistic, analytic and

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intellectual, perceptual and experiential, multidirectional schema-based strategies leading towards process-focused, independent and holistic, intellectual and perceptual, idealistic and multidirectional schema-based approaches and strategies in the fifth year of the architecture program at UTA.

The design process and the program offered in architectural design are the two focal points forming the basis of the learning approaches classification in the five year program. They have developed with the focus shifting from the product-to-process in the first year from dependent and unidirectional strategies to independent and multidirectional, schema-based approaches. The sound-building studio in the third year and advance design studios in the fourth and fifth year reinforce the importance of these two focal points in the classification at UTA.

The question of why the outcome space at UTA (Figure 25) has developed, together with the influence of the curriculum and design pedagogy is explained through illustrative accounts of the approaches to learning undertaken by nine architecture students in Chapter 11. These classified meta-categories at UTA have been further reflected as summarized architectural experiences of students in Chapter 12, Section 12.4.

Figure 26 depicts the learning approaches classification of School of Architecture, UTA and is further correlated with the six categorized approaches from the earlier pilot study (Chapter 5, Table 13) (Iyer & Roberts, 2014). There is further comparison with the fashion design studies (Bailey, 2002; Drew et al., 2001) and the initial phenomenographic text-based studies at the University of Gothenburg (Marton & Säljö, 1976) on deep and surface approaches to learning.
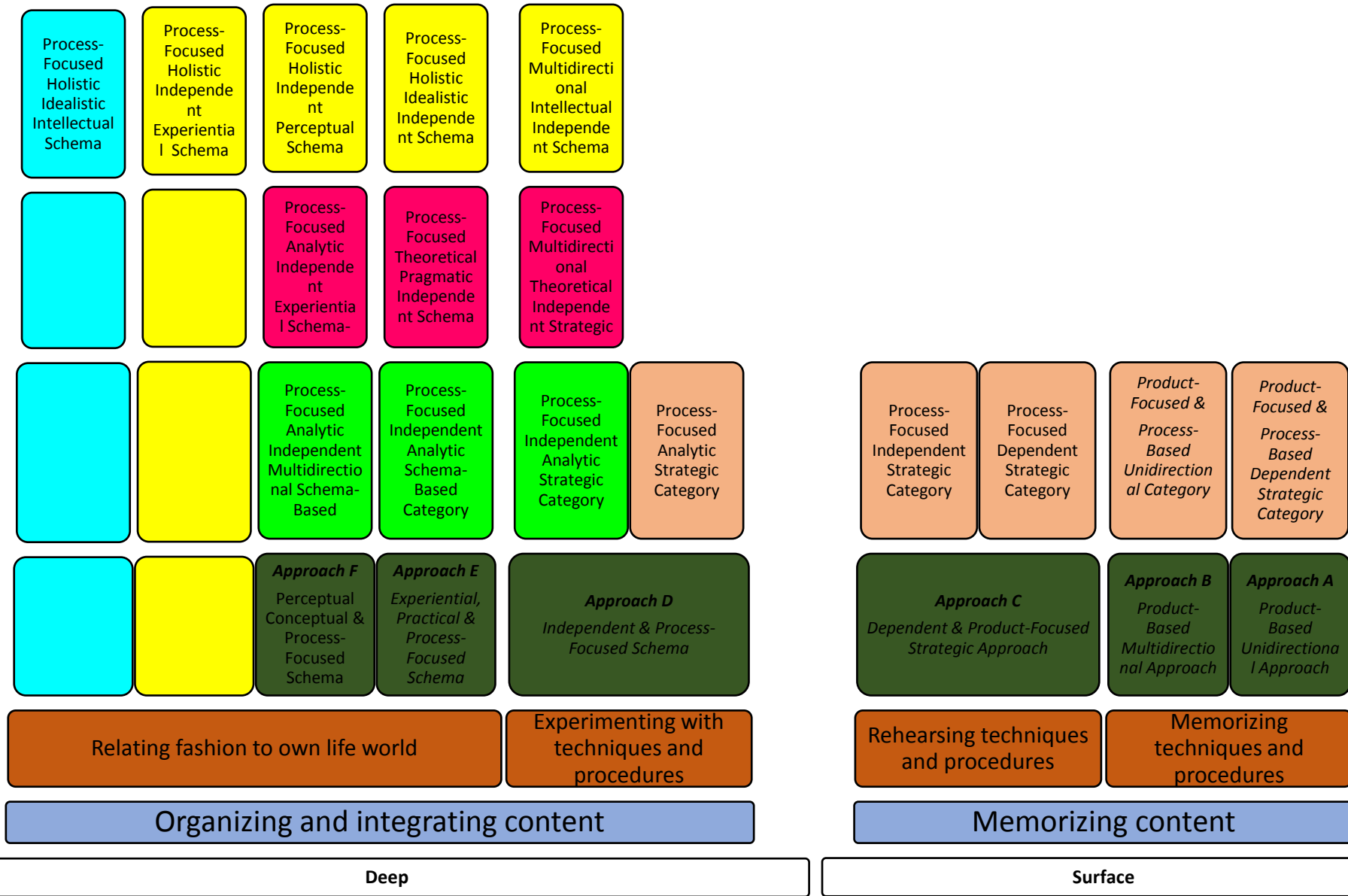
Figure 26: Chart explaining Classification of Approaches to Learning from Text-Based Fields (Marton & Säljö, 1976), Fashion Design (Bailey, 2002; Drew et al., 2001), the Earlier Pilot Study (Iyer & Roberts, 2014) and *Emerging Classification based Figure 25 Outcome Space of the Five-Year Design Coursework (First, Second, Third, Fourth, Fifth) at School of Architecture, University of Texas at Austin, Texas; USA*

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Year	Approach	Category	Sub Theme Description Major to Minor	Meta-Category	Structural Facet (Domain)	Referential Facet (Approaches)
1	UTA1A	Architectural Design as Series of Steps-Based Process-Based Product-Focused Approach	Product-focused design steps / Process-focused design steps	Product-Focused & Process-Based Unidirectional Strategy	Academic – Aesthetic Technical – Craft-Based	Surface-to-Strategic
1	UTA1B	Viscom in Architectural Design as Process & Product-Focused Approach	Viscom offered in parallel with architectural design / Strategically completing design solution / Role of Viscom in underlying process of design	Product-Focused & Process-Based Dependent - Strategy	Aesthetic – Technical Craft-Based	Surface-to-Strategic
1	UTA1C	Role of Viscom & Design Faculty in the Architectural Design Process	Viscom running parallel to architectural design / Faculty's role in Viscom and architectural design	Product & Process-Focused Dependent-Strategy	Academic – Aesthetic Technical – Craft-Based	Strategic
1	UTA1D	Architectural Design as Project-Based & Process-Focused Approach	Analysis of the design project / Learning curve through focus on design process	Process-Focused Analytic & Independent Strategy	Aesthetic Sociological – Utility	Strategic
1	UTA1E	Design Studio as Collaborative & Process-Focused Approach	Collaborative nature of architectural design at UTA / Continued emphasis on design process	Process-Focused Independent - Strategy	Academic – Aesthetic Sociological – Utility	Strategic
2	UTA2A	Architectural Design as Project & Process-Focused Approach	Focus on the design project offered / Continued emphasis on process-centric analytic approaches	Process-Focused Analytic & Independent Schema	Academic Sociological – Utility	Strategic-to-Deep
2	UTA2B	Viscom in Architectural Design as Process & Product-Focused Analogue-to-Digital Approach	Transition from analogue-to-digital domain / Product-focused strategies / Process-focused strategies	Product & Process-Focused Independent - Strategy	Aesthetic – Technical Craft-Based	Strategic
2	UTA2C	Architectural Design as Series of Steps-Based Process & Product-Focused Approach	Process-focused design steps undertaken / Product-focused design steps undertaken / Transition from analogue-to-digital domain	Product & Process-Focused Multidirectional Strategy	Academic – Aesthetic Technical	Strategic
2	UTA2D	Role of Design Faculty in Architectural Design as Process & Product-Focused Approach	Design process undertaken towards the final solution	Product & Process-Focused Independent-Strategy	Aesthetic – Technical Craft-Based	Strategic
2	UTA2E	Architectural Design as Process-Focused Experiential Approach	Independent strategies through experiential learning	Process-Focused Analytic & Independent Multidirectional Schema	Academic - Utility	Strategic-to-Deep
2	UTA2F	Studio Culture as Part of Architectural Design Process-Focused Approach	Importance of studio culture	Process-Focused Independent & Analytic Strategy	Aesthetic – Technical Craft-Based	Strategic
3	UTA3A	Architectural Design as Program & Process-Focused Approach	Focus on design process / Focus on design program / Advancement to schema-based design	Process-Focused Analytic & Independent Schema	Sociological Technological Functionality	Strategic-to-Deep
3	UTA3B	Viscom in Architectural Design as Process-Focused Analogue-to-Digital Approach	Focus on design process / Transition from analogue-to-digital domain	Process-Focused Independent - Strategy	Technical Craft-Based Functionality	Strategic
3	UTA3C	Architectural Design as Stages of Process & Program-Focused Approach	Various stages undertaken in the program offered based on the design process	Process-Focused Multidirectional & Theoretical Independent-Strategy	Aesthetic – Technical Craft-Based	Strategic
3	UTA3D	Role of Design Faculty in Architectural Design as Process-Focused Approach	Continuing and evolving role of faculty / transition of design process through independent learning approaches	Process-Focused Theoretical & Pragmatic Independent-Schema	Academic Sociological – Utility	Strategic-to-Deep
3	UTA3E	Architectural Design as Process-Focused Experiential Approach	Design process transcended through experiential facets of understanding architectural design	Process-Focused Analytic & Independent Experiential Schema	Sociological – Utility The Architect as Designer	Strategic-to-Deep
3	UTA3F	Architectural Design Studio as Collaborative Learning Approach	Studio culture through collaborative learning & peer-based discussions	Process-Focused Independent & Analytic Strategy	Academic – Aesthetic Technical	Strategic
4	UTA4A	Architectural Design as Program & Process-Focused Approach	Range of programs offered in advanced design studios / Consecutive focus on the process of design	Process-Focused Holistic & Idealistic Independent Schema	Sociological Technological Functionality – The Architect as Designer	Strategic-to-Deep
4	UTA4B	Architectural Design as Stages of Program & Process-Focused Approach	Various design stages through programs offered in advanced design studios / Focus on the process of design	Process-Focused Multidirectional & Intellectual Independent-Schema	Technical – Craft-Based – Functionality - Technological	Strategic
4	UTA4C	Viscom in Architectural Design as Process-Focused Analogue-to-Digital Approach	Emphasis on the process of design / Transition from analogue-to-digital domain	Process-Focused Analytic & Independent - Strategy	Aesthetic - Technical Craft-Based - Functionality	Strategic-to-Deep
4	UTA4D	Architectural Design Studio as Collaborative Learning Approach	Focus on design process in the program offered	Process-Focused Independent & Analytic Schema	Technological Functionality	Strategic-to-Deep
4	UTA4E	Architectural Design as Process-Focused Experiential & Conceptual Approach	Focus on design process in the program offered	Process-Focused Holistic & Independent Experiential Schema	Sociological – Utility The Architect as Designer	Strategic-to-Deep
4	UTA4F	Integral Role of Design Faculty's Studio in Architectural Design as Process-Focused Approach	Interface for the students' cohort as the nucleus for advanced design studio	Process-Focused Holistic & Independent Perceptual Schema	Academic Sociological – Utility	Strategic-to-Deep
4	UTA4G	Identifying with Design Process of Architectural Design Studio at UTA	Nature of specific advanced design studios	Process-Focused Independent & Analytic Strategy	Academic - Utility	Strategic
5	UTA5A	Architectural Design as Advanced Design Studio-Based Process-Focused Approach	Range of programs offered in advanced design studios / Consecutive focus on the process of design	Process-Focused Holistic & Idealistic Intellectual Schema	Sociological – Utility The Architect as Designer	Deep
5	UTA5B	Architectural Design as Stages of Program & Process-Focused Approach	Various design stages through programs offered in advanced design studios / Focus on the process of design	Process-Focused Multidirectional & Intellectual Independent-Schema	Sociological Technological Functionality – The Architect as Designer	Deep
5	UTA4C	Viscom in Architectural Design as Process-Focused Analogue-to-Digital Approach	Emphasis on the process of design / Transition from analogue-to-digital domain	Process-Focused Holistic & Independent - Schema	Technical - Craft-Based - Technological - Functionality	Deep
5	UTA4D	Integral Role of Design Faculty's Studio Philosophy in Architectural Design as Process-Focused Approach	Nucleus for advanced design studio	Process-Focused Holistic & Independent Perceptual Schema	Academic - Sociological – Utility	Strategic-to-Deep
5	UTA4E	Architectural Design Studio as Collaborative Learning Approach	Continued importance given to the collaborative learning process	Process-Focused Independent & Holistic Schema	Sociological Technological Functionality – The Architect as Designer	Strategic-to-Deep
5	UTA4F	Architectural Design as Perceptual, Experiential & Abstract-Based Process-Focused Approach	Continued transition in the process of design within the program offered	Process-Focused Holistic & Perceptual Intellectual Schema	Academic Sociological – Utility	Strategic-to-Deep

Table 39: Summation of Meta-Categories and Categorized Approaches to Learning in Architectural Design Coursework from 1st to 5th Year of B. Arch at School of Architecture, University of Texas at Austin

(The colors depicting categorized approaches represent their placement in Figure 25 (Outcome space) and Figure 26 (Meta-categories) with each year depicted in specific colors. Major-to-Minor Sub-themes are depicted in Grey-scale)

Chapter 10: International Perspective: Four – Welsh School of Architecture, Cardiff University, UK

Welsh School of Architecture (WSA) – Cardiff University located in Cardiff, Wales, United Kingdom is one of the four institutions covered in the current study. Table 40 presents an overall picture of the Bachelor of Architecture programs offered at the four institutions with WSA offering a total of six hundred credits with twenty core modules in the five year program. This program includes the first-three years as a B.Sc. program in architecture and two years as a M. Arch. program. The fourth year is termed as a *'sandwich'* year or the year of *'education in practice.'* This B.Sc.-plus-M. Arch. program offered at WSA meets the requirements and is accredited by the Royal Institute of British Architects (RIBA) and the Architects Registration Board (ARB)-Part 1 & 2 (C. University, 2016).

Name of Institution	Total Credits Hours	Equivalent Coursework / Core Modules	Accreditation Body
Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ) University of Mumbai - Mumbai, India	340	85 Courses offered in the 5 Year Program	Council of Architecture (CoA), New Delhi, India https://www.coa.gov.in/
School of Architecture, Oklahoma State University (OSU) - Stillwater, Oklahoma, USA	154	43 Courses offered in the 5 Year Program	National Architectural Accreditation Board (NAAB), United States http://www.naab.org/
School of Architecture, University of Texas at Austin (UTA) – Austin, Texas	161	47 Courses offered in the 5 Year Program	
Welsh School of Architecture (WSA) - Cardiff, UK	600	20 Core modules offered in the 5 Year Program	Royal Institute of British Architects (RIBA) and the Architects Registration Board (ARB)

Table 40: Data Collection at Four Institutions with Highlights of the Architecture Program offered at Welsh School of Architecture

10.1 Welsh School of Architecture, Cardiff University: A United Kingdom Perspective

Welsh School of Architecture was established as a school of architecture, one of the many departments in Cardiff Technical College on the 20th of March 1920. RIBA recognized Part-1 of the program offered at the School in 1923 and Part-2 in 1928 (Powell & Welsh School of Architecture., 2009). The 1929 fourteenth edition of the Encyclopedia Britannica has recognized the architecture program offered at Technical College, Cardiff as being exempted from the RIBA intermediate examination (AARUK, 2007). The school began to offer a four year degree program (B.Sc. plus B. Arch.) in 1962. Welsh School of Architecture became a part of Cardiff University which became

independent from the University of Wales in 2004. The four year B. Arch. degree was replaced with the five year degree program (B.Sc. plus M. Arch.) in 2006 (Powell & Welsh School of Architecture., 2009).

Figure 27: 5 Years BSc-plus-M. Arch Program Curriculum at Welsh School of Architecture, Cardiff University, UK

The five-year professional degree program includes the three-year B.Sc. in Architectural Studies degree program that satisfies Part 1 and the two-year Master of Architecture (M. Arch.) degree program that satisfies Part 2 of the UK qualification for architects, and is approved by RIBA and ARB. The B.Sc. program emphasizes on "the practical 'making' of architecture and with its broader physical, social and intellectual contexts," whereas the M. Arch. program is a combination of "experience in practice with challenges in advanced architectural design" (Welsh School of Architecture., 2015). The five year program has a total of 600 credits that includes 330 credits of architectural design coursework, 50 credits of research coursework, 60 credits of technology coursework, 30 credits of design principles and methods (DPM) coursework, 80 credits of practice-based training cum coursework and 50 credits of additional coursework as per the core curriculum depicted in Figure 27.

10.2 Architectural Curriculum at WSA

The design studio is core to the architectural curriculum at Welsh School of Architecture. The central focus of the design coursework is on the teaching and learning of design through workshops and tutorials complemented by model-making and architectural debate. This happens in the studio environment through the display of students' work

with "critical discussion and assessment by staff, peers and visiting critics" (Welsh School of Architecture., 2015). The studio atmosphere is highlighted as an important asset of the school encouraging this twenty-four hours a day creative and collaborative spatial experience that nurtures peer-based learning experiences within this supportive academic environment. The learning experiences in the five year program is highlighted by the Welsh Student Association as being consistently high, based on the superior quality of focus given to teaching in the design studio environment by lecturers, tutors and visiting staff from practice and academia (SAWSA & Architecture, 2012).

10.3 Architectural Design Learning Context at WSA
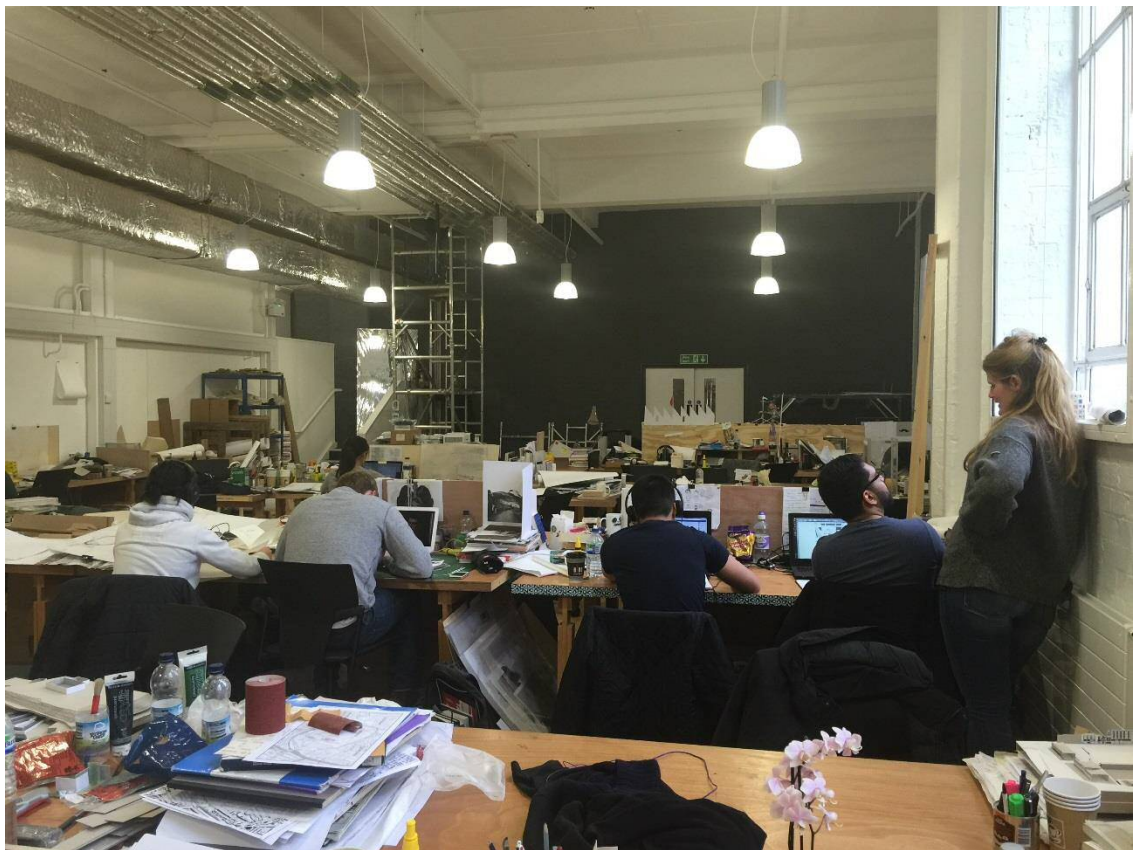
Pic 10: 2nd Year M. Arch - Architectural design studio work environment at Welsh School of Architecture in the United Kingdom (photograph taken by author 11th March 2015)

Architectural education at the Welsh School of Architecture has revolved around the production of graduates who will play an important role among the rich diversity in practice within the United Kingdom and the international context. This is being achieved through the three-year B.Sc. program equivalent to Part-1 of RIBA where the focus in on "how buildings are made" followed by the unique two-year M. Arch. program equivalent to Part-2 of RIBA, where the architecture students learn in the first year through "education in practice" and the second year through the advancement in the pedagogy of the architectural design coursework (Welsh School of Architecture., 2015).

Pic 11: Summer Exhibition of Architectural Design work at Welsh School of Architecture in the United Kingdom (photograph taken by author 15th July 2015)
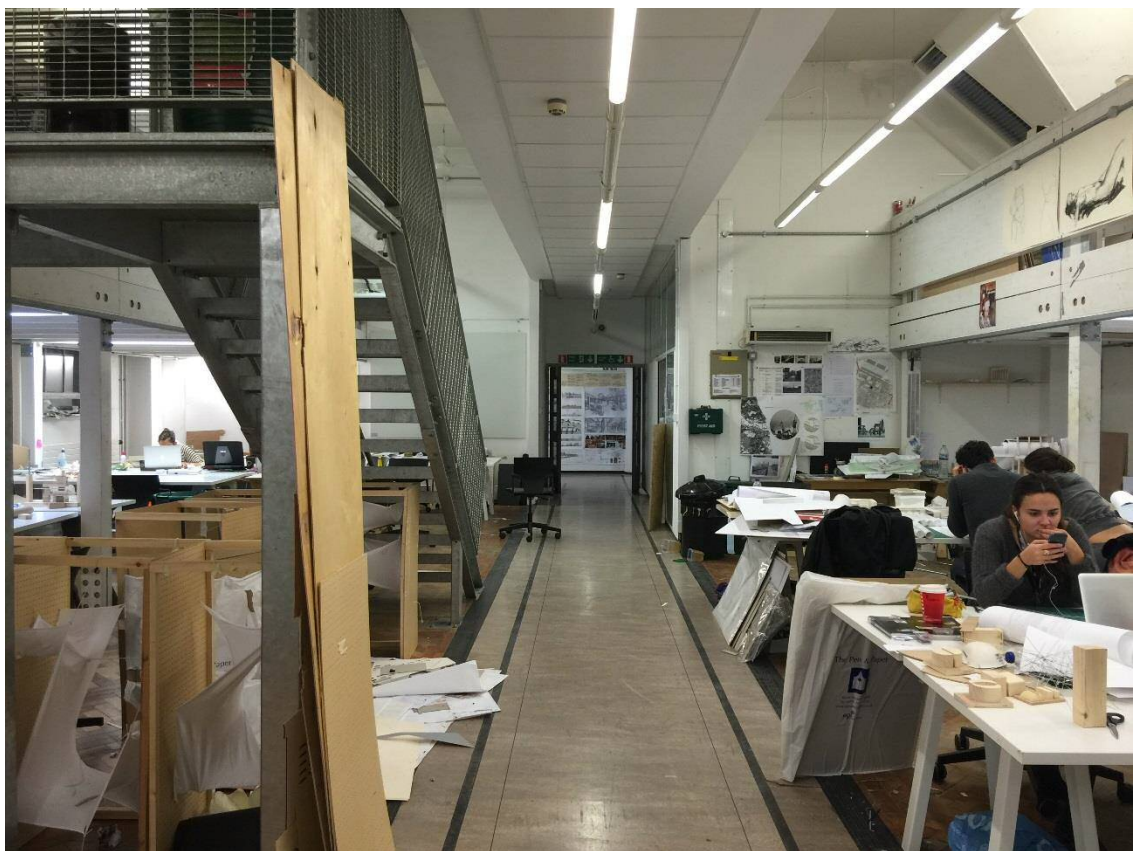
Pic 12: 3rd Year B.Sc architecture students at work in their design studio at Welsh School of Architecture in the United Kingdom (photograph taken by author 6th December 2015)

Pic 13: Panoramic View of Architecture Workshop at Welsh School of Architecture in the United Kingdom reflecting the focus on Making Architecture (photograph taken by author 16th July 2015)

Pic 14: Sketch View the Bute Building, Welsh School of Architecture in the United Kingdom (sketch by author 25th July 2014)

10.4 Architectural Design Coursework in First Year BSc Program at WSA

Architectural design and design principles & methods (DPM) coursework with an equivalent of eighty credits are offered across the three terms of the first year program covering 67% of the overall 120 credits. Other required coursework including architectural technology and building through time for a total of 40 credits are offered as per Figure 27. The design coursework in the first term has focused on the 'making' of architecture by generating ideas and responding to various contextual references. These skill-based developments are channelized through a small-scale design project in the second term reflecting the rural and urban contextual references within architecture. The third term gives students the opportunity to participate in the 'Vertical Studio', to get involved in peer-based interaction with senior students, and fostering collaborative learning amongst their first year cohort through a week-long international study visit or field trip (Welsh School of Architecture., 2015).

10.4.1 Summarized Discussion: First Year BSc Program Students' Learning Approaches at WSA

The data collected from first year WSA students suggests *product-focused, dependent-cum-unidirectional, strategies* evolving towards *process-focused, independent-cum-multidirectional, analytic* and *experiential, schema-based* approaches to learning in

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architectural design. The dominant Approach WSA1A represents *product-focused, strategic* approaches adopted through the *unidirectional* process of design based on the completion of the final solution. Approaches WSA1B. WSA-1F and WSA1C fall in the range of *surface-to-strategic* learning approaches with the dominant Approach WSA1A. Both WSA1B and WSA1F have focused on the design product as *multidirectional* and *process-based* learning strategies through collaboration, group-work and inculcating studio culture through architectural design. The *process-focused, dependent strategy* of Approach WSA1C represents the faculty's role in developing the final product.

Approaches WSA1D and WSA1E are centered on *product-cum-process focused, schema-based* categories. The importance of the parallel coursework of design principles and methods (DPM) conducted with architectural design as well as the development of the design process through *analytic* approaches towards conceiving design is discussed. WSA1B, WSA1D and WSA1E represent the *strategic* range in the first year classification.

Categories identified in the 1st Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Evolving Perceptions of Architectural Design Studio as Skills & Craft-Based Process & Product-Focused Approach	Approach WSA1A	Product-Focused & Process-Based Unidirectional Strategy	Surface-to-Strategic
Learning, Working & Exploring the Architectural Design Studio as a Collaborative Group of architecture students	Approach WSA1B	Product-Focused & Process-Based Multidirectional Strategy	Strategic
Faculty as Scaffold in Understanding Architectural Design as Process-Focused & Product-Based Approach	Approach WSA1C	Process-Focused & Product-Based Dependent-Strategy	Surface-to-Strategic
Exploration of DPM & Architectural Design as Process-Based Approach	Approach WSA1D	Process- Based Analytic & Independent Schema	Strategic
Experience of Conceiving Design through Architectural Design Process	Approach WSA1E	Process-Focused Independent & Experiential Schema	Strategic
Inculcating a Studio Culture and evolving a sense of experience within Architectural Design	Approach WSA1F	Process-Based Multidirectional Strategy	Surface-to-Strategic

Table 41: Categorized Approaches to Learning in 1st Year BSc – WSA

Table 41 depicted the six identified categories of learning approaches from the experiences of the first year students at WSA, mapped onto meta-categories identified in the earlier pilot study (Chapter 5, Section 5.5; Table 13). As explained in Chapters 7, 8 and 9 to ensure that the text supporting the meta-categories remain readable, the categorized evidence of quotations for this chapter can be found in Appendix VIII.

These categorized approaches have transitioned from *product-focused* approaches that are *process-based, unidirectional* and *dependent strategies* towards *process-focused, multidirectional* and *independent, analytic* and *experiential schema-based* approaches. The first year classification represents the understanding of the centrality of the design

process. Approaches WSA1A, WSA1B, WSA1C and WSA1F are in parallel with Approaches A, B, C and D of the pilot study representing the *unidirectional-cum-dependent, product-focused strategies* evolving towards *independent, process-focused* and *schema-based* approaches identified in the pilot study (Chapter 5, Section 5.5; Table 13) (Iyer & Roberts, 2014). This is in contrast with Approaches WSA1D and WSA1E, which focus on *experiential-cum-multidirectional*, *process-focused*, schema-based approaches connected to the pilot study's Approach E, the *experiential, practical* and *process-focused, schema-based* category (Iyer & Roberts, 2014). The WSA classification (Table 41), which is similar to UTA in Chapter 9 (Table 34), presents the further evolution in the first year learning approaches in comparison to Sir JJ and OSU in the earlier Chapters 7 and 8.

10.4.2 Approach WSA1A: Product-Focused & Process-Based, Unidirectional Schema-Based Category

Approach WSA1A as the dominant theme is based on the evolution of the design process in the architectural design studio, focusing on the final solution as the most discussed sub-theme. The two other sub-themes focus on the craft of making architecture, and acquiring the drafting skills necessary for the process of design. This identified category culminates with the sub-theme focusing on the design solution or the final product. The experiences of first year students through expressions focusing on 'the process of making,' 'architectural skills & crafts,' 'the technical aspects of visually communicating architecture in two-dimensional and three-dimensional format' as well as 'extrapolating the design process' represents the learning transition through *unidirectional schema-based* approaches.

10.4.3 Approach WSA1B: Product-Focused & Process-Based, Multidirectional Strategic Category

Approach WSA1B, one of the two less-dominant, but much discussed, themes is the transition towards working and exploring the potential of the design studio and collaboration amongst groups of students. This identified category is considered as the starting point for the decision-making process amongst students in groups as well as a comparative analysis amongst the group members. Identified as the basis for peer-based learning, Approach WSA1B represents the importance of working in groups as well as the collaborative environment of the design studio. This category is connected to the development of reflective learning approaches as multidirectional strategies.

10.4.4 Approach WSA1C: Process-Focused & Product-Based, Dependent Strategic Category

Approach WSA1C, the other less-dominant theme, discusses the role played by the design faculty in the development of the design process. This identified category

represents product-focused, dependent and strategic approaches with the faculty as the guide in the craft of making and acquiring the drafting skills required in the process of design. There is further articulation and communication on the process of design gained from the design faculty. This identified category represents the students' effort to gain a foothold in architectural language, which is key towards reinforcing their understanding of the design process.

10.4.5 Approach WSA1D: Process-Based, Analytic & Independent, Schema-Based Category

A minor but much discussed theme, Approach WSA1D, explains the role played by the Design Principles and Methods (DPM) coursework running parallel to architectural design. DPM is considered as a medium of exploration, experimentation and foundation for the design coursework, playing an important role in the development of the design process as independent and schema-based approaches. The students' learning experiences explain DPM's exploratory nature as well as the experimentation that projects offer in this coursework and its impact on the process of design.

10.4.6 Approach WSA1E: Process-Focused, Independent & Experiential, Schema-Based Category

Approach WSA1E, the other minor theme, focuses on the evolution in the process of design through experiential and independent, schema-based approaches. This evolution, with the continued focus on developing the design process, is represented in multiple architectural contexts.

10.4.7 Approach WSA1F: Process-Based, Multidirectional Strategic Category

Approach WSA1F, though a seldom-discussed theme, has also emerged as a sub-theme in Approach WSA1B, which is based on group-work and collaborative learning. This category represents the importance of architectural design in the evolution of multidirectional learning approaches, and the development of studio culture in the first year of the program. This categorized approach has explained the role of the design studio in reinforcing the skills and craft-based nature of the design process.

10.5 Architectural Design Coursework in Second Year BSc Program at WSA

Architectural design and design principles & methods (DPM) coursework with an equivalent of 80 credits are offered in the second year covering 67% of the overall 120 credits. Other required coursework including architectural technology and architecture in context for 40 credits, offered as per Figure 27. The second year design coursework in the first term has focused on "the concepts of 'making place' and sustainable living through a housing project in an urban context" (Welsh School of Architecture., 2015). The second term extends the design context through architectural technology focusing

on the performance of the building and working out technical aspects of the design. Term-3 includes the 'Vertical Studio' with first year students, week-long international study visit, digital domain-based second year DPM coursework as well as contextual study of historical and theoretical facets of architecture (Welsh School of Architecture., 2015).

10.5.1 Summarized Discussion: Second Year BSc Program Students' Learning Approaches at WSA

The collected data suggests that the second year students focus both on the *product* as well as the *process of design* through *analytic* and *experiential*, *practical* and *independent, multidirectional* and *schema-based* learning approaches. The second year classification focuses on the design process through the transition from the analogue-to-digital domains as well as macro-to-micro level contextual studies of architectural design from the *strategic-to-deeper* range of learning approaches.

Categories identified in the 2nd Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Experience-Based & Evolving Perceptions of Architecture through Exploration of Materials, Technology & Precedent Studies with Macro & Micro Scale Master Planning Studies as Process-Focused Approach	Approach WSA2A	Process-Focused Analytic & Practical Independent & Experiential Schema	Strategic-to-Deep
Architectural Design as Process-Based Analogue & Digital, Multi-Layered & Collaborative Process in Design Studio as Product-Focused Approach	Approach WSA2B	Product-Focused & Process-Based Multidirectional & Independent Schema	Strategic
DPM & Architectural Design as Process & Product-Focused Approach	Approach WSA2C	Process & Product-Focused Analytic & Multidirectional Independent Schema	Strategic
Faculty & Crit as Scaffold, Checkpoint & Evolution of Architectural Design Process	Approach WSA2D	Process-Focused & Product-Based Independent -Strategy	Strategic

Table 42: Categorized Approaches to Learning in 2nd Year BSc – WSA

The *strategic* range of learning Approaches WSA2B, WSA2C and WSA2D focus on the academic and aesthetic, craft-based and technical, functional and technological as well as the utility and sociological domains of architectural design. This includes the transition from the analogue-to-digital domain through collaborative learning and the first year DPM coursework as well as the faculty's role as the checkpoint through crit (See Chapter 3 Section 3.7 – 'crit' used for architectural review) in the design coursework. Approach WSA2A encompasses the *strategic-to-deeper* range by looking into the technological, sociological as well as utilitarian domains of architectural design through the development of *schema* and understanding the *analytic*, *practical* as well as *experiential* approaches of learning.

Table 42 depicts the four identified categories from the second year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13) (Iyer & Roberts, 2014). These categories represent the macro-to-micro level contextualization of architecture from *product-focused* and *process-based*, *analytic strategies* towards the evolution of *multidirectional, practical* and *independent, experiential* and *schema-based* and *process-focused* approaches. The second year classification represents the transformation of the learning approaches with marked similarity to Approaches D, E and F in the pilot study representing *process-focused, independent* strategies developing into *experiential* and *perceptual, as well as conceptual* and *schema-based* approaches (Chapter 5, Section 5.5; Table 13) (Iyer & Roberts, 2014). The second year WSA classification is further differentiated from the strategic-to-deeper range of learning approaches within the pilot study as Approaches D, E and F are predominantly adopted by a small cohort of fourth year students, further depicted in Figure 29.

10.5.2 Approach WSA2A: Process-Focused, Analytic & Practical, Independent & Experiential, Schema-Based Category

Approach WSA2A, one of the two dominant themes represents the evolution of the design process from the macro-to-micro level as analytic and practical approaches. The major sub-theme discussed is the evolving perception of architecture in the process of design being undertaken as experiential and schema-based approaches. Three equally well-discussed sub-themes include the importance of precedent studies and its emphasis on independent approaches in this process-focused category. The second sub-theme is the importance given to macro and micro scale master-planning studies, considered an important part of the design process. The third sub-theme focuses on micro-level points to be considered, including the exploration of materials and architectural technology as an important focal point in the design process.

10.5.3 Approach WSA2B: Product-Focused & Process-Based, Multidirectional & Independent Schema-Based Category

Approach WSA2B, the other dominant theme, has focused on the production of the final solution based on the evolving process of design. The development of the design process as an independent approach is described from both the analogue as well as the digital domain. Studio culture through collaborative and peer-based learning developments are part of the other sub-theme. The category of schema-based approaches focuses on the final design solution, but also presents the continued importance given to the multidirectional process of design. Approach WSA2B also represents the transformation developing within the students' cohort towards independent learning strategies in architectural design.

10.5.4 Approach WSA2C: Process & Product-Focused, Analytic & Multidirectional, Independent Schema-Based Category

Approach WSA2C, one of the two less-dominant but much discussed themes, represents the continuing focus on the first year design principles and methods (DPM) coursework offered. The role of DPM is presented from the precedent studies undertaken through analytic and multidirectional approaches. This identified category further looks into the development from abstract concepts to the continued focus on the design process, using skills and craft-based domains required for the 'making of Architecture' through independent, schema-based approaches. The focus on the final design solution as well as the visual and aesthetic domains embedded in the process of design are part of the learning experiences.

Approach WSA2D: Process-Focused & Product-Based Independent –Strategic Category

The other less-dominant theme of Approach WSA2D discusses the role of design faculty and the crit received by students at regular intervals of each term. As a checkpoint in the design process, the crit is balanced by the faculty's role as providers of knowledge towards these independent and strategic learning approaches. The faculty's role as well as crit at regular intervals are considered as an important part of the framework in the development of the design process.

10.6 Architectural Design Coursework in Third Year B. Arch. Program at WSA

Architectural design and design principles & methods (DPM) coursework with an equivalent of 80 credits are offered in the third year program covering 67% of the overall 120 credits. Other required coursework including architectural technology, issues in contemporary architecture, and practice management & economics for a total of 40 credits are offered as per Figure 27. The third year design coursework is transformed by the range of thematic units that are offered in all the three terms through a continued investigative structured exploration of the selected unit. This exploration of a neighborhood or of an urban block is done "at various scales; it will incorporate low environmental impact strategies; and use an architectonic language, brought to a good level of technical resolution." The design studio units are based on an international context and are complemented by coursework including DPM for digital methods and media, contemporary architecture, technology and practice-based coursework for the fourth year of 'education in practice.' (Welsh School of Architecture., 2015).

10.6.1 Summarized Discussion: Third Year BSc Program Students' Learning Approaches at WSA

The data collected from third year students suggests continued focus on the process of design through the range of *thematic units* offered in architectural design. Approaches WSA3B and WSA3D represent the *strategic* learning approaches exploring the role

played by the first year DPM coursework in the transition from analogue-to-digital domain as well as the pedagogy of architectural design coursework at Welsh School of Architecture. These *process-focused*, *holistic* and *multidirectional, independent*, *schema-based, product-based, theoretical* and *practical, strategic* categories represent the continuation from the second-to-third year classification.

Approaches WSA3A, WSA3C and WSA3E represent the *strategic-to-deeper* range of learning approaches by focusing on the *schema-based* process of design developed for the specific thematic units offered through *multidirectional* and *independent* learning approaches. The faculty's role in inculcating *pragmatic* as well as *practical* approaches and the continuing evolution in the design process towards understanding the *experiential and perceptual* facets of architectural design define the *strategic-to-deeper* range in the third year classification.

Categories identified in the 3rd Year	Nomenclature	Meta-categories	Position within Referential facet in Outcome Space
Architectural Design as Group Collaboration, Site, Technology & Society-Based Process-Focused Approach	Approach WSA3A	Process-Focused Multidirectional & Independent Schema	Strategic-to-Deep
DPM & Architectural Design as Process-Focused & Product-Based Approach	Approach WSA3B	Process-Focused Holistic & Multidirectional Independent Schema	Strategic
Faculty & Crit as Guide & Facilitator in Architectural Design Process	Approach WSA3C	Process-Focused Pragmatic & Practical Independent –Schema	Strategic-to-Deep
Approaching Architectural Design Process at Welsh School of Architecture	Approach WSA3D	Process-Focused & Product-Based Theoretical & Practical Independent –Strategy	Strategic
Architectural Design as Integrated, Experiential & Perceptual Process-Focused Approach	Approach WSA3E	Process-Focused Experiential & Holistic Independent Schema	Strategic-to-Deep

Table 43: Categorized Approaches to Learning in 3rd Year BSc – WSA

Table 43 depicts the five identified categories of learning approaches from the third year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13) (Iyer & Roberts, 2014). These identified categories represent the *product-based, theoretical* and *practical, multidirectional strategies* towards *process-focused, holistic* and *multidirectional, pragmatic* and *experiential, independent* and *schema-based* approaches. The classification further enhances the process-focused nature of the learning experiences with collaborative group-based learning structured within the thematic units offered in the third year architectural design.

The third year classification is in parallel to Approaches D, E and F from the pilot study representing *independent* and *pragmatic, process-focused* as well as *multidirectional, schema-based* approaches (Chapter 5, Section 5.5; Table 13) (Iyer & Roberts, 2014) going further beyond this identified spectrum. The identified approaches to learning predominantly being adopted in the third year classification are represented amongst a

minimal cohort of fourth year students from the pilot study. Approaches WSA3A, WSA3C and WSA3E represent identified approaches going beyond the spectrum of the classification of the pilot study depicted in Figure 29.

10.6.2 Approach WSA3A: Process-Focused, Multidirectional & Independent, Schema-Based Category

Approach WSA3A, one of the two dominant and much-discussed themes, focuses on the process of design as multidirectional thematic units offered in the design studio. A major sub-theme in this categorized approach has focused on site analysis extending further to master-planning and urban analysis. The other major sub-theme has correlated architecture, history and society with the process of design. Approach WSA3A also represents the learning experiences that are centered on the design process as independent, schema-based approaches through two minor sub-themes that have focused on materiality and incorporation of technology in the process of design and the importance of collaborative group-based learning.

10.6.3 Approach WSA3B: Process-Focused, Holistic & Multidirectional, Independent Schema-Based Category

Approach WSA3B represents the other dominant theme—the continued role of the first year design principles and methods (DPM) coursework in architectural design. The students have focused on the analogue-to-digital transition within the process of design. This identified category represents holistic and multidirectional, independent and schema-based approaches through the role played by DPM in arriving at the final design solution. The design process has further looked at the importance of analysis from the macro-to-the micro level.

10.6.4 Approach WSA3C: Process-Focused, Pragmatic & Practical, Independent Schema-Based Category

Approach WSA3C, one of the three less-dominant themes, is the continued discussion on the role played by the design faculty as well as crit in the framework of the thematic design units in developing independent schema-based approaches. The faculty's role as a facilitator and crit is further exemplified through the guidance and critical analysis given in the process of design as pragmatic and practical approaches.

10.6.5 Approach WSA3D: Process-Focused & Product-Based, Theoretical & Practical, Independent Strategic Category

Approach WSA3D, the other less-dominant theme represents the underlying notions pertaining to the process of design as independent strategies propagated in the design studio at Welsh School of Architecture. This categorized approach focuses on the relevance of the design process and connecting it theoretically to current architectural

practice through the practicality of the design solution. Approach WSA3D further reinforces the focus on practice-based pedagogy inbuilt into the design process.

10.6.6 Approach WSA3E: Process-Focused, Experiential & Holistic, Independent Schema-Based Category

Approach WSA3E, a minor but much-discussed theme, explains the experiential and holistic transformation in the process of design. This identified category represents the integration of bridging the macro-to-the micro level contextual facets of architectural design by connecting the experiential and perceptual aspects within the thematic design units. These independent, schema-based approaches are based on specific thematic units offered in third year architectural designs.

10.7 Architectural Design Coursework in First Year M. Arch Program at WSA

Popularly termed as the 'sandwich year,' the first year of the M. Arch program at WSA (fourth year of the five-year B. Arch program) represents the "good balance between learning in practice and in the university" (Welsh School of Architecture., 2015). Design in practice with 60 credits is offered in first year M. Arch covering 50% of the overall 120 credits. Other required coursework including research preparation with 20 credits and reflective practice for 40 credits are also offered as per Figure 27. Students are required to take up full-time employment at architectural firms in the international context and are expected to visit WSA for short periods during the year. These visits coincide with the assessment on the course-development offered in the first year of M. Arch including "architectural design, technology, research, professional practice and building economics" through a design project developed in practice, as well as report-writing for the final dissertation (Welsh School of Architecture., 2015).

10.7.1 Summarized Discussion: First Year M. Arch Program Students' Learning Approaches at WSA

The collected data from the fourth year students suggests the importance given to the design process representing the *strategic-to-deeper* range through *schema-based* approaches in the 'year of architectural education in practice.' Approaches WSA4B, WSA4C, WSA4D, WSA4E and WSA4F represent the strategic-to-deeper range with the focus on *process-focused, theoretical* and *practical, experiential* and *holistic, pragmatic* and *multidirectional, independent* and *schema-based* approaches through design in practice. The role of the craft of making architecture through the *experiential* and *perceptual* approaches, together with the importance of design faculty and crit in developing the process of design and *collaborative* learning, represent the *strategic-to-deeper* range. The *strategic* range is represented by Approach WSA4A focusing on the process of design based on the first year coursework of DPM.

Categories identified in the 1st Year M. Arch	Nomenclature	Meta-categories	Position within Referential Facet in Outcome Space
DPM & Architectural Design as Process-Focused Practical Approach	Approach WSA4A	Process-Focused Holistic & Multidirectional Independent Schema	Strategic
Architectural Design Process as Craft of Making, Practice-Based & Grounded-in-Reality at Welsh School of Architecture	Approach WSA4B	Process-Focused Theoretical & Practical Independent –Schema	Strategic-to-Deep
Architectural Design as Process-Focused Experiential & Perceptual Approach	Approach WSA4C	Process-Focused Experiential & Holistic Independent Schema	Strategic-to-Deep
Tutor & Crit as Mold, Facilitator & Positive Experience in Architectural Design Process	Approach WSA4D	Process-Focused Pragmatic & Practical Independent –Schema	Strategic-to-Deep
Architectural Design as Product-based & Process-Focused Approach	Approach WSA4E	Process-Focused Multidirectional & Independent Schema	Strategic-to-Deep
Architectural Design Studio Culture as Enriching & Process-Focused Practical Approach	Approach WSA4F	Process-Focused Multidirectional & Independent Schema	Strategic-to-Deep

Table 44: Categorized Approaches to Learning in 1st Year M. Arch – WSA

Table 44 depicts the six identified categories from the first year M. Arch students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13) (Iyer & Roberts, 2014). These identified categories represent the design process centered on *multidirectional* and *practical, theoretical* and *holistic, pragmatic* and *experiential, independent* and *schema-based* approaches in architectural practice as well as 'research in practice.' The first year M. Arch classification has its starting point represented by Approach F of the pilot study (Iyer & Roberts, 2014) focusing on *process-focused, theoretical* and *practical, schema-based* approaches through their 'education in practice. Approaches WSA4A and WSA4C as well as WSA4D, WSA4E and WSA4F represent identified approaches going beyond the spectrum of the classification of the pilot study depicted in Figure 29.

10.7.2 Approach WSA4A: Process-Focused, Holistic & Multidirectional, Independent Schema-Based Category

One of the two dominant themes, Approach WSA4A, discusses the role played by the first year design principles and methods (DPM) coursework in the development of skills and crafts-based domains through multidirectional and holistic approaches in the process of design. This role is further explained through the transition from the analogue-to-digital domain and its relevance in current architectural practice. This identified category has further explored the contextual aspects as well as the macro-to-micro level connections in architectural design relevant as independent and schema-based approaches in the design process.

10.7.3 Approach WSA4B: Process-Focused, Theoretical & Practical, Independent Schema-Based Category

Approach WSA4B, the other dominant theme, represents the importance given to learning experiences drawn from the theoretical and practical domains in the preceding three years of architectural design at WSA, focusing on the design process of 'making Architecture.' There is further explanation on the craft of 'making' as independent, schema-based approaches within the practice-based pedagogy of WSA in promoting design-based to meet requirements of the profession.

10.7.4 Approach WSA4C: Process-Focused, Experiential & Holistic, Independent Schema-Based Category

Approach WSA4C, one of the two less-dominant but well-discussed themes is the continued and transformational nature of the design process, representing the experiential and holistic contextualization of architectural design as independent and schema-based approaches.

10.7.5 Approach WSA4D: Process-Focused, Pragmatic & Practical, Independent Schema-Based Category

The other less-dominant theme of Approach WSA4D is the continued discussion on the role design faculty and crit have played in the development of pragmatic and practical approaches based on the preceding three years of the program. This identified category represents independent and schema-based approaches.

10.7.6 Approach WSA4E: Process-Focused, Multidirectional, Independent Schema-Based Category

Approach WSA4E, one of the two minor themes, discusses the consistent balance between the process of design and its basis for the final design solution through multidirectional and independent, schema-based approaches.

10.7.7 Approach WSA4F: Process-Focused, Multidirectional, Independent Schema-Based Category

Approach WSA4F, the parallel minor theme, discusses the nostalgic connection with studio culture developed in the preceding years of the architecture program and connecting it to their current year of 'education in practice.' This identified category further reconnects the design process and the final solution through multidirectional and independent, schema-based approaches.

10.8 Architectural Design Coursework in Second Year M. Arch Program at WSA

The second year of the M. Arch program is based at Welsh School of Architecture, with the focus on the design thesis for 80 credits covering 66% of the overall 120 credits. Other required coursework including a dissertation worth 30 credits and practice

management and economics for 10 credits are also offered as per Figure 27. The students' are required to develop a design thesis based on the "units representing different themes and issues for contemporary architecture and urbanism" (Welsh School of Architecture., 2015). The second year M. Arch design coursework includes dissertation, advanced design incorporating technology through consultancy and design economics theory that are incorporated in the thesis.

10.8.1 Summarized Discussion: Second Year M. Arch Program Students' Learning Approaches at WSA

The data collected from the second year M. Arch students suggests the continued importance given to the design process through *schema-based* approaches in design thesis through the units offered. Approaches WSA5B and WSA5D represent the *strategic-to-deeper range* of approaches. There is still a focus on the role played by first year DPM and reinforcing the pedagogical identity of architectural design at WSA through *process-focused, holistic* and *intellectual, multidirectional* and *intellectual schema-based* approaches. The *deeper* range including WSA5A, WSA5C and WSA5E cover *process-focused, experiential* and *perceptual, idealistic* and *intellectual, independent* and *schema-based* learning approaches. The importance given to the design process through the *perceptual* and *experiential* approaches of understanding architecture, the integral role of the faculty and crit, and the importance of the research domain in the design coursework at WSA define the *deeper range* of approaches to learning.

Categories identified in the 2nd Year M. Arch	Nomenclature	Meta-categories	Position within Referential Facet in Outcome Space
Architectural Design as Integrated Development of Perceptual & Experiential Process-Focused Approach	Approach WSA5A	Process-Focused Experiential & Perceptual Independent Schema	Deep
DPM & Architectural Design as Analytical& Aesthetic, Conceptual & Abstract, Grounded & Context-Based, Process-Focused Practical Approach	Approach WSA5B	Process-Focused Holistic & Intellectual Independent Schema	Strategic-to-Deep
Faculty & Crit as Sounding Board in Architectural Design Process	Approach WSA5C	Process-Focused Idealistic & Intellectual Independent –Schema	Deep
Architectural Design Process in Design Studio as Reinforcing the Identity & Practice-Based Approach at Welsh School of Architecture	Approach WSA5D	Process-Focused Multidirectional & Intellectual Schema	Strategic-to-Deep
Architectural Design as Developing, Intellectual & Research Oriented Process-Focused Approach	Approach WSA5E	Process-Focused Intellectual Schema	Deep

Table 45: Categorized Approaches to Learning in 2nd Year M. Arch. – WSA

Table 45 depicts the five identified categories from the second year M. Arch students' learning experiences at WSA, mapped onto meta-categories based on the pilot study (Chapter 5, Section 5.5: Table 13) (Iyer & Roberts, 2014). These identified categories represent the *process-focused, intellectual* and *holistic* and *multidirectional, perceptual* and *experiential, idealistic* and *independent, schema-based* approaches through

research-oriented domains incorporated in the design process. Similar to the first Year M. Arch, the second year classification has its starting point represented by Approach F from the pilot study (Iyer & Roberts, 2014) with the emphasis on *process-focused, theoretical* and *practical, schema-based* approaches through design research and thesis. Approaches WSA5A, WSA5B, WSA5C, WSA5D and WSA5E represent identified approaches going beyond the spectrum of the pilot study, and representing dimensions including holistic, idealistic and intellectual approaches reflected within the design thesis depicted in Figure 29.

10.8.2 Approach WSA5A: Process-Focused, Experiential & Perceptual, Independent Schema-Based Category

The dominant theme of Approach WSA5A represents the continuation of the transformation in the process of design represented by the students' experiential and perceptual contextualization of architecture in their design thesis. This identified category has led to independent, schema-based categorized approaches.

10.8.3 Approach WSA5B: Process-Focused, Holistic & Intellectual, Independent Schema-Based Category

Approach WSA5B, one of the two less-dominant themes is the continued focus on the role played by the first year design principles and methods (DPM) coursework in enhancing the holistic and intellectual approaches as well as aesthetic, skills and craft-based domains within the process of design. This identified category is further based on the conceptual and abstract domains as well as the contextualization of architecture based on the DPM coursework.

10.8.4 Approach WSA5C: Process-Focused, Idealistic & Intellectual, Independent Schema-Based Category

Approach WSA5C, the other less-dominant theme, is the continued discussion of the role played by the design faculty and crit in architectural design for the preceding four years including their year of 'education in practice' in enhancing idealistic and intellectual, independent, schema-based approaches. This identified category represents the faculty, both external and within WSA, as well as the crit at regular intervals as sounding boards for their journey through the design thesis.

10.8.5 Approach WSA5D: Process-Focused, Multidirectional & Intellectual, Schema-Based Category

Approach WSA5D, one of the minor but forcefully-discussed themes, is about practice-based, multidirectional approaches in the process of design identified with pedagogy at the Welsh School of Architecture. The fourth and third year, Approaches WSA4B and

WSA3D, form the starting point for this continued discussion on the underlying design pedagogy adopted at the school.

10.8.6 Approach WSA5E: Process-Focused, Intellectual Schema-Based Category

Approach WSA5E, the other minor but forcefully debated theme, deals with the transformational nature of the design process with the focus on research-oriented domains and intellectual development in architectural design. This identified category is centred on the design thesis as an independent, schema-based approach.

10.9 Outcome Space: Classification of Approaches to Learning at Welsh School of Architecture, Cardiff University, UK
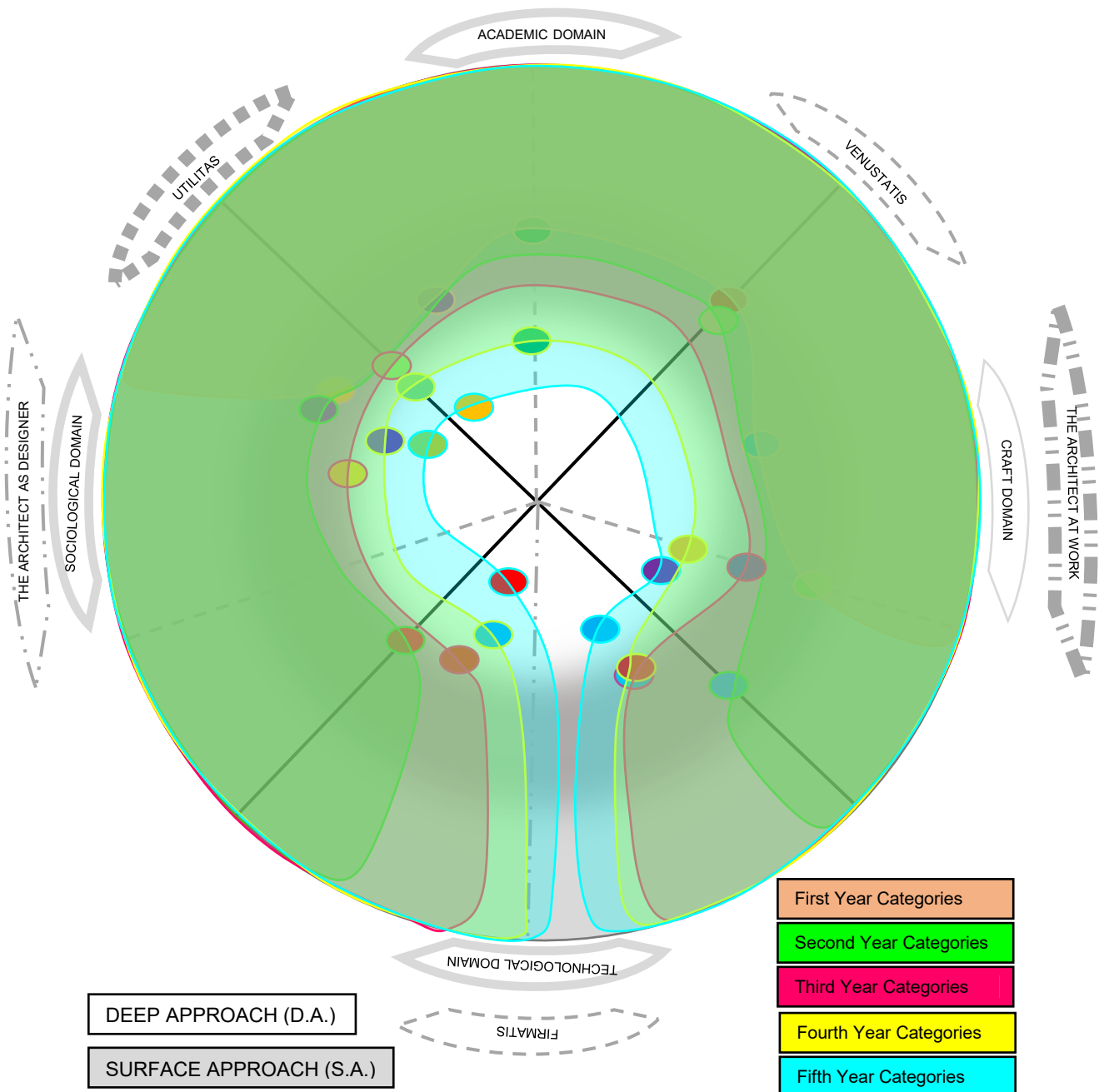
Figure 28: Outcome Space for Classification of Approaches to Learning in the B. Arch Program at Welsh School of Architecture, Cardiff University, UK

The outcome space for the five year learning approaches classification of architectural design at WSA is depicted in Figure 28. The Structural and Referential facets of the outcome space are based on Chapter 6, Section 6.11; Figure 17. The categories of learning approaches are depicted in Tables 41, 42, 43, 44 and 45, identified using phenomenographic analysis for WSA, as explained in Appendix VIII.

The categorized approaches depicted in Figure 28 represents the overall pedagogy of the five year design coursework at WSA, based on the overall summation of meta-categories in Table 46. These identified categories have evolved from product-focused and process-based, unidirectional and dependent strategies towards process-focused, multidirectional and independent, analytic and experiential schema-based approaches in the first year of the program. In the second year these categories continue to evolve from product-focused and process-based, unidirectional and analytic strategies towards process-focused, multidirectional and practical, independent and experiential, schema-based learning approaches. The third year reflects a transformation, from product-based, theoretical and practical, multidirectional strategies towards process-focused, holistic and multidirectional, pragmatic and experiential, independent and schema-based learning approaches within the thematic units offered in the design coursework.

The first year of the M. Arch program (fourth year) represents the process of design through reflective practice moving towards process-focused, multidirectional and practical, theoretical and holistic, pragmatic and experiential, independent and schema-based approaches to learning. This leads to process-focused, intellectual and holistic, multidirectional and perceptual, experiential and idealistic, independent and schema-based learning approaches in the second year of the M. Arch program (fifth year) at WSA.

The question of why the outcome space at WSA (Figure 28) has developed as well as the influence of the curriculum and design pedagogy is explained through illustrative accounts of the approaches of learning undertaken by nine architecture students in Chapter 11. These classified meta-categories at WSA have been further reflected as summarized architectural experiences of students in Chapter 12, Section 12.4.Figure 29 depicts the learning approaches classification of Welsh School of Architecture, Cardiff and is further correlated to the six categorized approaches from the earlier pilot study (Chapter 5, Table 13) (Iyer & Roberts, 2014). There is further comparison with the fashion design studies (Bailey, 2002; Drew et al., 2001) and the initial phenomenographic text-based studies at the University of Gothenburg (Marton & Säljö, 1976) on deep and surface approaches to learning.
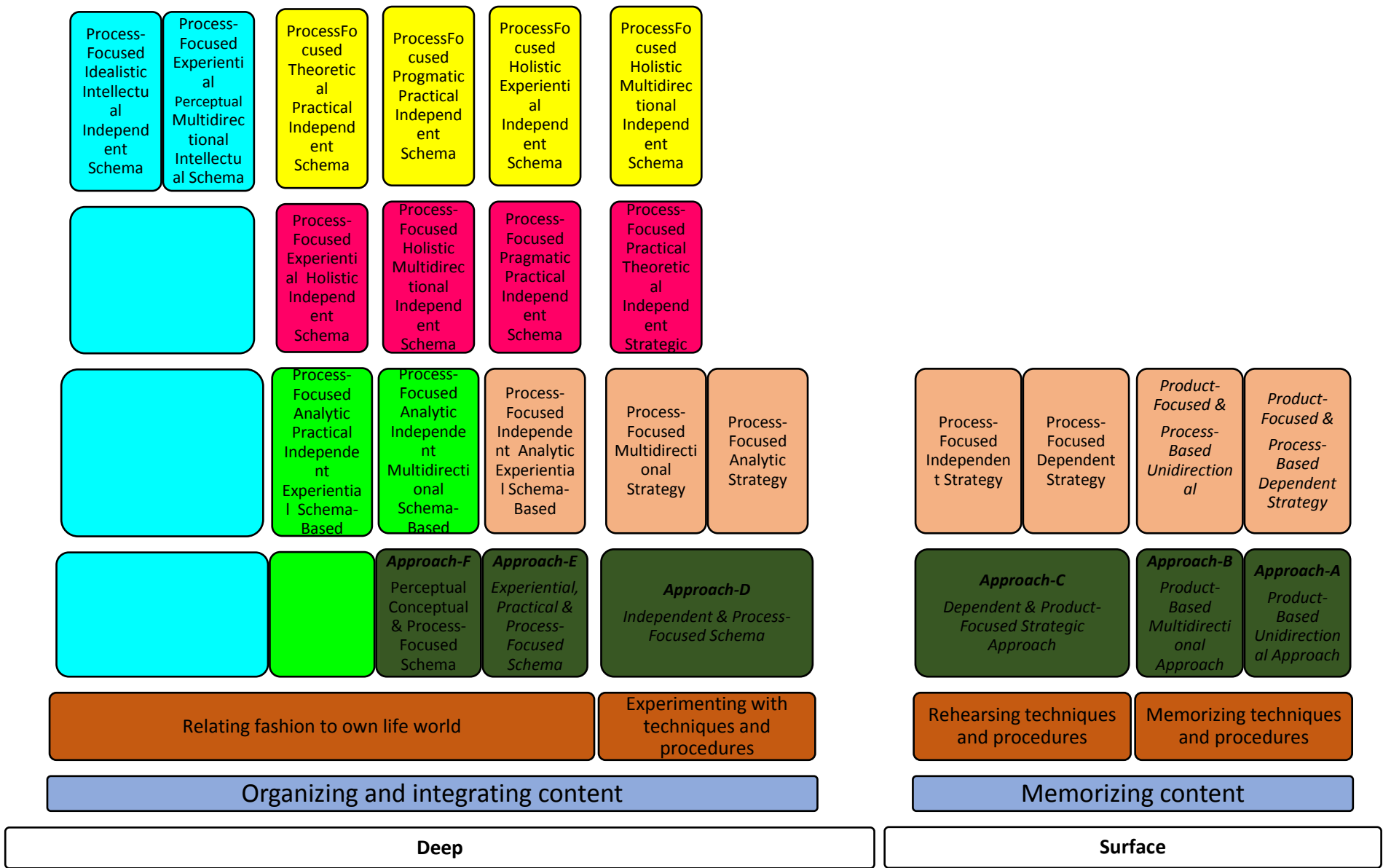
Figure 29: Chart explaining Classification of Approaches to Learning from Text-Based Fields (Marton & Säljö, 1976), Fashion Design (Bailey, 2002; Drew et al., 2001), the Earlier Pilot Study (Iyer & Roberts, 2014) and *Emerging Classification based Figure 19 Outcome Space of the Five-Year Design Coursework (First, Second, Third, Fourth, Fifth) at Welsh School of Architecture, Cardiff University, UK*

Year	Approach	Category	Sub Theme Description Major to Minor	Meta-Category	Structural Facet (Domain)	Referential Facet (Approaches)
1	WSA1A	Evolving Perceptions of Architectural Design Studio as Skills & Craft-Based Process & Product-Focused Approach	Evolution of design process / The craft of making architecture / Acquiring drafting skills for the process of design / Focusing on final solution	Product-Focused & Process-Based Unidirectional Schema	Academic – Aesthetic Craft-Based Technical	Surface-to-Strategic
	WSA1B	Learning, Working & Exploring the Architectural Design Studio as a Collaborative Group of architecture students	Transition of working and exploring the design studio / Collaboration amongst groups of students	Product-Focused & Process-Based Multidirectional Strategy	Aesthetic Craft-Based Technical	Strategic
	WSA1C	Faculty as Scaffold in Understanding Architectural Design as Process-Focused & Product-Based Approach	Guide in craft of making and acquiring drafting skills / Articulation and communication on the design process / Reinforcing understanding of architectural language	Process-Focused & Product-Based Dependent-Strategy	Aesthetic Craft-Based Technical - Functional	Surface-to-Strategic
	WSA1D	Exploration of DPM & Architectural Design as Process-Based Approach	Medium of exploration, experimentation and foundation / Important role in development of design process	Process- Based Analytic & Independent Schema	Academic - Utility	Strategic
	WSA1E	Experience of Conceiving Design through Architectural Design Process	evolution and continued focus on developing design process in multiple architectural contexts	Process-Focused Independent & Experiential Schema	Academic – Utility Sociological	Strategic
	WSA1F	Inculcating a Studio Culture and evolving a sense of experience within Architectural Design	Development of studio culture in first year	Process-Based Multidirectional Strategy	Aesthetic - Academic Utility	Surface-to-Strategic
2	WSA2A	Architectural Design as Experience-Based & Evolving Perceptions of Architecture through Exploration of Materials, Technology & Precedent Studies with Macro & Micro Scale Master Planning Studies as Process-Focused Approach	Evolving perceptions of architecture in design process / Importance of precedent studies / Importance of macro & micro scale master-planning studies / Focus on micro-level including exploration of materials and architectural technology	Process-Focused Analytic & Practical Independent & Experiential Schema	Technological Sociological Functional	Strategic-to-Deep
	WSA2B	Architectural Design as Process-Based Analogue & Digital, Multi-Layered & Collaborative Process in Design Studio as Product-Focused Approach	Design process described from analogue as well as digital domain / Studio culture through collaborative and peer-based learning / Focus on final solution based on design process of design	Product-Focused & Process-Based Multidirectional & Independent Schema	Craft-Based Technical Functional Technological	Strategic
	WSA2C	DPM & Architectural Design as Process & Product-Focused Approach	Role of DPM in the 'making of Architecture' / Final design solution as visual and aesthetic values embedded in design process	Process & Product-Focused Analytic & Multidirectional Independent Schema	Academic – Aesthetic Craft-Based Technical	Strategic
	WSA2D	Faculty & Crit as Scaffold, Checkpoint & Evolution of Architectural Design Process	Crit as checkpoint in the design process is balanced by faculty's role as providers of knowledge	Process-Focused & Product-Based, Independent - Strategy	Academic – Utility Sociological	Strategic
3	WSA3A	Architectural Design as Group Collaboration, Site, Technology & Society-Based Process-Focused Approach	Focus on site analysis, master-planning and urban analysis / Correlating architecture, history and society / Focus on materiality and incorporation of technology / Importance of collaborative group-based learning	Process-Focused Multidirectional Independent Schema	Technological Sociological Functional	Strategic-to-Deep
	WSA3B	DPM & Architectural Design as Process-Focused & Product-Based Approach	Transition from analogue-to-digital domain / Design process towards final design solution / Analysis from macro-to-the micro level	Process-Focused Holistic & Multidirectional Independent Schema	Craft-Based Technical Functional Technological	Strategic
	WSA3C	Faculty & Crit as Guide & Facilitator in Architectural Design Process in Design Studio	Faculty's role as facilitator and crit through guidance and critical analysis	Process-Focused Pragmatic & Practical Independent –Schema	Academic – Utility Sociological	Strategic-to-Deep
	WSA3D	Approaching Architectural Design Process at Welsh School of Architecture	Focus on practice-based pedagogy inbuilt into the design process	Process-Focused & Product-Based, Theoretical & Practical Independent –Strategy	Craft-Based Technical Functional The Architect at Work	Strategic
	WSA3E	Architectural Design as Integrated, Experiential & Perceptual Process-Focused Approach	Integration of bridging the macro-to-the micro level contextual facets	Process-Focused Experiential & Holistic Independent Schema	Utility – Sociological The Architect as Designer	Strategic-to-Deep
4	WSA4A	DPM & Architectural Design as Process-Focused Practical Approach	Development of skills and crafts-based, multidirectional and holistic approaches in design process / Transition from analogue-to digital domain & relevance in current architectural practice / . Explore contextual aspects as well as macro-to-micro level connections	Process-Focused Holistic & Multidirectional Independent Schema	Craft-Based Technical Technological Functional – The Architect at Work	Strategic
	WSA4B	Architectural Design Process as Craft of Making, Practice-Based & Grounded-in-Reality at Welsh School of Architecture	Design process of 'making Architecture' / the craft of 'making' in practice-based pedagogy of WSA	Process-Focused Theoretical & Practical Independent –Schema	Technological Sociological Functional – The Architect as Designer	Strategic-to-Deep
	WSA4C	Architectural Design as Process-Focused Experiential & Perceptual Approach	Continued and transformational nature of the design process	Process-Focused Experiential & Holistic Independent Schema	Academic – Utility Sociological The Architect as Designer	Strategic-to-Deep
	WSA4D	Faculty & Crit as Mold, Facilitator & Positive Experience in Architectural Design Process	Role of faculty & crit in preceding three years of program	Process-Focused Pragmatic & Practical Independent –Schema	Academic – Utility Sociological	Strategic-to-Deep
	WSA4E	Architectural Design as Product-based & Process-Focused Approach	Consistent balance between design process and its basis for the final design solution	Process-Focused Multidirectional, Independent Schema	Aesthetic – Craft-Based – Technical Functional	Strategic-to-Deep
	WSA4F	Architectural Design Studio Culture as Enriching & Process-Focused Practical Approach	Nostalgic connection to studio culture in preceding years and connection to current year of 'education in practice'	Process-Focused Multidirectional, Independent Schema	Aesthetic - Academic Utility	Strategic-to-Deep
5	WSA5A	Architectural Design as Integrated Development of Perceptual & Experiential Process-Focused Approach	Continuation of the transformation in design process representing experiential and perceptual contextualization of architecture	Process-Focused Experiential & Perceptual Independent Schema	Technological Sociological Functional The Architect as Designer	Deep
	WSA5B	DPM & Architectural Design as Analytical& Aesthetic, Conceptual & Abstract, Grounded & Context-Based Process-Focused Practical Approach	Conceptual and abstract-based as well as contextualization of architecture	Process-Focused Holistic & Intellectual Independent Schema	Craft-Based Technical Technological Functional The Architect at Work	Strategic-to-Deep
	WSA5C	Faculty & Crit as Sounding Board in Architectural Design Process	Faculty as well as crit as sounding boards in journey through design thesis	Process-Focused Idealistic & Intellectual Independent –Schema	Academic – Utility Sociological	Deep
	WSA5D	Architectural Design Process in Design Studio as Reinforcing the Identity & Practice-Based Approach at Welsh School of Architecture	Underlying design pedagogy adopted at Welsh School of Architecture	Process-Focused Multidirectional & Intellectual Schema	Craft-Based Technical Technological The Architect at Work	Strategic-to-Deep
	WSA5E	Architectural Design as Developing, Intellectual & Research Oriented Process-Focused Approach	Transformational nature of design process with focus on research-oriented domains	Process-Focused Intellectual Schema	Academic – Utility - Sociological	Deep

Table 46: Summation of Meta-Categories and Categorized Approaches to Learning in Architectural Design Coursework from 1st to 5th Year of B. Arch at Welsh School of Architecture, Cardiff University, UK

(The colors depicting categorized approaches represent their placement in Figure 28 (Outcome space) and Figure-29 (Meta-categories) with each year depicted in specific colors. Major-to-Minor Sub-themes are depicted in Grey-scale)

Chapter 11: Classification of Approaches to Learning in Architectural Design – A Discussion

The previous chapters have outlined how students' approaches to learning develop in the course of their studies at the four selected institutions. Figures 19, 22, 25 and 28 are diagrammatic representations of the classification of learning approaches for each institution within the phenomenographic outcome space derived from Figure 17 (Chapter 6, Section-6.11).
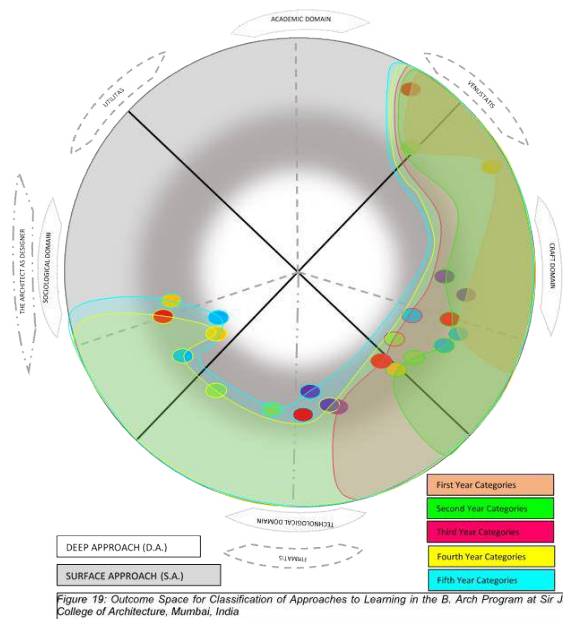
Figure 19: Outcome Space for Classification of Approaches to Learning in the B. Arch Program at Sir J.J. College of Architecture, Mumbai, India

Figure 22: Outcome Space for Classification of Approaches to Learning in the B. Arch Program at School of Architecture, Oklahoma State University, Stillwater, Oklahoma
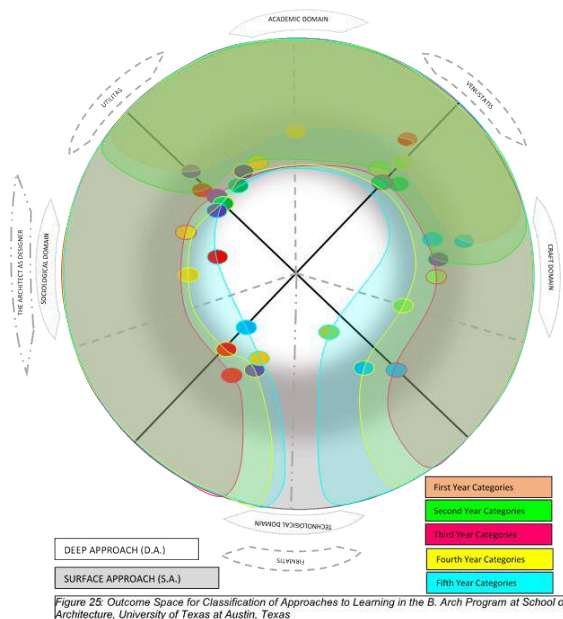
Figure 25: Outcome Space for Classification of Approaches to Learning in the B. Arch Program at School of Architecture, University of Texas at Austin, Texas

Figure 28: Outcome Space for Classification of Approaches to Learning in the B. Arch Program at Welsh School of Architecture, Cardiff University, UK

Based on these diagrammatic representations, the classified results of the University of Texas (UTA) (Chapter 9, Figure 25) and the Welsh School of Architecture (WSA) (Chapter 10, Figure 28) are seen to depict *broad* and *holistic* architectural education

(*structural* facet) in first year leading to *deeper* approaches in fifth year (*referential* facet) of the program. Is the *deeper-holistic* dimension being depicted in both these institutions where the focus is on the whole curriculum? (Chapter 2, Figure 5) (Ramsden, 1992).

Similarly the data suggests that *narrow* and *atomistic* curriculum of architecture in the first year leading to the *surface-to-strategic* range of approaches in the fifth year is depicted at Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ) (Chapter 7, Figure 19) and Oklahoma State University (OSU) (Chapter 8, Figure22). Is the *surface-atomistic* dimension being depicted in the other two institutions where the learning focus is on various segments of the whole picture, or the curriculum in its entirety? (Chapter 2, Figure 5) (Ramsden, 1992).

Ramsden has focused on the organization and structure in 'the act of experiencing' the learning approaches within the curriculum offered in the learning context (Ramsden, 1992). This study's learning context is depicted by the structural facet of the outcome space depicting the domains of knowledge of architectural design that refers to the holistic and atomistic dimensions. These classified results of the four institutions capture the meaning of 'that which is experienced' representing the range of the *surface-to-deeper* dimensions of the established learning approaches (Marton & Säljö, 1976; Ramsden, 1992) within the referential facet of the outcome space. These learning approaches used by the architecture students are further developed through the series of meta-categories identified within the classifications.

11.1 Phenomenographic Classification of Learning Approaches for the Four Institutions

It should be noted that phenomenographic classification does not cater for the linking of pedagogy with identified learning approaches in this study. Research linking pedagogy and learning approaches would be the thesis for a separate, future study. However, in the second paragraph of each institution's classification, the pedagogic stages which link learning evolution over the five-year programs are described.

The results suggest that approaches to learning at Sir JJ College of Architecture are characterized by an evolution from *product-based, dependent strategies* in the first year; to *product* and *process-focused, dependent* strategies in the second year. These categories are evolving to *process-focused, independent* and *uncritical strategies* in the third year; further leading *to process-focused, independent* and *critical, schema-based strategies* in the fourth and fifth year. The categories depicted in Figure 19 (Chapter 7) are the representation of the overall pedagogy of design across the five year B. Arch

program at Sir JJ. The focus of architectural design is largely centered on the design and development of the building within the context of the brief offered.

The Sir JJ student's learning experience represents the evolution of the basic understanding of the design process, its application and practicality by focusing on the design solutions that are product-based approaches in architectural design to process-based strategies in the first year. These include the use of the faculty's instructions and directions in the second year as learning strategies in understanding the process of design. The third year represents the stage of independent learning strategies through self-determined steps undertaken, based on the backdrop of faculty instructions and guidance, with the singular focus on the building, together with the architectural development. The fourth and fifth year, that includes the semester dedicated to internship, has depicted the evolution towards critically understanding architecture as schema-based approaches. There is a continued focus given to the design process of the building and architectural development through self-introspection regarding the aesthetics, functionality and utility domains of knowledge through schematic design development leading to the final solution.

The results further suggest that learning approaches at the School of Architecture, Oklahoma State University (OSU) have evolved from *product-focused* and *process-based, dependent strategies* in the first year, to *product* and *process-focused, unidirectional* and *independent strategies* in the second year. The third year represents the continued evolution towards *multidirectional and independent, uncritical strategies* leading to *process* and *product-focused, independent* and *critical, schema-based strategies* in the fourth and fifth year. The three phases of the curriculum at OSU have focused on the design studio and the program offered, with specific interventions through group-based collaborative design process concerning the project and its connection to current practice. The identified categories in Figure 22 (Chapter 8) represents the pedagogy of design across the program at OSU. The design process is the point of focus based on building development in the context of current practice central to the brief provided.

The OSU student approaches learning by understanding the design process through the aesthetic and craft-based development of architectural design through product-focused first year assignments on the elements and principles of design. The development of the notion of the architect at work in the design coursework is focused on the design process, with prominence given to the craft of making through faculty's instructions. This leads to independent learning approaches in the second year. Group-

based work and collaborative learning are the hallmark of the third year with the learning evolution moving towards developing the building design for current architectural practice. The fourth and fifth year represent the reinforcement of this collaborative learning process, with the student involved with faculty in developing architectural solutions for professional consultancies by working as a part of the team.

The results suggest that approaches to learning at the School of Architecture, University of Texas at Austin (UTA) depicted in Figure 25 (Chapter 9) have evolved from *product-focused, dependent* and *unidirectional* approaches to *process-focused, independent* and *analytic strategies* in the first year, developing to *process-focused* and *independent, analytic* and *multidirectional strategies* in the second year. The use of the third year 'sound building studio' (see Section 9.6) has led to *independent* and *analytic, theoretical* and *pragmatic strategies* in addition to *experiential* and *multidirectional, schema-based* approaches. The use of the fourth year 'advanced design studio', (see Section 9.7) which enables students to combine the elements of a thorough building design leads to *analytic* and *intellectual, perceptual* and *experiential, multidirectional* and *schema-based strategies* leading on to *idealistic* and *multidirectional, schema-based* approaches in the fifth year.

The student at UTA typically approaches learning through the aesthetic and craft-based development of the design process, with evolution towards independent learning through multidirectional strategies connected to the issues discussed in the current practice, and through the steps undertaken at various stages of the design process. The second year reflects comprehensive developments focusing on the technical domain, with students evolving their learning approaches from the analogue to digital medium in the architectural design process. At this stage, the students have been grounded in the theoretical domain of architectural design both from a historic and a technological perspective. The student further evolves through learning approaches focusing on design development from the macro-to-micro context of the third year design brief, requirements and measurable learning outcomes. The student is expected to develop the technical, technological and sociological domains of knowledge required in architectural practice. The fourth and fifth year represents the advancement within the student's learning approaches utility and functional domains on one end of the spectrum through intellectual approaches. This is combined with the notion of architect as the designer where the drawing, the atmosphere, and the communication of the architectural language is referred through idealistic approaches in architectural design.

The results further suggest that learning approaches at the Welsh School of Architecture (WSA), Cardiff University depicted in Figure 28 (Chapter 10) evolve from *product-focused* and *process-based, unidirectional* and *dependent strategies* towards *process-focused, multidirectional* and *independent, analytic* and *experiential, schema-based* approaches in the first year. The second year approaches evolve further towards *process-focused, multidirectional* and *practical, independent* and *experiential, schema-based* approaches. The third year represents the transformation towards *process-focused, holistic* and *multidirectional, pragmatic* and *experiential, independent* and *schema-based* approaches based on the specific intervention of thematic units offered in architectural design. The first year M. Arch program (fourth year) represents the design process through the other specific intervention of 'education in practice' tending towards *process-focused, multidirectional* and *practical, theoretical* and *holistic, pragmatic* and *experiential, independent* and *schema-based* approaches. The second year M. Arch (fifth year) further represents this transformation towards *intellectual* and *holistic, multidirectional* and *perceptual, experiential* and *idealistic, independent* and *schema-based* approaches.

The first year WSA student represents the architectural development from one end of the spectrum of 'making Architecture' where the focus of learning evolution begins with the craft-based domain, evolving towards the academic and technical domain. The student may also display evolution within the sociological domains in architectural design moving on to the academic and technical domain is because the first year design development is a wholly-rounded process where skill-based and contextual studies of architectural design are reflected in the student's learning approaches. The second year represents the reinforcement of development of the Vitruvian triad of utility, functionality and aesthetics, with integration of technology into the architectural design development and further emphasis on the transition from the analogue to digital medium. The WSA student evolution in the third year is represented by the introduction of thematic units and the specific interventions of the technological and sociological domains through design development focusing on construction and systems on one end of the spectrum with the other focusing on the built environment and urbanity. The WSA student utilizes the three years of learning development in the fourth year towards its applicability in the architectural professions through the year of 'education in practice.' This represents the connection of these architectural domains of knowledge with the profession together with their independent design project which they need to develop. This culminates in the fifth year of the program, that balances the development of the research-based thesis and the design dissertation. The WSA student's learning approaches classification

represents the overall amalgamation of the evolution required within architectural design in the five years of the program.

The overall learning approaches classification of the four institutions represents the larger canvas of the students' cohort through meta-categories within architectural education depicted in Figure 30. Individually, specific students in any of the institution are developing their learning in architectural design through this larger canvas. The evolution of these approaches through the five year program is designated through the established surface and deeper dimensions (Marton & Säljö, 1976) together with the strategic dimension (J. Biggs, 1979) of learning approaches.

Based on this overall classification from the final study of the four institutions and its comparison with the earlier pilot study, fashion design studies and text-based studies (Bailey, 2002; J. Biggs, 1979; Drew et al., 2001; A. Iyer, 2015; Iyer & Roberts, 2014; Marton & Säljö, 1976), this research has presented a wider spectrum of learning approaches within the established surface and deeper dimensions depicted in Figure 30. This summation of the identified meta-categories from the text-based, fashion design, pilot as-well-as the final study is signified in specific colors, including each of the five years of the B. Arch program. The pilot study has identified six Approaches A to F that fall within the surface-to-deeper range (Chapter 5, Figure 17) (Iyer & Roberts, 2014). Figure 30 depicting the overall summation represents this multi-tiered canvas. Learning approaches within the strategic-to-deeper range are represented by categories that go beyond Approach F, the *process-focused, perceptual* and *conceptual, schema-based* category identified in the pilot study (Chapter 5, Figure 17) (Iyer & Roberts, 2014).

This canvas is based on Figures 19, 20(Chapter 7), 22, 23(Chapter 8), 25, 26(Chapter 9), 28, 29(Chapter 10) and is depicted as the overall summation in Figure 30. The identified meta-categories in the summated overall canvas of the four institutions vary as per the years of study depicted by colors in multi-layered boxes. The multiple tiers of the final study are based on the comparison to the surface-to-deeper range identified in the earlier pilot study, fashion design studies and text-based studies (Bailey, 2002; J. Biggs, 1979; Drew et al., 2001; A. Iyer, 2015; Iyer & Roberts, 2014; Marton & Säljö, 1976).
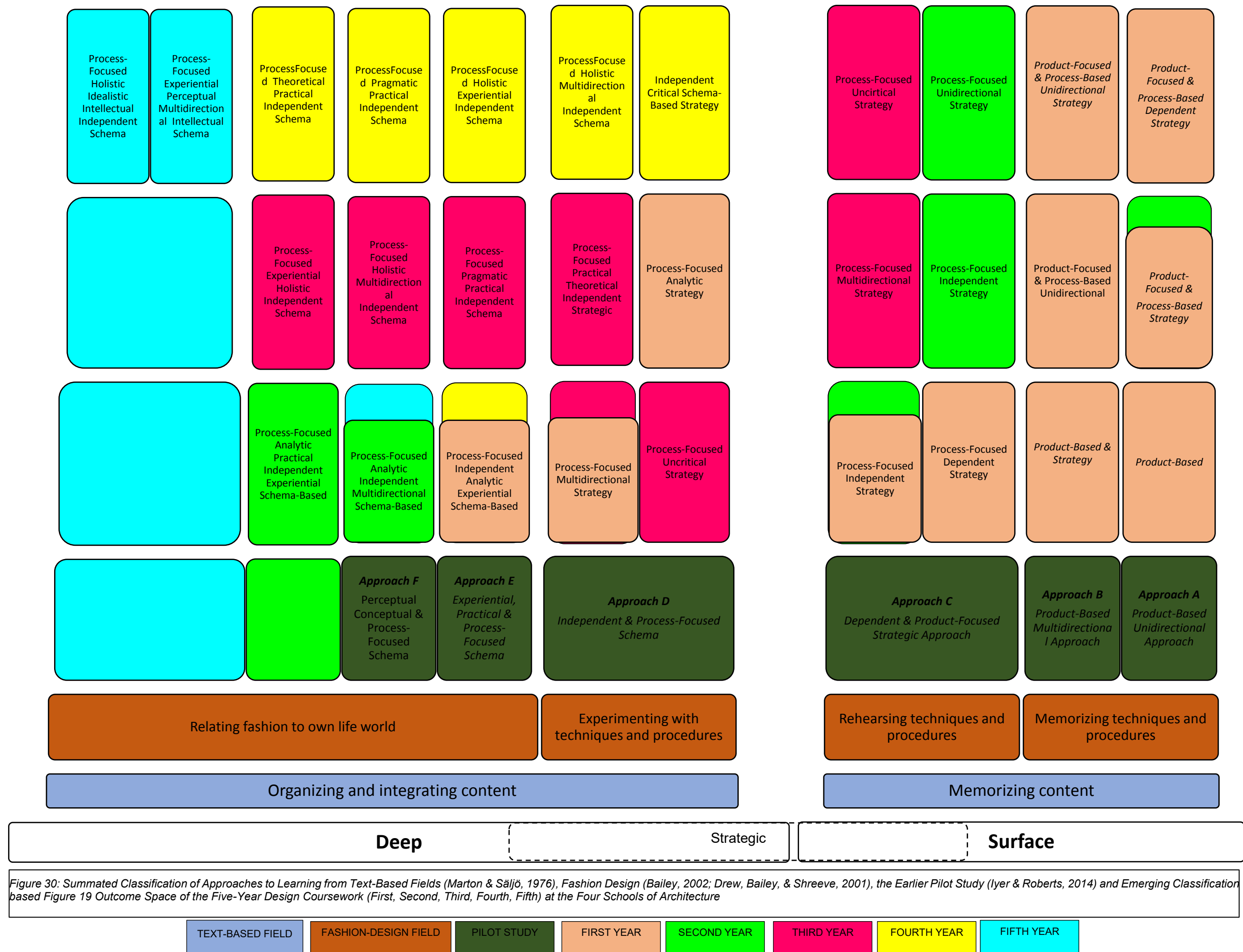
Figure 30: Summated Classification of Approaches to Learning from Text-Based Fields (Marton & Säljö, 1976), Fashion Design (Bailey, 2002; Drew, Bailey, & Shreeve, 2001), the Earlier Pilot Study (Iyer & Roberts, 2014) and Emerging Classification based Figure 19 Outcome Space of the Five-Year Design Coursework (First, Second, Third, Fourth, Fifth) at the Four Schools of Architecture

11.2 How do Architecture Students Approach Learning in Design – A Discussion

This research has raised the question of what are the typical ranges of approaches that students might adopt in their design coursework in the five-year program. The answer is explained through the journey taken based on the illustrative accounts of a number of students in their architecture program. Whereas the classified results within the four institutions has endeavoured to represent the overall learning development of a major cohort of students' approaching their learning in architectural design, individual student from any of these institutions would traverse their learning approaches through a range within the established surface and deeper dimensions. These include

- Surface range
- Surface-to-strategic range
- Surface-to-strategic-to-deeper range
- Strategic-to-deeper range
- Deeper range

In order to highlight the different approaches, this illustrative account of students has been drawn using the established surface-to-deeper range of learning approaches in the referential facet through the summated meta-categories in Figure 30 and correlating their learning experience through the classifications of the four institutions from the structural facet of architectural design.

11.2.1 Student of Architecture (1) - LAURA

Figure-31: Student (1) – LAURA :Approaches to Learning in the B. Arch Program
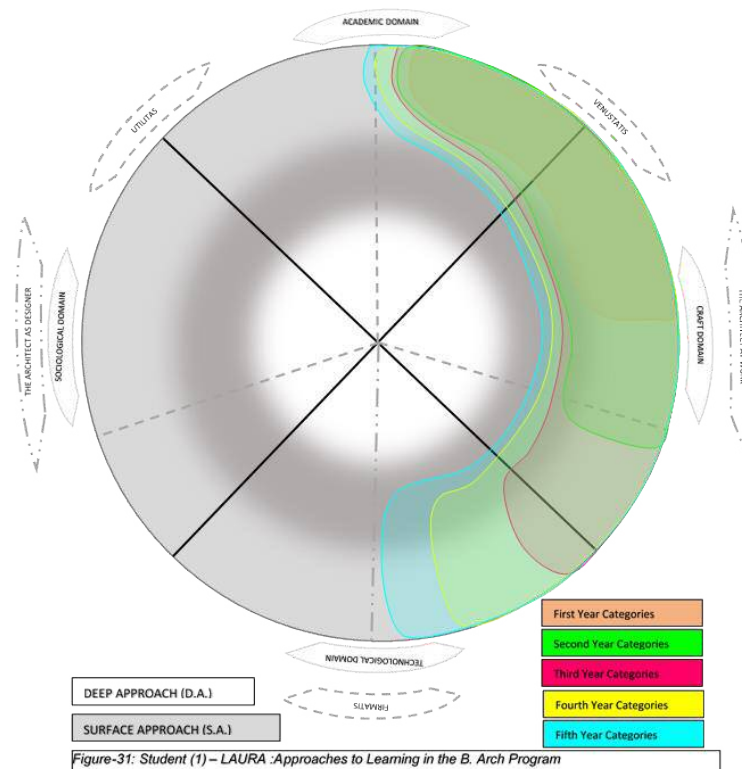
Laura represents the surface-to-strategic range of approaches depicted in Figure 31. Her focus in the first year is to develop the design project through aesthetic, academic

and craft-based domains of architectural design using product-focused and process-based approaches within the surface dimension. Laura evolves her approaches in the second year towards the technical and functional domains of the project offered, through product and process-focused strategies, using dependent and unidirectional approaches.

She continues the development in the third year through multidirectional and independent learning approaches by incorporating aspects of the functional and technological domains of architecture. The fourth and fifth year represents her reinforcement of the technical, technological and functional domains of architectural design through the project as-well-as program offered. Laura's learning approaches from first to fifth year traversing the surface-to-strategic range represents the importance given to preparing herself as 'the architect at work' with the focus on the requirements in current practice. She further reinforces the importance of working in the profession by developing her learning approaches towards the utility domain through the academic domain of architecture based on the theoretical input delivered within the program.

11.2.2 Student of Architecture (2) - JACK

Figure-32: Student (2) – JACK :Approaches to Learning in the B. Arch Program
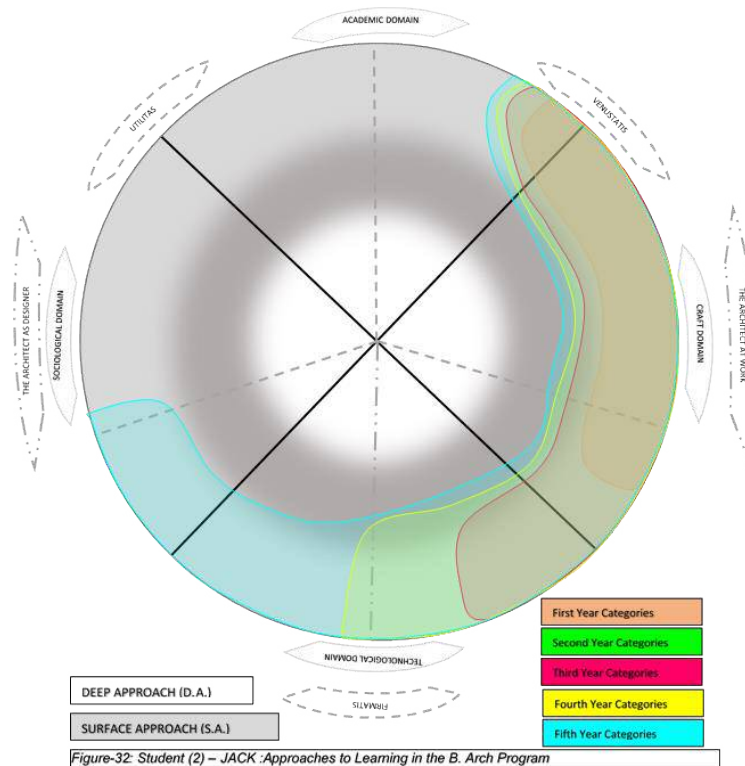
The surface-to-strategic range of learning approaches depicted in Figure 32 represents Jack. His focus in the first year to develop the academic and craft-based domains is balanced by the aesthetic and functional domains of architectural design through product-focused and process-based approaches. There is further evolution towards the technical and functional domains with Jack's focus on technology implementation

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related to the project offered in the second year. Product and process-focused strategies through independent and unidirectional approaches represent the evolution from the first to the second year.

Jack continues to develop his focus using multidirectional and uncritical strategies in the third year through the functional and technological domains of architecture. The fourth and fifth year of the program represents his continued focus on the technical, technological and functional domains towards the sociological and utility domains of architectural design through the program offered. Jack's learning approaches from first to fifth year are based on the surface-to-strategic range representing the balance between developing his profile as both 'the architect at work and architect as designer' and the focus on developing a portfolio for current practice. The sociological and the utility domains of architecture are traversed by Jack through the functional and technological domains based on the experiential and schema-based approaches within the surface-to-strategic range.

11.2.3 Student of Architecture (3) - MADDIE

Figure-33: Student (3) – MADDIE: Approaches to Learning in the B. Arch Program
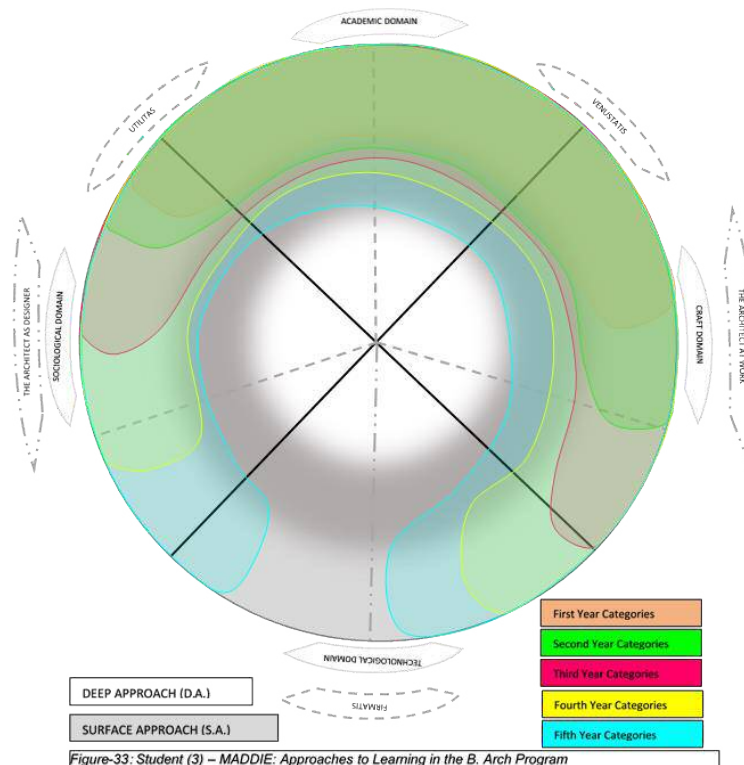
Maddie represents the surface-to-strategic-to-deeper range of learning approaches adopted by architecture students depicted in Figure 33. She has focused in the first year on developing the academic, craft-based and sociological domains by balancing the aesthetic and utility domains of architectural design. These surface-to strategic range of approaches have a continued focus on the product together with the design process through dependent and unidirectional strategies. There is further evolution in the second

year towards the technical and functional domains in addition to the sociological domain which is the basis of the program offered. Maddie has traversed these product and process-focused strategies through independent and analytic approaches.

The third year represents further development of the functional domain moving towards the technological domain on one end of the spectrum and from the academic-to-sociological domains on the other end, defining the architect's role at work and as the designer. Maddie has further focused on multidirectional and theoretical, pragmatic and experiential approaches for these process-focused, schema-based categories. The fourth and fifth year represent the strategic-to-deeper range, focusing on the technical, technological and functional domains together with the sociological and utility domains of architectural design. Maddie's learning experience from the first to fifth year through the surface-to-strategic-to-deeper range represents the amalgamation of architectural education from the professional requirements in current practice and the continued focus on her development as the designer. These process-focused, holistic and idealistic, perceptual and experiential, schema-based approaches represent the strategic-to-deeper range.

11.2.4 Student of Architecture (4) - SENURA

Figure-34: Student (4) – SENURA: Approaches to Learning in the B. Arch Program
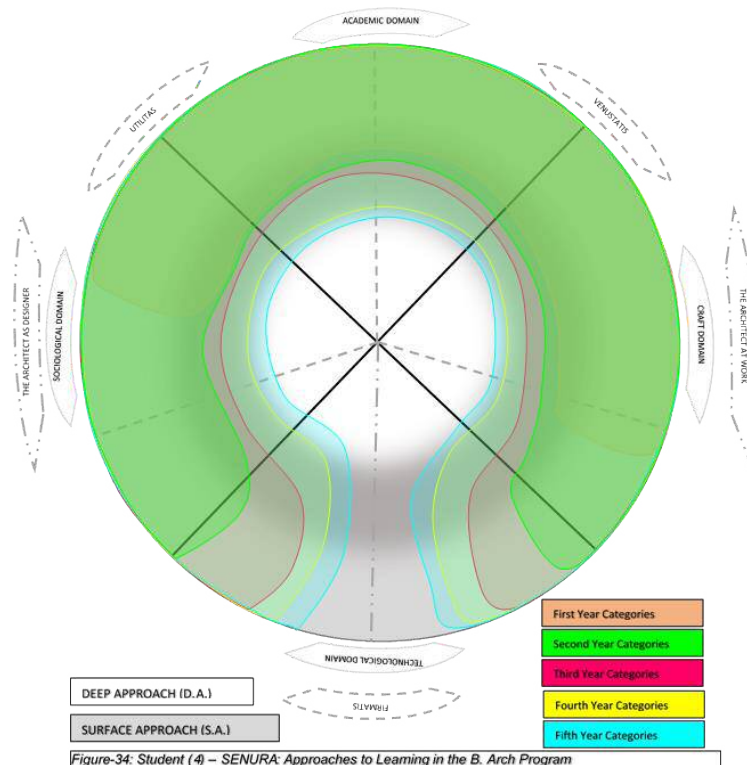
Senura represents the strategic-to-deeper range depicted in Figure 34. His overall focus in the first year is on the academic, craft-based and sociological domains by developing the aesthetic and the utility domains in addition to moving in the direction of the technical domain of architectural design. These first year surface dimension-based approaches

are evolving towards the strategic range with the continued focus on the process and product through dependent and unidirectional strategies towards independent and analytic, multidirectional and experiential, schema-based approaches. The second year represents the evolution towards the technological domain through the technical and sociological domains based of the program offered. Senura is continuing his focus on the process of design through independent and analytic, experiential and schema-based strategic learning approaches.

The third, fourth and fifth years of the program represent the strategic-to-deeper dimensions, with further evolution in the functional and technological domains through the sociological, academic, craft-based and technical domains, determining Senura's development as the architect at work and as the designer. His progress in the third year through theoretical and practical, pragmatic and experiential, holistic and multidirectional approaches is the continuation of these process-focused, independent and schema-based strategic categories. Senura's learning experience from the strategic-to-deeper range is further represented through intellectual and holistic, idealistic and experiential, schema-based approaches that promote both his development as an architect at work, and architect as designer .

11.2.5 Student of Architecture (5) - JULES

Figure-35: Student (5) – JULES: Approaches to Learning in the B. Arch Program
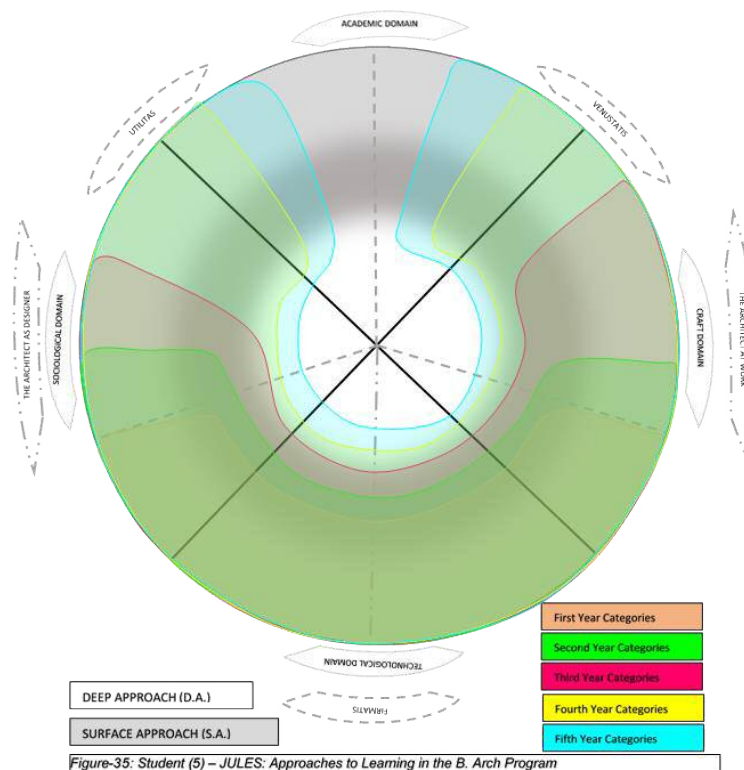
Jules is the other representation of the strategic-to-deeper range depicted in Figure 35 with the technology domain as the starting point. The first and second year is represented by the evolution from the technological and functional domains through the

technical and sociological domains in the surface-to-strategic range. The focus is on the process of design through independent and analytic, experiential and strategic learning approaches further developing the utility and the technical domains.

The third, fourth and fifth years of the program represent the strategic-to-deeper range through further evolution in the utility and technical domains in parallel to the sociological and craft-based domains amalgamating the development of Jules as the architect at work with that as the designer. The learning experiences through theoretical and practical, pragmatic and experiential, holistic and multidirectional approaches in the utility and sociological domains is balanced through the process-focused, independent and schema-based approaches within the aesthetic domain. The starting point for his learning is based on the technology together with the functional domains of architectural design.

11.2.6 Student of Architecture (6) - LARA

Figure-36: Student (6) – LARA: Approaches to Learning in the B. Arch Program
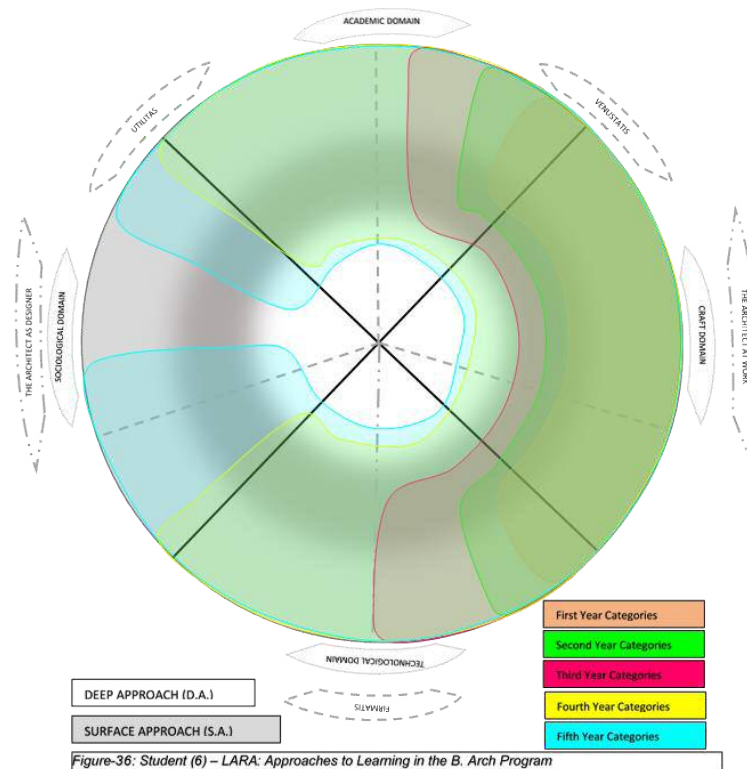
Lara is the third representation of the strategic-to-deeper range as depicted in Figure36 through the focus on the craft-based and technical domains. The first and second year is represented by the evolution from the aesthetic and functional domains through the technical as-well-as craft-based domains being central to the design coursework. Her focus on the process of design is through independent and analytic, experiential and strategic learning approaches, further developing the academic and the technological domains.

The strategic-to-deeper dimensions are represented in third, fourth as-well-as fifth year through further evolution in the functional and utility domains in parallel to the technological and academic domains, encompassing Lara's development as the architect as designer through the work environment, and moving towards the sociological and utility domains of architecture.

11.2.7 Student of Architecture (7) - IZZY

Izzy is the final representation of the strategic-to-deeper range depicted in Figure 37 through the focus on the sociological, technological and academic domains of architectural design. The first and second year is represented by the evolution from the utility and functional domains through the sociological domain, which she sees as central to architectural design.

Figure-37: Student (7) – IZZY: Approaches to Learning in the B. Arch Program
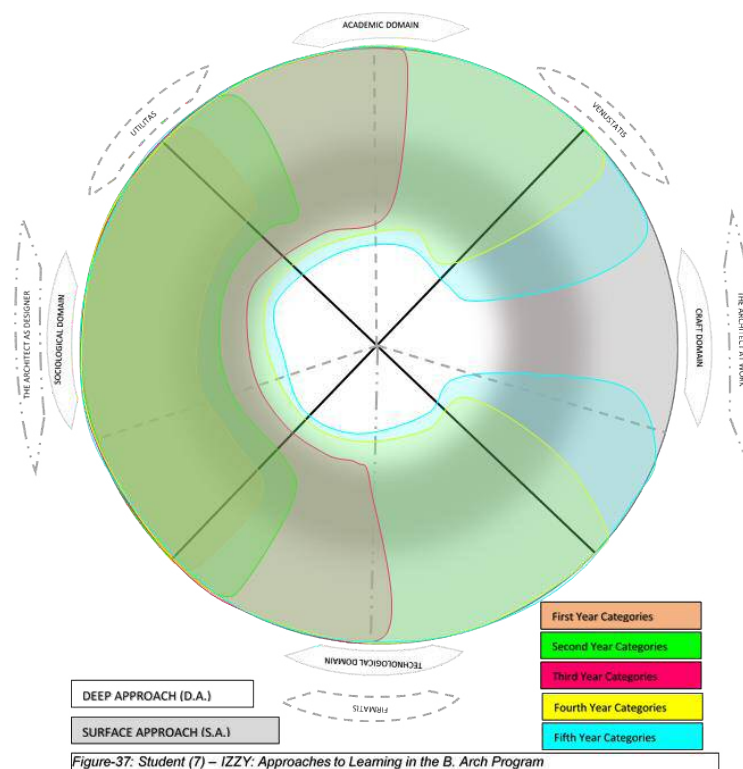
The strategic-to-deeper range represented in third, fourth and fifth year is through the evolution in the functional, utility and academic domains through the sociological, technological and academic domains, amalgamating in Izzy's development as the architect as designer. She further evolves her learning experiences within the work environment by developing further focus towards the technical and craft-based domains of architectural design.

11.2.8 Student of Architecture (8) - ALICE

Alice represents the deeper range of approaches depicted in Figure 38 not only through the focus on the aesthetic, functional and utility domains of learning architectural design but also through the academic, craft-based, technological and sociological domains of

understanding this coursework. The first and second year displays this evolution from the strategic-to-deeper range of approaches.

Figure-38: Student (8) – ALICE: Approaches to Learning in the B. Arch Program
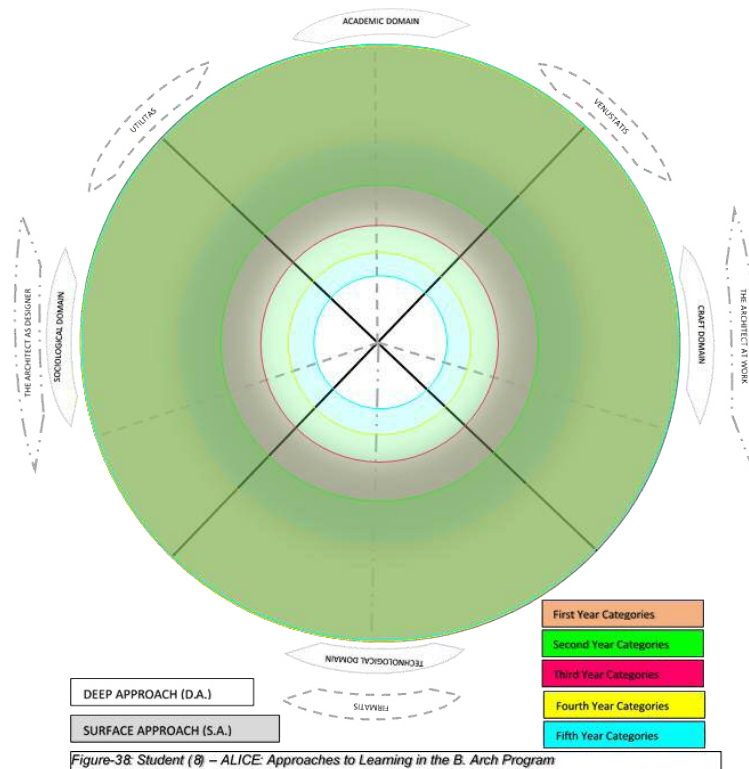
The third, fourth and fifth year represents the progression towards the deeper range in this evolution and development of Alice as 'the architect as designer as well as designer at work.' Students' approaches to learning should be based on the holistic development as represented by Alice at architectural institutions. But are these institutions encouraging students to learn and develop like her is the question to be looked into.

11.2.9 Student of Architecture (9) – JAMES

James represents the overarching problem facing architectural education today and this illustrative account falls within the surface range of learning approaches depicted in Figure 39. His focus is based on the academic and craft-based domains of architectural design.

James develops his learning experiences based on the aesthetic domain, at very few intervals in his five-year program touches some points of the functional and utility domains. The first, second, third, fourth and fifth year represents his progression at the surface dimension of learning to work as an architect. Evolution of James' learning approaches reflects the dichotomy within the emerging classification through the phenomenographic study conducted in the four institutions.
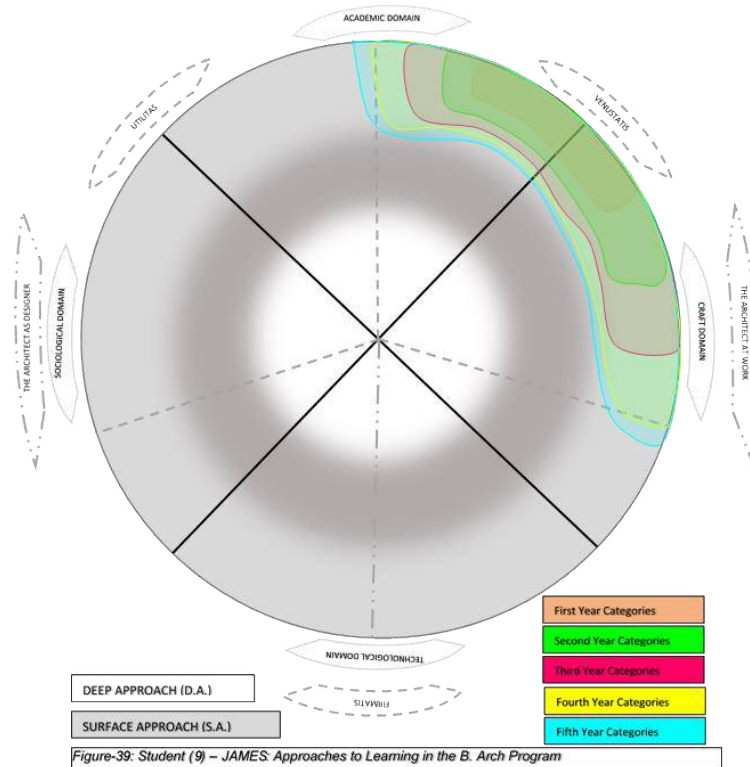
Figure-39: Student (9) – JAMES: Approaches to Learning in the B. Arch Program

11.3 Illustrative Accounts: Surface-to-Deep Dimensions

Laura (Figure 31), Jack (Figure 32), Maddie (Figure 33) and James (Figure 39) are illustrative accounts of architecture students whose features mainly depict the parallels to the surface-atomistic dimension by continuing their approaches to learning from the first-to-final year through various segments of the identified domains in architectural design (Figure 16, Sub-section6.10.2; Chapter 6) with the aim of working as architects in practice. These identified domains are depicted in Figure 16 representing the structural facet in this phenomenographic analysis.

Senura (Figure 34), Jules (Figure 35), Lara (Figure 36), Izzy (Figure 37) and Alice (Figure 38) are illustrative accounts that represent the deep-holistic dimension. These students depict learning approaches amalgamating a majority of the identified domains in architectural design (Figure 16, Sub-section-6.10.2; Chapter 6) with the aim to develop as designers in addition to working as an architect.

11.3.1 Surface Approaches to Learning in Architectural Design

The final and related question on the evolution of learning approaches from the first to fifth year of the program is based on the overall classification derived from the four institutions and its adoption by the series of fictional students. Laura (Figure 31), Jack (Figure 32) and James (Figure 39) represent the surface-to-strategic range, with their evolution from the first-to-fifth year more closely parallel to the classified results of Sir JJ

(Figure 19) and OSU (Figure 22). The pedagogy of architectural design together with the curriculum in these institutions has focused on training the students of architecture for the work environment.

Laura represents the surface-to-strategic range from an aesthetic and craft-based domain perspective with a balanced focus towards developing the technical and domains. Her learning approaches are product and program-focused, working towards technically perfect design solutions. Laura resembles a major cohort of students at OSU who are approaching learning in architectural design with the focus of the design pedagogy on current practice. Laura's inability to develop her learning approaches towards the sociological as-well-as utility domains of architectural design and develop the attributes as a designer is a reflection of the physical context of the institution in addition to the curriculum. In case of OSU, the rural context of Stillwater in Oklahoma, North America should be considered as a major factor in the resulting classification (Figure 22, Chapter 8).

Jack also represents the surface-to-strategic range with the aesthetic and craft-based domain as the starting point in architectural design. The pedagogical focus is on the development of the technical and technological domains, with input given by the design faculty. Jack represents a major cohort of students at Sir JJ who are approaching the design coursework based on the technical and skill-based requirements within current practice. His ability to develop the functional and technological domain and connecting to the sociological and utility domains represents the importance of the physical context of the institution. Sir JJ's location in the cultural and economic center of the city of Mumbai should be considered as a major factor in the classification results (Figure 19, Chapter 7). The other factor in the form of the curriculum within the surface-atomistic dimension, which reflects a parallel to the Sir JJ classification (Figure19, Chapter7) through Jack's illustrative account.

11.3.2 Deep Approaches to Learning in Architectural Design

Senura (Figure 34), Jules (Figure 35), Lara (Figure 36), Izzy (Figure 37) and Alice (Figure 38) represent the strategic-to-deeper range with their evolution from the first-to-fifth year representing parallels to the classified results of UTA (Figure 25) and WSA (Figure 28). Senura, Jules, Lara and Izzy display the academic, technological, craft-based, and sociological domains of architectural design as their starting point in the evolution of their learning approaches. Senura has focused on the aesthetic and utility domains, further evolving towards the functional as-well-as technological domains of the design coursework. His evolution parallels a major cohort of students at UTA where the

pedagogy as-well-as the curriculum is oriented with design as the center-point, in addition to theory of architecture, history and technology.

Lara with her focus on the craft-based, aesthetic and technical domains and Izzy's focus on the sociological, utility and functional domains in the first and second year, evolving further towards the other domains, reflect the major cohort of students at WSA. The pedagogical focus of design at WSA is on 'the making of Architecture' and contextual study at the physical, social and intellectual level, with further focus on 'education in practice' (Welsh School of Architecture., 2015). Lara and Izzy represent the WSA students' balanced evolution towards their development as 'the architect as designer' together with 'architect at work.'

Jules (Figure 35) has focused on the technological and functional domains representing the strategic-to-deeper range from the first-to-fifth year. His case is unique and represents parallels to specific students who were interviewed as a part of the classified results of UTA (Figure 25) and OSU (Figure 22) but were not included in the phenomenographic analysis. These students are from the architectural and civil engineering programs who join the architecture program in the second and third year with the aim of gaining a dual / twin degree. The learning classification and evolution of Jules also represents institutions where engineering and technology are the core programs with architecture emerging from that backdrop.

Maddie (Figure 33) represents the surface-to-strategic-to-deeper range with her evolution from the first to fifth year displaying parallels to the classified results of all four institutions. She represents a major cohort of students developing their learning evolution starting at the aesthetic, academic and craft-based domains in architectural design in the first and second year. These surface-to-strategic ranges further evolve towards the deeper dimension amalgamating the functional, technical and utility domains together with the technological and sociological domains of the coursework. Maddie represents students within architectural institutions including Sir JJ, OSU, UTA and WSA, with the strategic intent of developing herself as 'the architect as designer' as well as 'the architect at work.'

11.3.3 Illustrative Account vs Reality Check in Architectural Education

The illustrative account for Alice (Figure 38) represents the strategic-to deeper range, though she technically displays the deeper range in her learning evolution within the five-year program. The first and second year represents her evolution from the strategic-to-deeper range progressing to the deeper-holistic dimension, depicting the holistic development in the third-to-fifth year. This is probably the case for a few students within

the overall cohort studied within the six architectural institutions in the current research, when one includes the earlier pilot study (Rizvi and Manipal-India, Chapter 5) with the final study (Sir-JJ, OSU, UTA and WSA). The classified results of the four institutions do not display the learning evolution of Alice; she remains a theoretical construct. This could be the result of major factors that have an impact on approaches to learning, including design pedagogy, curriculum, studio environment, learning and teaching paradigm, within each institution. This should be a part of a future study that may subsequently enable institutions to develop approaches that produce more students like Alice.

This brings forward the case of James (Figure 39), the final illustrative account, which represents the surface range. The focus in evolving his learning strategies from the first-to-fifth year are confined predominantly to the academic, craft-based, technical and aesthetic domains of architectural design. James attempts to evolve his learning approaches further towards the utility and functional domains in the fourth and fifth year, but has developed himself to be part of the work environment through the specific skill-sets acquired from the architecture program. He represents a cohort of students from all four institutions studied, though Sir JJ (Figure 19) and OSU (Figure 22) more frequently represent similar learning evolution amongst their students' cohort in the first, second and third year of the program.

Chapter 12: Classification of Approaches to Learning in Architectural Design – The Conclusion

12.1 Conclusion – Classification of Learning Approaches in Architectural Design

Pevsner's (1943) argument of comparing a famous historic cathedral with a bicycle shed leading to the discussion on the distinction between 'architecture' and 'building' (Broadbent, 1988; Lawson, 2006) is echoed by these illustrative accounts with Alice, who is connected to the deeper-holistic dimension and James who represents the surface-atomistic dimension of architectural design. This well-discussed paradigm has resurfaced within this research.

This thesis has posed the central question on the students' approaches to learning in architectural design from the first to subsequent years of the program. This research has presented the overall canvas through the summation of meta-categories identified from the learning approaches' classification and results of the four institutions depicted in Figure 30 (Chapter 11). Whereas the established approaches to learning in text-based studies follows the surface-atomistic to deeper-holistic dimensions (Marton & Säljö, 1976; Ramsden, 1992) in addition to the strategic dimension (J. Biggs, 1979), studies in the field of fashion-design have identified four approaches (Bailey, 2002; Drew et al., 2001). The earlier pilot study which forms part of this thesis charting the variations and exploring the reasons for the differences encountered amongst first and fourth year students identified a wider series of six approaches to learning, falling within the 'surface-to-deeper' range. The final study at the four institutions has identified learning approaches for the five-year architecture program that represents a complex and multiple-tiered series of meta-categories falling within the surface-to-deeper range (Chapter 11, Figure 30).

The parallel question of how the students' learning approaches progress from the first to the subsequent years of the architecture program is presented through the results from the four institutions depicted in Figure 25 (Chapter 9), Figure 28 (Chapter 10), Figure 19 (Chapter 7) and Figure 22 (Chapter 8). This progression in the students' learning approaches in architectural design from the first to fifth year is represented by the transformation in the meta-categories towards the *deeper-holistic* dimension, or by their static continuation in the *surface-atomistic* dimension (Chapter 2, Figure 5) (Ramsden, 1992). The Surface-to-strategic-to-deeper range representing the referential facet in this phenomenographic analysis has been depicted through the classified results of the University of Texas (UTA) (Chapter 9, Figure 25) and the Welsh School of

Architecture (WSA) (Chapter 10, Figure 28) representing the *deeper-holistic* dimension (Ramsden, 1992). Similarly Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ) (Chapter 7, Figure 19) and Oklahoma State University (OSU) (Chapter 8, Figure22) have depicted the *surface-atomistic* dimension (Ramsden, 1992).

The final research question of how do approaches evolve in the architectural design coursework from the first to fifth year of the program has been represented through the complex and multiple-tiered series of meta-categories depicted in Chapter 11, Figure 30. This research has further presented this evolution from the first to fifth year through real world examples of the students' learning experiences analyzed using phenomenography and illustrated as nine students of architecture in Chapter 11, Section 11.2.

12.2 Architecture Students' Approaches to Learning within the Context of Scholarly Research

The current research on classification of students' approaches to learning in design coursework has attempted to fill the identified gap within scholarly research into students' approaches to learning in architectural education (de la Harpe & Peterson, 2009). The question regarding the identified meta-categories from the earlier pilot study and the final study, together with its continuum between the surface and deep dimensions (A. Iyer, 2015; Iyer & Roberts, 2014) has been answered through the overall summation in Figure 30 (Chapter 11) and further articulated through the case studies of the nine illustrative accounts depicted in Figures 31 to 39.

The classification of architecture students' learning approaches also emphasises the importance given to the 'content of student learning' and the application of knowledge in the abstract learning situation as well as in the context of practice (Gibbons et al., 2010; Ramsden, 1992). Barnett et al. have connected knowledge to students' learning through their engagement of 'knowing,' the skills acquired in this learning process leading them to 'acting' and the development of self-awareness leading to their 'being' in that contextual situation (Barnett, 2007).

12.3 Opportunities for Further Research in Approaches to Learning

The scope of this research and the framework undertaken for this phenomenographic classification has not catered to linking architectural pedagogy with the identified learning approaches. Future studies will need to link the findings of this research to pedagogy.

These classification results of the four architectural institutions together with the nine illustrative accounts of architecture students, represent the connection with the schema of engagement within the curricula through 'knowing, acting and being' proposed by Barnett et al. (Barnett, 2007). The architectural curricula are balanced by the beauty, functional and utility domains of knowledge in architectural design (Lawson, 2006; Rasmussen, 1964; Vitruvius, 1960, 1999). This study raises the prospects for further research on Barnett et al.'s schema and any perceived parallel to the results of Sir JJ (Figure 19), OSU (Figure 22), UTA (Figure 25) and WSA (Figure 28) (Barnett, 2007). This is in addition to the further studies on architectural curricula and its impact on students' learning through their engagement using the schema of 'knowing, acting and being' (Barnett, 2007).

The studies of surface vs. deep approaches within Asian Culture especially in Chinese students (J. B. Biggs, 2011; Marton & Booth, 1997; Moon, 2004) could be extended to the current research, to examine the variations in the learning approaches amongst Indian students to those of their Western counterparts in architectural education. Architectural Design studio-based education and deep approaches to learning and its connection to intrinsic and extrinsic motivation (Marton & Saljo, 1997) within the emerging students' classification is a further area to be studied.

Architectural education and collaborative learning that have emerged within the classified results and further connections to established research in higher education to place them within the surface-to-deeper dimension (Marton & Säljö, 1976) would further expand its relevance within architectural education. The data collected from the four institutions can be further studied through 'linguistic analysis' and mapped with the students' architectural work. This research is a starting point for further studies on the identified classifications of learning approaches through Outcome-Based Education (OBE) (J. B. Biggs, 2011) within the architectural context. Various educational models and tools involving qualitative, quantitative and mixed research methodologies from established research with in higher education can be used to accept, reject or add to the overall classification which this thesis has outlined (Chapter 11, Figure 30).

The literature review for the current research is based on established research into approaches to learning in other design fields, professional education and higher education. The current research represents the opportunity to fill a gap in this field through a series of research publications to review the results, and through obtaining feedback from the architectural research community. The data collected at the four institutions is a cross-section of the five-year architecture program that was collected in

one academic year. This research gives impetus towards further studies into the evolution of learning approaches from the first to fifth year of the program by mapping further cohorts of students involving a combination of research methods including phenomenography to either query, or to reinforce and ratify, the classified results of the overall classification (Chapter 11, Figure 30).

As discussed in Chapter 4, Phenomenography, the research methodology used in the current research is based on the process of discovery and the question of replicability as a reliability test for the qualitative research findings is therefore not applicable. The author has used the phenomenographic research method for analyzing student's approaches to learning, which can be considered as a starting point within pedagogical research in architectural education. Further review of this data using other research methods and tools of analysis, will help in the continuation of future research in the area of students' approaches to learning within the field of architectural education.

12.4 Students' Approaches to Learning in Architectural Design – A Reflection

Students' approaches to learning have been based on the question posed by many educators on how the students can be encouraged to become deep learners who actively engage with their learning in a search for meaning. This is considered as an opposite to surface learning where students aim to reproduce material without critical engagement and often through memorization. This distinction between deep and surface learning originally proposed by educational psychologists Ference Marton and Roger Säljö (Marton & Säljö, 1976) has been the starting point for this research.

Much of the early work, conducted by Marton and Säljö focused on studying how students approached the study of text-based materials. Whilst there will be elements of architectural education where this remains relevant, little has been written on how concepts of deep and surface learning might manifest themselves in design studio activities (A. Iyer, 2015; Iyer & Roberts, 2014). As an anecdote, most design faculty would be able to recognize students who actively engage in the studio and their design project work, and those who adopt a more passive approach to their studies. Through varied teaching and learning strategies, the students of architecture are constantly exposed to learning as an experience; familiar strategies including 'learning-by-doing,' 'self-learning,' 'reflecting on prior experiences' and 'reflection-in-action' represent these approaches in the deeper dimension (Bradley, 2000; Brown & Yates, 2000; Schon, 1983; Webster, 2000) suggesting that deep approaches to learning can be encouraged in the architectural design coursework within the design studio.

Students' learning approaches in architectural design has therefore being explored through two principal dimensions, the 'pedagogical' extrapolated in Chapter 3 and the 'learner' in Chapter 2. The pedagogical dimension reflects the values and interests of faculty, and the institution; effectively described as the content of the learning, and the methods adopted in the design coursework within the studio by the design faculty. The learner dimension refers to the different ways in which students approach their learning in response to that pedagogical context; in the current research being the architectural design coursework. This phenomenographic analysis of the classification of architecture students' learning approaches at the four international institutions using their experiential journey through the first to final year have mapped the pedagogical and learner dimensions.

Name of Institution	Total Credit Hours	% Credit Hours for Architectural Design Coursework	Courses / Core Modules in 5 Year Program
Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ) University of Mumbai - Mumbai, India	340	30 %	85 Courses
School of Architecture, Oklahoma State University (OSU) - Stillwater, Oklahoma, USA	154	32%	43 Courses
School of Architecture, University of Texas at Austin (UTA) – Austin, Texas, USA	161	33%	47 Courses
Welsh School of Architecture (WSA) - Cardiff, UK	600	63%	20 Core modules
Table 47: Curriculum structure at Four Institutions and % Credit Hours for Architectural Design Coursework			

Table 47 has presented the curriculum structure of the four institutions where two are from the North American educational context, and one each from the context of the United Kingdom and India. The data collection from the four institutions as case-studies were distinctively different. Welsh School of Architecture (WSA), UK in comparison to a more intimate rural American context of School of Architecture, Oklahoma State University (OSU) in Stillwater, Oklahoma, USA had very different urban and rural settings within the perspective of the western world. At the same time both WSA and School of Architecture, University of Texas at Austin (UTA) – Austin, Texas, USA have a comparable three-plus-two years structure for the Bachelor of Architecture program and are each located within the city centre that were local capitals of their respective regions/countries. The structure of the five-year programs of Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ) University of Mumbai - Mumbai, India and OSU were comparable, with a contiguous start-to-end structure, leading to the professional architectural degree.

In this study semi-structured interviews were conducted with students at each of the selected institutions. These were carried out by students at all levels of the architecture program to see how their approach changed as they progressed through their education.

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The interviews were phenomenographically analyzed and presented as a series of categories of description (Tables 25, 32, 39 & 46). These categories of description were represented graphically on a circular diagram (outcome space – Chapter 6, Figure 17) for each of the four institutions to show the range of approaches encountered, categorized by the pedagogical and learner dimensions; or the structural (Sub-section 6.10.2) and referential (Sub-section 6.10.1) facets. The quadrants of the circle highlighted the range of pedagogical sub-dimensions described by the students, whereas the learner dimension is graphically represented to be deeper, the closer it is to the centre of the circle.

Figure 19: Outcome Space for Classification of Approaches to Learning in the B. Arch Program at Sir J.J. College of Architecture, Mumbai, India

Figure 22: Outcome Space for Classification of Approaches to Learning in the B. Arch Program at School of Architecture, Oklahoma State University, Stillwater, Oklahoma

Figure 25: Outcome Space for Classification of Approaches to Learning in the B. Arch Program at School of Architecture, University of Texas at Austin, Texas

Figure 28: Outcome Space for Classification of Approaches to Learning in the B. Arch Program at Welsh School of Architecture, Cardiff University, UK

The outcome space classifications for the four institutions (Figures 19, 22, 25, 28) have graphically represented the students learning approaches depicted in the summated canvas depicted in Chapter 11, Figure 30.

Sir JJ (Figure 19) depicts the architecture student developing their design project work as a product, based on the various steps involved in building the solution by gaining the necessary skills in the first and second year with the help of design faculty peers from the senior years of the program. The third year represents an evolution with the student independently approaching the design project work based on the knowledge and skills gained. The fourth and fifth year represents the students developing their design project work based on the basic requirements of the profession to gain employment after the conclusion of the program. The goal of the curriculum is to develop an architect who has the knowledge, skills and self-awareness to work in the industry.

OSU (Figure 22) represents further evolution with the student developing their design project work based on the various steps as well as developing the necessary skills required but also creating an interface with the profession through the faculty based on the pedagogical requirements of the program. The third, fourth and fifth year represents the reinforcement of the students developing their design project work based on the requirements of the profession. The curriculum is playing a key role in the development of architects who knows their work and are in the process of acting through self-awareness of the work environment in the industry.

UTA Figure25) and WSA (Figure 28) represent the evolution of the architect student from surface learning towards deep learning with further transformation towards deep engaged learning. The student is grounded towards understanding the various contexts of the built environment including the knowledge required in architectural design through the process of experiencing architecture or 'knowing'. In addition to the development of their design project work based on the required design steps as well as the process, including the necessary skills; the student is engaged in the process from conceptual visualization to actual realization of the design solution or 'acting.' The curriculum and the pedagogy helps the student to be a part of this design process thus developing the architect as the designer as well as at work or 'being.'

It is apparent from the data that the four institutions highlighted in this research depict quite different approaches to both the pedagogical dimension and the learner dimension. It was clear from the data that different pedagogical sub-dimensions in each of the schools were leading to a different set of learner approaches. Surface approaches were typified by students either adopting a product focused approach (i.e. a desire to 'design a building' in isolation of its philosophical and pedagogic context), or adopting a process focused approach to design, following a contained set of rules in order to meet their objectives. At the surface level, students were often uncritical, and dependent upon

their tutors for direction. As students moved towards a deeper approach, the data showed evidence of a greater degree of independence, with focusing more holistically, considering multiple aspects simultaneously. Students with deeper approaches showed evidence of analytic, idealistic and intellectually independent thinking.

All four institutions showed evidence that students were reaching the deeper approaches to learning, although Sir JJ and OSU, where the pedagogic approach was focused largely on the craft domain, showed little evidence of students developing the sociological domain. There is little specific teaching covering the sociological domain in UTA and WSA, but students are typically reaching deep levels of engagement within the architectural design coursework. One possible explanation for this is that these institutions are providing the appropriate time and space in the curriculum to enable students to fully engage with the full extent of the design. In Sir JJ and OSU, there may be an overloading of courses designed to support design – which is having an unintended consequence of reducing the space available for engagement.

This research has endeavored to classify student's approaches to learning in their architectural design coursework. Whilst there is evidence of surface, deep and strategic learning in all four institutions, it is clear that further research is required in understanding the pedagogical and learner dimensions in architectural design education to further connect these findings (Chapter 11, Figure 30) to real world architectural design work and examples.

12.5 Implications of the Research on Students' Approaches to Learning in Architectural Design

This research on students' approaches to learning in the design coursework set out to map how individual student's learning develops within the international context in architectural education. Whilst there is evidence of deep learning in all four institutions, it is clear that the understanding of the deeper as well as surface approaches to learning varies qualitatively, both in the institutions where this research was conducted, but also in the larger context of architectural and higher education.

What is particularly notable is how in Sir JJ, despite having a very detailed curriculum with a large number of courses allied to architectural design is represented by the surface-to-strategic range of learning approaches amongst the students. In contrast WSA, which has the smallest number of supporting courses is appearing to have students' with the strategic-to-deeper range of learning approaches. Barnett and Coate have argued that in order to maximize the levels of students' engagement in the

approaches to learning, time and space must be provided within the curriculum to both, students and staff, the opportunities to actively engage within the learning context. The Greek agora and forum as a venue and space where engagement and collaboration can take place has been used as the metaphor here by defining the architectural design studio as both a physical and philosophical venue for engagement (Barnett & Coate, 2007).

This research suggests that in the complex canvas built around the repertoire of the existing pedagogical research in architectural design education, the classification of students' approaches to leaning is perhaps the starting point towards the understanding of the architectural design coursework. The focus should be less on providing additional coursework; to where students learn the skills, techniques and processes of design outside the context of the design studio, in order to free up time and space for students to undertake meaningful learning through active engagement with their architectural design projects, peers and faculty.

Glossary

The following terms frequently appear within the text. In order to avoid ambiguity as regards their meaning within the specific context of this thesis, the following definitions are listed:

Term	Definition
3-P (Presage – Process – Product) Model	The framework of the 3-P model includes teaching, learning activities and intended learning outcomes to conceptualize "outcome-based education (OBE)" (J. B. Biggs, 2011). Classroom-based constructivist model has its origins in cognitive psychology (Piaget, 1950) and the framework is derived from the Dunkin and Biddle's (1974) presage-process-product classroom teaching model or the 3-P Model (Biggs, 1993), presented as an amalgamated model (Figure-8)
Allied Design	Allied Design has complemented the design coursework in the first year program at Sir JJ and has been considered as an important influence and starting point in architectural design. Based on the traditions of Bauhaus (Bax, 1991), allied design introduces the architecture student to the early-stages of design theory. This coursework has been historically offered under the nomenclature of 'Basic Design' at Sir JJ.
Analytic Approaches	The focus concentrates on the cultural facets of the urbanity of the city, built environment and its connection to architecture within the design project Focus on the schema-based design process in the project with an emphasis towards advancement through independent analysis from a critical perspective in architectural design
Appresentation	This phenomenological term has been described as an important facet of awareness within the learner's experience and is tantamount to her consciousness. The learner's overall experience of the phenomenon; even in its partial form, through the student's perceptual consciousness is experienced in its totality or 'appresented' within the structure of awareness (Marton & Booth, 1997)

Approaches To Learning	Approaches to learning are described as actions taken by learners while undertaking specific learning tasks, within particular learning contexts. It is also the reference to the level of thinking undertaken and to the action
Architectural Design	Van Bakel has provided various definitions for *architectural design* from a 'signifier of power' by Rapoport (1979) through the 'Vitruvian expressions to the modern values of aesthetics, function and technology' by Moore (1979) and the 'transformational brief' by Foz (1972). Through multiple definitions he has stated that "unique for architectural designing is the combination of the designing of a space and the use of this space, where sometimes the form follows function, and sometimes the function follows form" (Van Bakel, 1995)
Atomistic Approach	Distorts the structure, focuses on the parts, segments the whole
Basic Design	The foundation course introduced in the early-stage curriculum from the 1919 manifesto of Walter Gropius established 'Basic Design.' This six-month coursework was conducted by world renowned artists including Wassily Kandinsky, Paul Klee and Johannes Itten to name a few at the Bauhaus. The students were required to concentrate on various arts and crafts "including studies of nature, fabrics, geometry, colour and composition, constructions and presentations, materials and tools" before being introduced to architectural design (Broadbent, 1995)
Bracketing	As per Morris (2006) from the phenomenographic perspective, within the qualitative research framework there is a requirement placed on the researcher to filter out "preconceived ideas" by excluding certain selected portions of the collected data related to the phenomenon being studied, thus avoiding "predetermined classification" of the categories being analyzed (Kebaetse, 2010).

Categories of Description	These common ways of understanding humanity are collectively presented as categories of description classified by their characteristics as relational categories (intentional or subject-object relations), experiential categories, content-oriented categories (meaning of the phenomenon) and/or qualitative categories (description of the phenomenon) (Demirkaya, 2008; Marton, 1981). Whereas the categorized variations determining the categories of descriptions are primarily hierarchical, the vertical and horizontal axis of the outcome space graphically represent the structural and referential facet of the phenomenon in question (Bailey, 2002; Hsu, 2008).
Collaborative Learning	Working in a group as an emerging phenomenon that is inculcated in the students' learning experience when they join the architecture program. These peer-based learning experiences are taken by the students' cohort in gaining the skill and craft-based design learning process that is required in the product to process-based approaches to learning in the design coursework. Peer-group learning and assessments are used as structured platforms to elevate collaborative learning in the design studio to an organizational level of functioning with design projects being dealt with from a process-oriented perspective
Conception	Conception in phenomenographic research or the unit of description is described as ways of conceptualizing, experiencing, seeing, apprehending and understanding. It includes two interconnected facets, the referential facet that represents the meaning of the conceptualized object of research at a global level; and the structural facet that presents a specific blend of characteristics which is the focus of the research and observed in detail (Marton & Pong, 2005).
Conceptions of Learning	The learner's experience of modifying the structure of knowledge and its progression within the learning context

Constitutionalist Research	Phenomenography espouses the constitutionalist research tradition with its focus on "the constitutive role of language in human life" which is presented through the individual and collective phenomena of experiences that constitute the world (Säljö, 1997). The role played by language in the individual and collective experiences related to the phenomenon in question represents the constitutionalist framework which is the focus of phenomenography (Anderberg et al., 2008) Approached through a constitutional perspective as "discourse is given a critical role in this constitution of the world in social practices" (Richardson, 1999; Säljö, 1997)
Constructivism	The focus is on the creation of meaning by the learner "particularly on the nature of learning activities the student uses and on this account more readily leads to enhanced teaching" (J. B. Biggs, 2011) The constructivist research traditions in social sciences where the role and analysis of discourse within human affairs is the key includes ethnography (Heritage, 1984), conversation analysis (Atkinson & Heritage, 1987), social constructionism (Shotter, 1993) and linguistic anthropology (Goodwin & Durante, 1992)
Content Analysis	Traditional content analysis has a predetermined framework of categories within which the phenomena are codified in comparison to phenomenographic analysis where the codification and categorization of the said phenomena is a process of discovery (Marton & Saljo, 1997). This point is argued as qualitative content analysis of the collected data involves theoretical and thematic coding which includes open, axial and selective coding that have their basis on the philosophical and methodological construct of the researcher (Flick, 1998) and being interpreted on the basis of the research question. Content analysis and the phenomena as human experience has led to the comparison and connection of phenomenography to the

	phenomenological traditions of research, within the realms of psychology, philosophy and the science.
Critical Approaches	The focus given to the process of designing the building and architectural development by looking into the aesthetics, functionality and utility domains of the design solution through self-evaluation and introspection
Deep Approaches to Learning	Deep learners actively engage with their learning in a search for meaning (Marton & Säljö, 1976)
Dependent Approaches	Product-based approaches with the superficial focus on aesthetics and rational processes depending on being visually attractive or being artistically perfect in the aesthetics domain, or representing the functional or practical design solutions within the functional domain of architectural design Faculty instructions and guidance being used to undertake the design project Continued emphasis on beauty and aesthetics as the principal domains of knowledge in the design project with a balanced focus towards the functional and technical domains in architectural design
Discursive Phenomenography	Discursive phenomenography or Pure-phenomenography is focused on the actual collection of experience and conception in comparison to the research outcome.
Element of Learning	The element of learning has been distinguished at the individual and collective level. Here the learner is being prepared at the individual level to understand the indirect object of learning or the notion of the ever changing world and the future, which is still unknown. This has been the case at an incremental level in collective learning as the learner transitions from the school to the university (Bowden & Marton, 1998)
Experience & Awareness	Experience and awareness is non-dualistic and relational; human awareness is the object of any study following this approach; and that, there is a structural and referential facet to this architecture of awareness (Kebaetse, 2010; G. S. Åkerlind, 2011). Within

	phenomenographic research, the structural and referential facets of awareness form the key components to the outcome space that will emerge from the categories of description
Experiential Approaches	Understanding design through various architectural experiences and implementing those experiences in the process of design
Experimental Phenomenography	An enterprise with its focus on the outcomes to learning that are analyzed through quantitative measures; but processed through the qualitative rigor required for the phenomenographic analysis and categorization
External Horizon	The structural facet includes the external horizon or the refinement of the collective experiences to the entire context within the internal horizon, which involves the refinement of the categorized variations in these collective experiences and their relationship to the said context. In-turn, the external and internal horizon determine the delimitation of the theme of awareness or the phenomenon in question.
First-Order Perspective	The researcher describes the phenomenon on his own accord as approached in a *first-order perspective* like ethnographic research
	The detailed understanding of learning as the phenomenon, and about the learner or learners; and thus discussing the relationship between learning and learner. This discussion is based on the research framework as the learning experience of the learners is excluded from the analysis.
	The search is *"for the singular essence of the phenomenon"* using the *first-order* within the *phenomenological* perspective (Marton, 1981; Röing et al., 2006)
Form	*Form* has been explored through the primary elements and various geometries that are required to be studied in architecture. Form is further correlated with *space* by understanding the invisible connections related to organization, circulation, proportion and scale within

	architecture. *Order* has been architecturally extrapolated through the ordering principles of design (Ching, 1996)
Hermeneutic Phenomenography	Focus on the interpretation of data by the researcher who is the interpreter and the experience which is the object of interpretation. This approach has value in interpreting raw data dating to a certain period and its relevance to the actual period of research.
Holistic Approach	Preserves the structure, focuses on the whole in relation to the parts
Independent Approaches	Students' learning experience, evolving through self-determined steps undertaken based on faculty instructions and guidance by focusing on the design solution. This includes the ability to understand and undertake specific tasks and to think in certain directions
Internal horizon	Internal horizon involves the refinement of the categorized variations in these collective experiences and their relationship to the said context. In-turn, the external and internal horizon determine the delimitation of the theme of awareness or the phenomenon in question.
Knowledgebase	Classified from its traditional framework or "mode 1" within educational research towards 'context-driven, problem-focused and interdisciplinary' perspective, labelled as "mode 2" knowledge (Gibbons et al., 2010)
Language of Architecture	"The language of architecture" (Unwin, 2014) in reference to the language of higher education with a marked contrast between the two educational contexts. The approaches to learning within architecture will also be in contrast to higher education. An example on similar lines is the difference between learning a second foreign language and learning the native language for the first time as an infant. They are not quite the same process and learning architectural design may also be so different from that of higher education. It may be like another childhood learning. This has been interpreted as the study of a new language which involves communication in visual and

	tactile terms. The educational experience for the students in architectural education includes learning the process and gaining the competency to practice as a professional (Unwin, 2014)
Learning	Learning as defined by Ramsden (1988) from the learners' perspective are the qualitative changes in their visualization, experience and conceptualization of something specific to the worldwide learning context (Brockbank & McGill, 2007c) "Learning is a way of interacting with the world. As we learn our conceptions of phenomena change, and we see the world differently. The acquisition of information in itself does not bring about such change, but the way we structure that information and think with it does. Thus education is about conceptual change, not just the acquisition of information" (from Biggs 1999) (J. B. Biggs, 1999; Brockbank & McGill, 2007c). "Learning knowledge and learning to learn" (Moon, 2004).
Learning Experience	The life long process of exploring and try to understand or gain an awareness of the constitution and reconstitution of the world around the learner An amalgamation of the learner's various ways of experiencing the phenomenon in question, i.e. learning from the distant past, to the very-present into the distant future
Learning Skills	Learning skills has been studied as a separate facet of the learner's knowledge of one specific aspect within the process of learning, which is termed in an array of broadly used terms including 'cognitive skill,' 'presentation skill,' 'study skill,' 'physical' and 'practical skill' (Moon, 2004)
Learning Style	Learning style is the composite of cognitive, affective, and psychological factors that serve as an indicator of how an individual interacts with and responds to the learning environment, Duff (2000)

Lived Experience	The interviews are the preferred qualitative tool in collecting data within the phenomenographic tradition due to the substantial data describing the phenomenon that is collected as-well-as the flexibility that is inbuilt in qualitative semi-structured interviews (Shamblin, 2006) and the representation of the interviewee's "lived experience" (Ashworth & Lucas, 1998). Qualitative interviews as a tool include the characteristics of understanding the phenomena in the interviewee's life with reference to the world; the interpersonal and sensitive approach of interaction with the interviewer; thus leading to a qualitative, positive and experiential, descriptive, open, theme-based and, on a specific line of conservation (Shamblin, 2006)
Multidirectional Approaches	Students undertake these approaches connected to the issues discussed in the current architectural practice and are adopted in multiple ways representing the steps undertaken at various stages of the design process at specific moments which is part of their individual or group-work based collaborative learning process
Naturalistic Phenomenography	Focus on collecting data within the authentic environment without manipulation. A natural analysis of these actual observations is the key to this phenomenographic approach. *Learning skills* as an attribute falls in the domain of learning and cognitive styles with reference to the learner
Non-Dualistic Perspective	Phenomenography is presented from a non-dualistic perspective as there is an understanding that there cannot be a disconnect between the objects and the subjects, with humanity or the world being "what we perceive and experience it to be" (Hsu, 2008)
NVivo	NVivo, a qualitative data analysis software (http://www.qsrinternational.com/nvivo/nvivo-products) is a widely used computer-aided platform with the qualitative research tradition. It enables coding possibilities in the platform using the nomenclature of

	'nodes' including parent and child nodes. The researcher is in a position to commence with the open coding process and can create an aggregate set of codes called a node tree. The platform is also enabled to represent the identified fragment of description in the context of the individual transcript or that of the cluster of coded fragments within the specific node (Kebaetse, 2010). The platform enables the researcher to analyze transcripts individually and prepare nodes in reference to the object of conception.
Object of Learning	Knowledge as the object of learning is projected as a 'sensuous experience' for the learner even at the level of abstraction The object of learning has been referred as acquiring the 'knowledge-base' of an existent substance or something
Object of Research	The phenomenon in question is analyzed through "the pool of meanings" from a range of individual experiences. This procedure of discovery is reiterated as "rigorous qualitative analysis" leading to the categories of description and outcome space in the phenomenographic research method (Marton & Booth, 1997; Marton & Saljo, 1997).
Order	*Form* has been explored through the primary elements and various geometries that are required to be studied in architecture. Form is further correlated with *space* by understanding the invisible connections related to organization, circulation, proportion and scale within architecture. *Order* has been architecturally extrapolated through the ordering principles of design (Ching, 1996)
Outcome Space	The categories of description are presented as the results of phenomenography with interpretation, analysis and graphical depiction of the outcomes of this research method having a logical correlation to the said categorization or the object of the research, termed as the outcome space (Bruce, 1994; Marton, 1988). Outcome space and categories of description go hand-in-hand within the phenomenographic tradition of

	research. These categories of description are based on a collective platform of the limited variations of experiencing the phenomenon. This phenomenon being studied is represented through a structure-of-awareness termed as the outcome space involving the structural and referential facet (Bailey, 2002; Hsu, 2008). Whereas the categorized variations determining the categories of descriptions are primarily hierarchical, the vertical and horizontal axis of the outcome space graphically represent the structural and referential facet of the said phenomenon in question (Bailey, 2002; Hsu, 2008).
Phenomena	The interpretation of a *phenomena* is the experience of an individual or a range of shared experiences of a group of people. The focus of phenomenographic research is to present this range of shared experiences within "limited ways in which any given phenomena is experienced" (Brew, 2001)
Phenomenography	"the empirical study of the limited number of qualitatively different ways in which we could experience, conceptualize, understand, etc. various phenomena in and aspects of the world around us. These differing experiences, understanding, etc. are characterized in terms of categories of descriptions, logically related to each other, and forming hierarchies in relation to the given criteria. Such an ordered set of categories of description is called the outcome space of the phenomenon or concepts in question" (Drew et al., 2001; Marton, 1992) "phenomenography is a research for mapping the qualitatively different ways in which people experience, conceptualize, perceive, and understand various aspects of, and phenomena in, the world around them" (Marton, 1988).
Phenomenological phenomenography	The phenomenographic approach with its construct in Grounded Theory has its "focus on the essence of the learning experience rather than on describing the

	outcomes of learning" (Hasselgren & Beach, 1997; Kebaetse, 2010)
Phenomenology	Based on the philosophical focal point of intentionality propounded by German Philosopher, Franz Brentano (1973); phenomenology approaches phenomena as all the scientific knowledge around the world which is established within our immediate experience. According to Husserl, the founder of modern phenomenology; it is possible for the perception of phenomena to remain uncontaminated through the experience of the historical and intellectual construct (Marton, 1988; Webb, 1997)
Pool of Meaning	A "pool of meaning" which fragments of the individual experience and categorized as a pool of collective fragments of experiences (Gerlese S. Åkerlind, 2005b).
Practice-Based Approaches	Centered on the process of design through the program offered through the backdrop of architectural practice
Pregnancy	The importance of certain descriptions in the interviewee's experience that develop into categories of description are due to their frequency; but also their position generally at the commencement of the experience; and finally the emphasis given to the description over the entire experience also termed as "*pregnancy*" (Hsu, 2008)
Process- Focused Approaches	To conceptualize, absorb, approach different architectural and design perspectives in developing, extrapolating the design techniques and theories from prior architectural experiences and limitations from a human as well as a logical standpoint
Process-Based Approaches	The design process is based on the nature and sequences of the spatial experiences in addition to exploring architectural design using the faculty's instructions as learning strategies in understanding the process of design
Process-Focused Approaches	This brings to the fore the notion of "architect - the maker," "representation of work" and architectural design with Callicott and Sheil pointing that the design process holds prominence to the craft of making. This is

	represents that delicate balance that needs to be achieved within the approaches to learning (Callicott & Sheil, 2000).
Product-Based Approaches	Series of steps undertaken by the students in architectural design in a singular direction including memorizing techniques and procedures An understanding of the process of design, its application and practicality, which has been achieved by focusing on the design solution Focus on representing the architectural solution as an artefact or a design product by primarily focusing on completing the assignment Focus on building, constructing, and creating the solution in addition to being attractive, or looking good in reference to the making and finishing the design solution
Product-Focused Approaches	Series of steps undertaken by the students in architectural design by rehearsing techniques and procedures The focus on developing the design solution of the building or the architectural development is considered as the central task in the design process Building-centric design process including visual, technical and construction-based aspects of the building typology including mapping the design process Undertaking the process of design by focusing on developing the design solution based on the specific design project and the steps involved in completing that project by reflecting on the evolution of this design process by connecting it to the final portfolio
Product-Focused Approaches	The *product-focused approaches* is further explained as the basis for evaluation and assessment in various schools of architecture where a distinctive balance between 'craft and knowledge' and 'image production' needs to be reassessed (Callicott & Sheil, 2000; Morrow, 2000).
Referential Facet	Represents the meaning of the conceptualized object of research at a global level

	The importance in phenomenographic analysis is the focus on the referential facet and interpreting the identified conceptions related to the phenomena being studied based on its interpretation at the global level or the macro-context of research the referential facet that "involves the meaning given to the experience" in comparison to the structural facet which is represented by "the internal and external horizons of the phenomenon" (Hallett, 2010; Pang, 2003)
Reflection-in-Action	Reflection-in-action is fundamental to architectural inquiry, the learning approaches are propagated through the notion of constant reflection. The expectation for students' to train themselves through 'self-regulation' is considered as an experience for a life time and is correlated to this notion of the students' architectural learning experience (Nicol & Pilling, 2000; Schon, 1985).
Reflective Learning	The Kolb (1984) cycle of experiential learning (Chapter-3, Figure-12) is considered as a model that facilitates learning through the managed framework of the teaching situation. This cycle has a correlation to learning and teaching in architectural education as the four key activities within this cycle are interplayed in the design studio as a part of the design coursework through approaches to teach as-well-as learn. *Reflective learning* is considered as a core-training endorsed within architectural practice and the design studio is further elaborated by Schon (1983) through the dialogue between the design faculty and the student in the design coursework in 'the reflective practitioner' (Schon, 1983, 1985, 1987)
Schema-Based Approaches	Focusing on process of architectural development from concept and schematic design leading to the holistic design solution Transition from site analysis in the larger context and correlating architectural experiences to the design

	process by referencing it to the design of the building within the architectural development
Second-Order Perspective	The focal point is exploring the experiences of the people in the diverse contexts of humanity (Marton & Booth, 1997) Phenomenography as a qualitative research approach represents the *second-order perspective* and *"it is the study of variation on ways that people understand phenomena in the world around them"* (Marton, 1981; Röing et al., 2006)
Sensible Minimum	The phenomenographic study involves semi-structured interviews for the data collection in mapping the learning experiences. The sample includes seven to ten interviews involving a random selection of individuals amongst the population from which this "sensible minimum" is selected (Cousin, 2009).
SOLO (Structure of the Observed Learning Outcome) taxonomy	The SOLO taxonomy (Biggs & Collis, 1982) has been used in implementing outcome-based education (OBE) with the focus on teaching, learning and assessment (J. B. Biggs, 1994, 2011) presented as a qualitative model (Figure-9)
Space	*Form* has been explored through the primary elements and various geometries that are required to be studied in architecture. Form is further correlated with *space* by understanding the invisible connections related to organization, circulation, proportion and scale within architecture. *Order* has been architecturally extrapolated through the ordering principles of design (Ching, 1996)
Strategic Approaches to Learning	the motivation is towards a successful conclusion in the learning situation based on the teaching and assessment criteria set within its organizational framework, this approach has also been termed as an achieving approach
Structural Facet	Presents a specific blend of characteristics which is the focus of the research and observed in detail The structural facet is represented by "the internal and external horizons of the phenomenon" in comparison

	with the referential facet that "involves the meaning given to the experience" (Hallett, 2010; Pang, 2003)
Structure of Awareness	The learner's awareness of the learning situation and the associated learning process is represented as the structure of awareness and ways of experiencing learning
Studio-Based Learning	Roberts has suggested that Schon's (1983) work on the project-based approaches of 'learning by doing' in architectural education is considered as a pioneering model for professional education and "the design studio provides a venue for students to engage in conversation, dialogues and collaboration related to open-ended problems and encourages speculative exploration. *Studio-based learning* has been seen to be an enjoyable and effective way of learning critical design skills" (Roberts, 2004a)
Surface Approaches to Learning	Surface learners aim to reproduce material without critical engagement and often through memorization (Marton & Säljö, 1976)
Theoretical Approaches	Integration of previous coursework including visual communication, design and construction, structures and environmental controls - systems, mechanical systems, ventilation systems, air conditioning, that kind-of thing
Uncritical Approaches	The focus given to the completion of building design by emphasizing functionality and practicality without looking critically into the process of design
Unidirectional Approaches	Series of steps undertaken by the students in architectural design in a single direction starting with the design brief to the final solution The spectrum of product-centric processes from the commencement to the completion of the design project
Vitruvian Triad	The paradigm of defining the design coursework has its origins in western culture through the Classical *Vitruvian triad* of architectural characteristics from first century BC of *'utilitas'* also termed as commodity and / or utility, *'firmatis'* for firmness or durability and *'venustatis;'* for delight or beauty that has been interpreted through

| | various translations. Vitruvius has further elaborated in *Book-I* on the education to undertaken by an architect where the focus of learning is in gaining theoretical inputs from various departments and applying it in practice (Translation dated from specific year).(Vitruvius, 1960, 1999) |

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Classification of the Approaches to Learning Adopted by Students of Architecture in Their Design Coursework

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VOLUME II

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Summary

Students' approaches to learning has been classified through their experiences in the design coursework within the larger context of architectural education. What are the learning approaches being adopted by students in architectural design and how does the introduction of the first year design coursework impact on their approaches to learning in the subsequent years are key to this classification. This research reflects on why learning approaches evolve from the first to the final year of the architecture program. Approaches to learning is well-understood in other disciplines including engineering, information technology, mathematics and sciences to name a few, but less-researched in architectural education. This research endeavours to fill this gap.

The students are introduced to design theory as a part of their architectural design coursework. This research vehicle of the architectural design is identified as a more appropriate way of classifying learning approaches instead of history, critical theory and technology as design coursework plays a central role in the studio-based program. The academic context has been reviewed through existing literature with a focus on learning approaches within pedagogical research in architectural education, in addition to other fields and disciplines including established research on 'surface and deep' approaches in text-based fields through the qualitative research method of phenomenography. This classification is the further consolidation of the pilot study on students' learning comparing the first and fourth year of the architecture program through phenomenography. The learning context for this classification includes four architectural institutions from the United States of America, United Kingdom and India.

The intention of this research is to present the phenomenographic results as meta-categories by depicting the evolution of the learning approaches in architectural design. This research currently intends to further represent these findings and interpret these meta-categories within real world examples of architectural pedagogy and education through an illustrative account of nine students of architecture and their learning approaches in evolution.

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Approaches to Learning in Architectural Design - A Classification
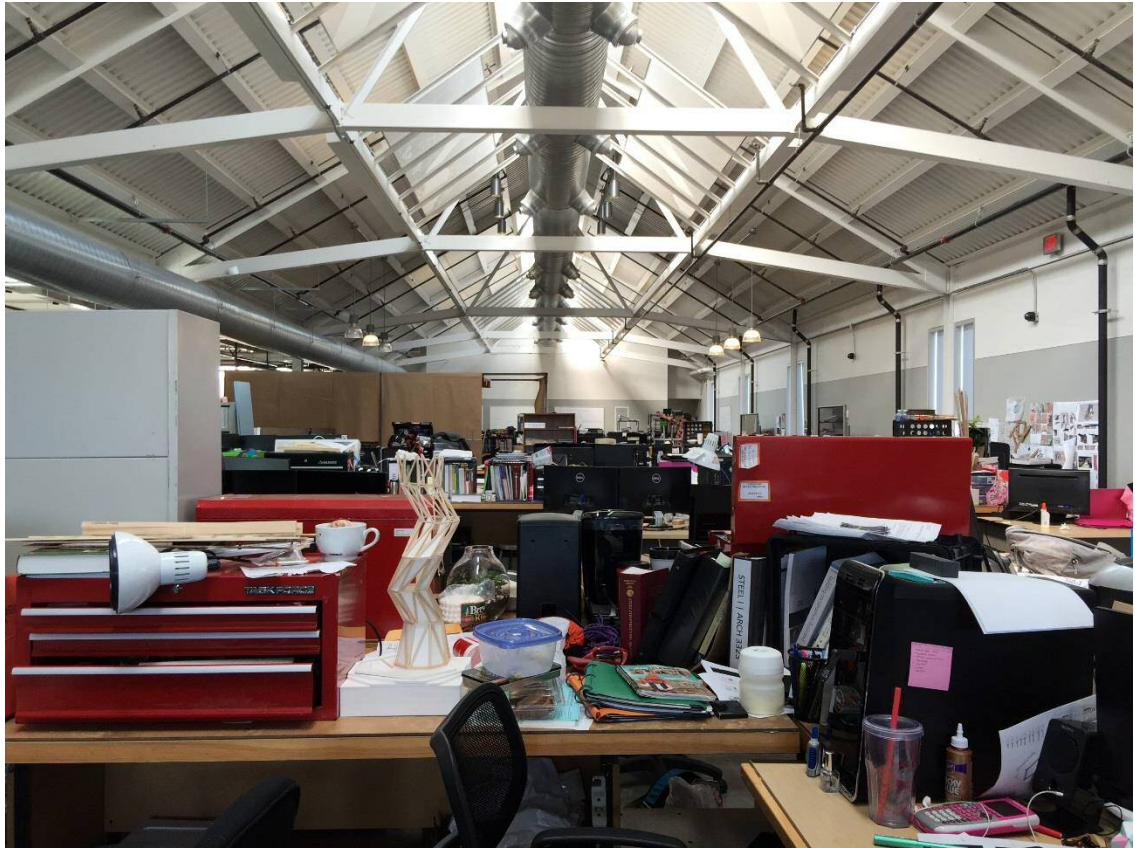
Typical architectural design studio work environment, School – United States of America © Ashok Iyer

Students' approaches to learning has been classified through their experiences in the design coursework within the larger context of architectural education. What are the learning approaches being adopted by students in architectural design and how design-theory introduced in first year design coursework has an impact on their approaches to learning in the subsequent years are key to this classification. This research reflects on why learning approaches evolve from the first to the final year of the architecture program. Approaches to learning have been well-understood in other disciplines including engineering, information technology, mathematics and sciences to name a few, but less-researched in architectural education. The current research endeavors to fill this gap.

The students are introduced to various theoretical constructs as a part of their design coursework in the architecture curriculum. This research vehicle of the design theory-based model has been identified as a more appropriate way of classifying learning approaches instead of history, critical theory and technology as architectural design coursework has played a central role in the studio-based program. The academic

context has been reviewed through existing literature with a focus on learning approaches in architectural education, the design studio and the prevailing schools of thought with reference to the undergraduate curriculum. In addition, the research has focused on the identified learning approaches within other disciplines through the qualitative research methodology of phenomenography. This classification is a consolidation of the pilot study on students' learning comparing the first and fourth year of the architecture program that has derived six categories of learning approaches through phenomenography, representing a broader spectrum with reference to the recognized 'deep,' 'surface' and 'strategic' approaches to learning. The physical domain for this classification includes undergraduate architecture programs offered at four schools from an international perspective including the United States of America, United Kingdom and India.

<u>Review of Approaches to Learning adopted by Architecture Students in the Coursework of Architectural Design</u>

Review of Approaches to Learning adopted by Architecture Students in the Coursework of Architectural Design

Abstract

Students' approaches to learning in higher education has been presented in terms of surface and deep approaches (Marton & Säljö, 1976). This paper reviews selected literature in architectural education where the definition of approaches to learning adopted by architecture students in the coursework of architectural design is compared with surface and deep approaches. The categorized approaches identified in an earlier study adopted by first and fourth year architecture students (A. Iyer & Roberts, 2014) is correlated to this review to present how the concepts of deep and surface approaches to learning manifest themselves in architectural education. In conclusion, the study (A. Iyer & Roberts, 2014) and the review points towards a more complex set of approaches to learning than just a deep and surface division. It also raises a further question on do the categorized approaches from the earlier study form different points on a continuum between deep and surface, or are some in a different dimension. The review on architecture students' approaches to learning is a reflection towards the surface dimension and going in the direction of deeper dimension through years of training and reflective practice in architectural education.

Key Words: approaches to learning, architectural design, architectural education

Introduction

Students' approaches to learning are directly correlative to their prior experiences of studying and understanding the key concepts of the subject matter, which is vital to the subsequent approaches to studying and learning outcomes (Prosser & Trigwell, 1999). Biggs poses a case of the implicit and explicit theories of students' learning; with the latter pointing to the importance of the phenomenographic model (Biggs, 1994) describing surface and deep approaches to learning (Marton & Säljö, 1976). This paper reviews the literature in architectural education looking into the question of defining the approaches to learning adopted by architecture students in the coursework of architectural design and presents it in perspective of surface and deep approaches. The review is correlated to the categorized approaches to learning identified in an earlier study of comparing the approaches of first and fourth year architecture students (Iyer & Roberts, 2014) to delve into the related question of whether these approaches adopted by architecture students' in architectural education are different from the deep and surface dimension. It also raises a further question on do the categorized approaches

from this earlier study form different points on a continuum between the deep and surface dimension, or are some of these identified approaches in a different dimension.

Learning Approaches of Students in Early-Stages of Architectural Education

A perspective on how are the approaches to learning in the early stages of architectural education manifested in the students during the enrollment process is reflected by the introduction of architecture as specialization after A-Level education and through aptitude tests like the National Aptitude Test for Architecture – NATA (Council of Architecture, 2014). This creates a distinct student cohort within the early stages in various schools of architecture 'who have learning approaches that are streamlined due to their exposure to architectural education' (Atkinson, 2010). The prior learning experiences of the students' cohort and the appeal to architectural education are, thus correlated. The architecture student's experience is explored through the terms 'creativity' and 'engagement' with research to 'tease out the relationships between engagement and creativity for student learning in design' and the complexity of 'the nature and quality of students' engagement with their learning' in the architecture profession (Reid & Solomonides, 2007). The student's experience is used as the basis to understand the impact on their learning approaches within the design studio. These experiences can be tapped in the early stages of architectural education and channelized towards a deeper impact on their approaches to learning. The seminal research into 'how students learn' and 'what motivates the student' are fundamental questions posed by Biggs (Biggs, 2011). Roberts emphasizes on Biggs' focus on 'the student' which he says 'we all encounter' (Roberts, 2009). 'Learning is about what the students do rather than what the teachers do' and, 'if students value something, then they see it as important, and will be motivated to learn' (Roberts, 2009) brings to fore; the importance of architecture students' approaches to learning after they formally enroll into the architecture program. They can be motivated through structured approaches to learning adopted in the early stages of the architectural design studio which act as the formative years of their architectural experience.

Salama explores the importance of design studio in the architectural 'curriculum to design training and teaching' elaborating that it 'is the kiln where the future architects are molded and the main forum for creative exploration and interaction and assimilation'. He argues 'that most design studio teaching continues to provide students with little understanding of the value of design as a technique, a process, or set of purposive procedures'(Salama, 2005). The integration of learning history with students' learning approaches in the design studio is investigated from a historical and cultural context to learning (Stewart & Wilson, 2007). Simon Unwin's stoic phrase 'nothing will come of nothing' (Unwin, 1996) and Andrew Higgott's pointed question 'Teaching First Year:

what do they need to know?' (Higgott, 1996) sums up approaches and experiences seen from the students and acadamics perspective when dealing with architectural history within the design studio (*Architectural history and the studio*, 1996). Cakin has evolved a major educational strategy developing communication skills and collaborative initiative between institutions stating 'a strong belief in the use of precedents in teaching and learning design, derived from students' need to start from a knowledge base; encouraging students to explore ideas based on metaphors and analogies resulting from the acknowledgement of the role of metaphor in conveying meaning in architecture' (Cakin, 2001). The design studio is effectively presented as the fertile ground where the students' approaches to learning goes through years in its formative stage from a process, technique, language and contextual perspective.

Webster looks at project-based learning as the central pedagogic tool in architectural education 'represented by the design project at its core' with the process of students' learning where 'critical reflection; understood as a key element of project-based learning in the design studio requiring students to continually reflect on their work both alone and with others, most significantly with design tutors in the one-to-one tutorial.' The author suggests that students' experience 'three principal types of tutor behavior; the entertainer, hegemonic overlord and the liminal servant and they believed that only the liminal servant increased their motivation and supported their learning' (Webster, 2004). Robinson looks at 'the tutorial system within architectural education, which aims to support the process of design in a studio environment where things can be tested without the practicalities of the real world' and concludes that mentoring using peer-assisted learning, 'seems an ideal tool in architectural education which is presently neglected' (Robinson, 2007). Thus approaches to learning of architecture students in the early stages of architectural education within the design studio have quality of students' engagement, motivation, design curriculum, historical & cultural context and the role played by the design tutor as key parameters.

The Review Process as a Learning Tool

The review process is approached by architecture students with research pointing at a revisit and a proposed guide for the design studio tutors by looking at 'the established model highlighting inherent opportunities for learning and conditions associated with a lack of learning' (Sara & Parnell, 2004) reflecting the balance between challenge and support required. Chadwick and Crouch focus on 'the review, as a learning and teaching tool, is a fundamental component of architectural education' and terms it as 'educationally flawed' with the process seen as 'intimidating and unnecessarily grueling and can lead to students feeling demoralized and humiliated'. They propose a model-

in-development to humanize the review process and integrating it as an important part of the students' learning process within the design studio(Chadwick & Crotch, 2006). The review process as a constructive learning assessment tool in the design studio can be used by the design tutor as-well-as the architecture students' cohort to encourage approaches to learning towards understanding the complexities of architectural education from the early stages to the later years. In comparison, a typical surface approach; where the response of the student in early stages would generally be that the reviewers did not like the presented work; which perhaps oversimplifies the discussion and the purpose of the review and needs to be explored in further detail.

Impact of Design Studio on Approaches to Learning

This brings to the fore the impact of the design studio on the students' approaches to learning. The central role played by the design studio has been 'routinely referred to as being a core of architectural education' (Webster, 2001). 'The Reflective Practitioner' by Donald Schon champions the cause of the design studio as central; both to architectural education, the profession and the pedagogic connect of teaching design; 'the distinctive structure of reflection-in-action' and 'the future interaction of research and practice' (Schon, 1983). Webster provides an outline of the ideas of Schon and related literature from disciplines outside architectural education, pointing towards the importance of 'design project, as a vehicle for project-based learning, was adopted on the assumption that the expertise needed by architects could only partially be learnt through the traditional methods of knowledge transmission, lectures, etc. used by most academic disciplines' (Webster, 2001). Schon's work is described as the launch of 'an attack on the dominant technical rationality in professional education, criticizing it for being unable to respond to the complexities of the real world and of failing to account for how professionals work in practice' (Schon, 1983) (Webster, 2001). The design studio is reflected as the core of architectural design curriculum and the integrated design project seen as the principal teaching vehicle (Schon, 1985) (Schon, 1987). This clearly reflects the centrality of the design studio and its impact on the architecture students' approaches to learning.

The Design Studio in the Early Stages of Architectural Education

Platt questions 'if architectural ideas are only fully understood with the illumination of construction, what are the implications of teaching architectural design in the academic studio?' and takes us to 'design and build' design project in the design studio with the emphasis on 'do it' & 'teach it' and the required balance of full time academicians and practicing designers towards the right impact on the students' learning approaches in the design studio(Platt, 2000). Roberts suggests that Schon's (1983) work on

architectural education's project-based 'learning by doing' approach has been considered as a pioneering model for professional education and 'the design studio provides a venue for students to engage in conversation, dialogues and collaboration related to open-ended problems and encourages speculative exploration. Studio-based learning has been seen to be an enjoyable and effective way of learning critical design skills' (Roberts, 2004). This can be seen as a pointer to the first year design studio and the approaches to learning that is required to be adopted by students of architecture. Farivarsadri states that 'introductory design studio as a foundation of architectural design education which has a great importance' and elaborates 'on the importance to organize the body of knowledge and skills to be learned in this year properly, to find suitable methods to transferring them to students, and to achieve maximum efficiency in teaching requires an awareness of different pedagogical approaches and the implications of any chosen method of instruction on the students' (Farivarsadri, 2001). The author elaborates on Bloom's Taxonomy in introductory design education and looks at the work of Lede Witz(1985) and his summarization of learning architecture as 'learning and practicing new skills such as visualization and representation; learning a new language and learning to think architecturally'. Farivarsadri states that 'still many of the design studio syllabi are derived from the 'basic design model' developed in the Bauhaus school' and the limitations of this model with a reflection on a holistic perspective concluding that the quality of introductory instructors, their knowledge about learning process and their patience and willingness to look at an array of subjects and enrich the introductory design process(Farivarsadri, 2001). This need for a more holistic approach towards introductory architectural education is voiced by major architects iin their seminal works including 'Lessons for Students in Architecture' (Hertzberger, 2005) and 'Thinking Architecture' (Zumthor, 1998); with these different ways of thinking about architecture pointing at distinctive approaches to learning.

Unwin explores the question of 'how new students in Welsh school of architecture are inducted to architecture through first semester program of design project run in parallel with supplementary exercises focusing on analysis, place and technique' (Unwin, 2001). Unwin is looking at how the students of architecture in early stages of their education develop an appropriate approach to learning and has structured exercises that 'run alongside the design projects' with a 'focus on three main themes, seen to build a bridge into architectural education, the core skill of which is taken to be architectural design' and based on these pointed themes including analysis, space and techniques; extrapolating on each theme with architectural examples (Unwin, 1997). 'Students are encouraged to refine the framework and their own analytical themes. They are expected to translate the lessons run from the exercises creatively rather than mechanically or

slavishly, into their own design work thus developing their own capacity for designing or building to build their own repertoire of architectural ideas which they will hopefully add to in similar ways through their careers as architects'. He concludes that 'students learn for themselves rather than doing what they are told but at the same time they are not left to struggle with design without sources of ideas and information' (Unwin, 1997). This statement by Unwin represents two different approaches; one where they approach learning by mechanically following a demonstration or as a craft-based approach and the other; where they learn by going through the process of making architecture, which can be seen in parallel to surface and deep approaches to learning (Marton & Säljö, 1976). They see the benefit of 'learning by doing' but also of 'learning by looking at the work of others' (Unwin, 2001) and with this analysis, Unwin further widens the range of the approaches to learning with reference to the students of architecture. The review further explores schools of thought from the Beaux Arts-to-Bauhaus and the prevailing philosophical viewpoints; world over (Bax, 1991; *Education of an achitect*, 1988; Gulgonen & Laisney, 1982; Littmann, 2000).

Approaches to Learning and Early Stages of Architectural Education
'Learning as an interactive process is an important issue in architectural design education' and the authors look at 'the role of the design studio', further considering three steps including 'learn and practice some new skills, say, visualization and representation; learn and practice a new language as Schon(1984) described design as a graphic and verbal language; and learn to think architecturally, as pointed by Lede Witz(1985)' (Demirbaş & Demirkan, 2003). The design studio is portrayed as a knowledge studio defining it 'as a mental place of dialogue, where all sorts of knowledge (scientific, technological, and humanistic), skills and attitudes are integrated'. Depuydt argues that with learning knowledge and skills, the emphasis should be on the attitudinal aspects of learning (Depuydt, 2001). Odgers explores 'the question of authority in teaching and learning with reference to Barthes and Gadamer' by offering 'two interpretations of authority. One is based on power, the other on the recognition of superior understanding in another' with these versions of authority in a teaching relationship within the context of the design studio at Welsh School of Architecture, Cardiff (Odgers, 2001). Parnell looks at 'project-based learning, a form of which lies at the heart of the design studio' and to the surprise of architecture students in their early years of architectural education; the nature of 'students learning experiences prior to university' seems to lie within the didactic model. The students face problems in the early stages of architectural education with project-based learning, which 'requires the students to reassess their familiar mode of learning and adopt a new learner identify in relation to the tutor' (Parnell, 2001). This becomes difficult to achieve for the students

as, 'this transition from receiver of knowledge to critic and instructor of knowledge is complex and hence difficult for many students to achieve' and Parnell concludes that the peer discussion method has a positive effect on students' learning processes and evidence points that 'students develop higher quality cognitive strategies cited as necessary for the management of disjunction' (Parnell, 2001).

Roberts has investigated 'how students with particular cognitive styles, as measured by Riding's cognitive style analysis, perform in design project of work at particular stages of architectural education' concluding that 'contrary to assumptions found in the literature, those with a preference for thinking in a holistic, global manner, perform less well than their peers in the early stages of their education, but tend to improve as they progress through their education' (Roberts, 2006). The design studio has been explored with reference to 'the learning styles of freshman design students in three consecutive academic years using Kolb's experiential learning model' with the conclusion that 'the bipolar perceive dimension indicated that the freshman design students are more related to the analytical skills of theory building, quantitative analysis and technology. Also, the bipolar process dimension showed that they have better behavioral skills compared to perceptual learning skills'. The research suggests that 'design education can be considered as being in line with the experiential learning model of Kolb(1984)' (Demirkan & Osman Demirbaş, 2008). In summary, this review presents the connection of the early stages of architectural education with reference to skill-based, knowledge-based, experiential and cognitive based perspective of reflecting on the students' approaches to learning.

Conclusion: Categorized Approaches to Learning in Architectural Education adopted by Architecture Students

The study on students' approaches to learning adopted in the first and fourth year of architecture based on their experiences while undertaking an architectural design project has been categorized as six learning approaches (A. Iyer & Roberts, 2014). These categorized approaches to learning reflect on the research question & the literature review into architectural education, the latter giving a broad canvas to draw upon for a definition on approaches to learning adopted by students' of architecture; while the former points to these identified approaches falling within the spectrum of the deep and surface dimension presented in higher education research (Marton & Säljö, 1976).

The introduction of the architectural design coursework in the first year of the architecture program is considered as the stage where the students tread their formative

learning approaches; A & B as a step-by-step approach from the design problem to its final solution (A. Iyer & Roberts, 2014). This could be seen as learning approaches bordering to the surface dimension (Marton & Säljö, 1976). Approaches F & F pursued predominantly by fourth year architecture students were learning approaches at a very conceptual and abstract level (A. Iyer & Roberts, 2014) and dwell within the parameters of the deep dimension (Marton & Säljö, 1976). The categorized approaches to learning duly form a framework parallel to the one suggested by Unwin with reference to his work with students in the early stages of architectural education at Welsh School of Architecture (Unwin, 2001). This study; is a work in progress in charting the approaches to learning adopted by the architecture students' as they progress on the ladder of their rigorous years in architectural education and step into the portals of the architecture profession; thus moving from the surface to the deeper dimensions of approaches to learning.

Categorized approaches to learning adopted by First & Fourth Year Architecture Students (A. Iyer & Roberts, 2014)	
Approach A	Series of steps taken from the introduction of the design problem to the completion of the final solution with emphasis on presenting a good output and preparing a good portfolio.
Approach B	Trying to understand or experience architecture using the experiences of the faculty as a scaffold or reflecting on their instructions to present the learning outcome.
Approach C	Evolving perceptions of architecture by adopting a series of steps within the process of design which is based on a product-focused outcome.
Approach D	Evolving the perceptions of architecture through the process of design which is based on a process-focused outcome.
Approach E	Conceptualizing the thought process and using it in the evolution of architecture based on in-depth experiences directly correlative to perceptual psychology within the students' experiences.
Approach F	Students' reflecting into the conceptual and abstract focus towards design based on an innately creative and experiential level of understanding architecture.

A Phenomenographic Study in Understanding Architecture Students' Approaches to Learning the Coursework of Architectural Design

Ashok Iyer & Andrew Roberts

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Abstract

The paper looks at the architecture students' change in the approaches to design learning between their first year and fourth year of the architecture program; charting the variation in the said approaches and exploring the reasons for the differences in the same. The study aimed to use phenomenography in understanding the said approaches with the objective of exploring the variation from a qualitative perspective and this was undertaken using a sample of thirty-nine students in two colleges of architecture in India.

The semi-structured interviews undertaken using phenomenography; focused on the students' approaches to learning the coursework of architectural design from the first year and fourth year using an architectural design project as the learning context. The study was conducted to chart the learning approaches that emerged and relating them to Deep and Surface Approaches to learning.

The study was done on the lines of earlier phenomenographic studies to understand the variation in the approaches to learning of fashion design students based in various institutions in the United Kingdom (Bailey, 2002; Drew, Bailey, & Shreeve, 2001).

Keywords: Phenomenography, Approaches to Learning, Architectural Design

The Research Question

How might the approaches to design learning undertaken by architecture students' change between their first year and fourth year of the architecture program? Why is there a variation in the approaches to learning and what are the reasons for any differences?

Introduction

The approaches to design learning have been explored as a personal journey through the experiences of well known architects (Zumthor, 1998) and as an important facet of reflective practice gained through professional knowledge and the academic journey in

the architectural school (Schon, 1996). They have also been explored through design exercises that is undertaken by the student of architecture and its reflection in the architectural practice (Unwin, 2012). The writers in architectural education commonly make a distinction between the design and learning processes that students undertake, and the final output of their work, or the product. The evolution of the same from a product to a process-centered approach involving the experiences of architecture students has been explored in the current study using phenomenography as the research methodology. The chosen methodology looks at the research question with specific reference to the change in the learning approaches of architecture students between the first year and fourth year; which is the focus of the study.

Similar studies have been conducted in fashion design by Drew et al. (2001); comparing the students' approaches to learning with Marton and Saljo's (1976) concept of deep and surface approaches to learning (Marton & Säljö, 1976).

Design education from a micro to macro perspective amalgamates fields such as product and fashion design; but also looks at built environment within the realm of interior design, architecture and planning. Phenomenographic studies in these fields of design education would further widen the scope of this research approach; undertaken in the earlier studies on fashion design education. The research question has been explored using phenomenography as there is little published evidence of the chosen methodology being used to investigate the approaches to design learning for architecture students.

Phenomenography as a research approach

Marton (1992) defined phenomenography as "the empirical study of the limited number of qualitatively different ways in which we could experience, conceptualise, and understand various phenomena in and aspects of the world around us. These differing experiences, understanding, etc. are characterized in terms of categories of description, logically related to each other, and forming hierarchies in relation to the given criteria" (Drew et al., 2001). In simple terms "phenomenography enables the researcher to identify the range of different ways in which people understand and experience the same thing" and "is interested primarily in surfacing variation of experience and understanding"(Cousin, 2009). Marton (1992) has stated that "each phenomenon in our world can be seen and understood in only a limited number of distinctively different ways". He extrapolates by stating that "understanding is defined as the experiential relations between an individual and a phenomenon"(Marton, 1992). Thus a phenomenographic study helps in mapping the experiences based on the

understandings of the participating individuals with reference to the phenomenon. L. Svensson (1997) has stated that the theoretical foundations of phenomenography are based on its close relation to the epistemological and ontological assumptions from a methodological point of view. He has stated that it looks into the nature of knowledge and its essence of being, which is the central characteristic through its explorative methodology of data collection; of conceptions and formulations through thoughts and language. Phenomenography involves the identification of a limited number of "qualitative different experiences and understanding of a particular phenomenon"(Cousin, 2009) and the emerging categories of description reflects the findings of the said study through the outcome space of the said phenomenon.

Phenomenography as a research approach "has its roots in the general scientific tradition" and "represents a reaction against, and an alternative to; the then dominant tradition of positivistic, behaviouristic and quantitative research" and its fundamental assumptions seem to point at the relational and holistic nature of knowledge; with "conceptions being the central form of knowledge"(L. Svensson, 1997). The categories of description, identified; based on the experiences of the participants, hold the key in identifying conceptions and understanding of the particular phenomenon. Saljo (1997), one of the pioneers of the phenomenography has taken a critical look at interviews; the core object of this methodology which is the "ways of experiencing" and the relationship between discourse and experience' as the phenomenographic researcher may be connecting utterances to the latter than to the former (Säljö, 1997).

The possibility of connecting the original experience with the participant is ruled out as the "scientific knowledge about conceptions is based on the exploration of delimitations and holistic meanings of objects as conceptualized" and "is based on differentiation, abstraction, reduction and comparison of meaning" (L. Svensson, 1997). Thus, phenomenography is based on disconnecting the original experiences from that of the participants, on the iteration and filtration of these experiences by differentiating and abstracting them to come up with categories of description.

Phenomenographic Approaches in Higher Education

The importance and the validity of phenomenography in higher education were based on the seminal research done by Marton & Saljo (1976) as a part of the original Gothenburg research group. Their research helped in qualitatively looking at different levels of understanding and doing a detailed analysis of the students' descriptions of the treatment of the task which helped in the distinction between deep and surface approaches to learning (Entwistle, 1997). This qualitative differentiation was the key with

specific reference to phenomenography and the ongoing research into higher education as the students' experiences in understanding the approaches to learning was the central part of this research method. Marton and Saljo (1976) analyzed the responses of several students who were asked to read an extract from a text book. The students were instructed that questions would be based on their understanding of the text within the extract. The authors found "that while some students tried to make sense of the text, others placed emphasis on memorizing it; these seemingly opposing study strategies were described as deep and surface learning respectively"(Cousin, 2009). Deep and surface approaches as metaphors had a lasting impact on the ongoing research in higher education in the three decades that followed. Cousin (2009) feels that "it is important to note that Marton and Saljo never claimed that deep and surface approaches are innate attributes of students; they accepted that the same student might use both approaches at different times, depending on the task in hand"(Cousin, 2009).

Booth (1997) has stated that in phenomenography, two aspects of learning as a phenomenon are questioned which includes the "What" of learning and the "How" of learning. She goes on the ascribe the "What" as "the conception held of the content of the learning task" and the "How" which "concerns more the nature of the act of tackling the learning task;" further ascribing that "the teacher has to take an analytical stance to the phenomena to be taught" and help the learners "reveal their experience of learning"; and also "ensure that the tasks of learning are integrated into that world which the learners experience" (Booth, 1997).

Phenomenography and Design Education

Phenomenography has been applied to qualitatively study the teaching and learning approaches of teachers and students into the various creative fields in design education excepting architectural education. The relevance of the current study into the approaches to design learning of the students of architecture clearly reflects the effectiveness of phenomenography within the realm of architectural education. The variation in design teacher's approaches to teaching design was done by Trigwell (2002) reporting that "a significant variation in descriptions of how design teaching is approached but that overall, the approaches adopted by design teachers are described as being more student – focused than most other areas of higher – education teaching." These variations were identified using a quantitative method of the Approaches to Teaching Inventory (ATI) and the author found similar variations by comparing the same with studies done on qualitative descriptions of design teaching (Trigwell, 2002). Drew et al. (2001) have explored "issues associated with phenomenographic methodology used in a study to investigate the qualitatively different ways that students approach their

learning in the context of first and second year fashion design courses" (Drew et al., 2001). The methodology used in conducting this study clearly pointed that the process to design followed paths which traversed between the extremes of the deep and surface approaches to learning proposed by Marton and Saljo (1976).

The categories of approaches to learning in fashion design as identified by Drew et al. (2001) included product focused strategies with the intention to demonstrate technical competence and to develop the design process; to process focused strategy to develop the design process and a concept focused strategy to develop own conceptions, and the outcome space which revolved around "focus of the learning" was based on "the strategy and intention dimensions" of the same (Drew et al., 2001). They have elaborated on visual metaphor as the fundamental basis in the development of concepts and its prominence within the approaches to learning adopted by the student in comparison to the process and product oriented approach that is generally adopted. Bailey's study (2002) on a fashion design project pointed that four approaches to learning including two that shared the features described as deep and surface approaches. She has emphasized on further research in other streams of design education "to discover whether other art and design students show a similar range of variation in approach" (Bailey, 2002). The four different approaches are similar to the earlier study but reflect the achievement of empathy and engagement into the learning approaches of the fashion design student, and thus; being in a position "to engage with the student's lived experience" (Ashworth & Lucas, 2000). Bailey (2002) has clearly worked out the outcome space on Table 2 which points that the range in design education on a practice-based learning context has a deeper range in comparison to the text-based learning context of deep and surface approaches.

Bailey (2002) co-relates and compares each dimension of the approach within the practice-based learning context and the text-based learning context by illustrating the same in Table 3, 4 and 5. In table 3, "the focus of learning" clearly reflects that design process as a distinctive learning approach seems to be the intermediary between "visualization of concepts" which is correlative to deep approach and "task of producing artifact" which is in turn correlative to surface approach. In Table 4, "learning intention;" the students seem to be dwelling towards developing a higher level of technical competence; with some developing their own design practice and at the highest level; trying "to develop one's own conceptions"(Bailey, 2002). The importance of design as a learning process is brought to the fore with reference to practice-based learning and a clear bridge between the deep and surface approaches related to text-based learning. Thus in Table 5, Bailey (2002) has reflected on the learning activities within the practice-

based learning context by dwelling on design process as a learning approach. "Experimenting with techniques and procedures" and "Rehearsing techniques and procedures" being correlative to the approaches adjacent to deep and surface approaches, which in turn seem to be moving towards the conceptual real world experience on one end and "memorizing techniques and procedures" (Bailey, 2002) on the other. The studies by Drew et al. (2001) and Bailey (2002) point to the distinctive difference in the approach that needs to be adopted in practice-based learning context; especially in reference to design education. They have emerged as a research platform for the current study which is looking into the practice-based learning context of architecture education with specific emphasis to the coursework of architectural design.

Other studies using phenomenographic approaches in design oriented activities and situations

A study conducted by Isomäki (2007) on the clarification with reference to "Information Systems (IS) Designers' conceptions of human users (of IS) by drawing on in-depth interviews with 20 designers" is clearly reflective of their "lived experiences in the work build up; a continuum of levels of thought, from more limited conceptions to more comprehensive ones reflecting variations of the designers' situated knowledge related to human-centred design. The resulting forms of thought indicate three different but associated levels in conceptualising users; the separatist form of thought; the functional form of thought and the holistic form of thought"(Isomäki, 2007). This reflects the importance of looking at the creative process within practice-based learning context from a different perspective in comparison to the deep and surface approaches from conceptual to memorization which seems to be applicable in text-based learning context. It correlates the conception of knowledge with specific reference to the designers; whether they are catering to technology or at macro and micro level, with specific reference to the human-centered environment at large.

Zoltowski et al. (2012) have studied the incorporation of human-centered approaches in the subject area of design. The phenomenographic study involved thirty three student designers and seven categories of description were identified. The categories formed a two dimensional outcome space; where the two dimensions seem to be pointing towards "human-centered design approaches" and "progression of design skills and strategies from novice to more expert like" with the vertical and the horizontal axis of the said space. "Five of the categories were nested hierarchically. From less comprehensive to more comprehensive, those categories included: Human-centered design as 'User as Information Source Input to Linear Process,' 'Keep Users' Needs in Mind,' 'Design in Context,' 'Commitment' and 'Empathic Design.' Two categories represented ways of

experiencing human-centered design that were distinct: design was not human-centered, but 'Technology-Centered' and human-centered design was not design, but 'Service" (Zoltowski, Oakes, & Cardella, 2012). Zoltowski et al. (2012) provide a pointer towards the categories of description that would arise by studying the learning approaches taken by students while undertaking the architectural design coursework as they are fundamentally looking at human-centric design in architecture.

Kleiman (2008) has done a phenomenographic study into the conceptions of creativity in higher education by interviewing twelve academics from a range of disciplines. The fundamental question of the study was the 'definition of creativity,' which has manifested through a range of statements that have been stated; correlative to various manifestos and studies. "Five main categories of description describing qualitatively different ways of understanding creativity in the context of learning and teaching, were constituted, and they focused varyingly on the experience of creativity as: a constraint – focused experience; a process – focused experience; a product – focused experience; a transformation – focused experience and a fulfillment – focused experience"(Kleiman, 2008). Kleiman has stated that the study is "still emergent and requires further analysis and distillation in order to depict both the relational and hierarchical aspects of the variations." He has elaborated on the emergence of some patterns and relationships in "the five key aspects of variations that, if placed on a continuum of inclusivity, would almost certainly situate creativity as a constraint – focused experience at the 'lower' end, and creativity as a fulfillment-focused experience at the 'higher' end. It would also appear logical that creativity as a process – focused experience ought to precede creativity as a product-focused experience. However that is problematic as it is clear from the research data that there is a conception of creativity-as-process that is not linked to product"(Kleiman, 2008). This study points towards looking at the abstract conception of creativity from a 'constraint, process, product, transformation and fulfillment focused experience' which has a direct bearing towards looking at architecture and the design process that the students chart.

Svensson et al. (2010) has explored technological literacy through the use of technological objects which in today's society "is increasingly integrated with technological systems." Technological literacy has been seen from the question of "how concrete (objects) and abstract levels (systems) are linked"(M. Svensson & Ingerman, 2010). The phenomenographic study has looked into "pupils' experiences of technological systems as embedded in four everyday objects." The study has identified "five qualitatively different ways of understanding systems, ranging from a focus on using the particular objects, over-focusing on the function of objects, seeing objects as part of

a process, and seeing objects as system components, to understanding objects as embedded in systems"(M. Svensson & Ingerman, 2010). The authors "suggest an educational strategy for teaching about systems in technology education" (M. Svensson & Ingerman, 2010). This study points towards understanding the influence of tools ranging from manual to computer aided approaches and their influence on the architecture students' learning approaches.

Phenomenography - the Research Method

Phenomenography is seen as a research method where the exploration is with reference to experiencing things variously. "Phenomenography is not hypothesis driven though it always starts with the broad speculation that variation of perception is likely to exist in relation to a given phenomenon" (Cousin, 2009). The nature of the questions is driven towards exploration of this experience. This is relevant in the current study as phenomenography has been used to explore the approaches to design learning by the architecture students in the first year and fourth year with the focus being on their experiences with reference to the coursework of architectural education. The study has therefore focused on phenomenography – the research method and has not been connected to the other strands of literature available with specific reference to learning approaches in architectural education.

Phenomenography involves semi-structured interviews with questions that help in mapping this experience. The sample for the interviews involves a random selection of individuals amongst the population which ranges from "a sensible minimum" of ten (Cousin, 2009). The interviews are transcribed and the collected data are compared, grouped and analyzed either manually or using software. The transcribed data is studied three to four times in detail to explore the variations and through repetitive iterations; are filtered into groups. The experiences are decontextualized from their original context and these variations are then categorized into descriptions. The set categories of description may be hierarchical or have distinctly varied positions which would be clearly reflected in the final outcome space or findings which acts as the basis for analyzing the said research.

Data Collection & Analysis

The data was generated by selecting students on a random basis from the first year and fourth year of two colleges of architecture based in India. After an initial discussion with reference to the architectural design project for the concerned years, the semi-structured interviews were carried out. The interviews endeavored to chart the approaches to learning in the coursework of architectural design by discussing the project and trying to

gain a phenomenographic output by charting a pattern from the experiences of the students and identifying the underlying conceptions in their approaches to learning. The questions were based on the structure of the questionnaire created for the study for fashion design students with a set of the introductory questions followed by questions on probing the approach and conceptions (Drew et al., 2001).

The introductory questions (first year / fourth year)
What can you tell me about the coursework of architectural design?
Can you discuss the architectural design project in the coursework in detail?
How did you undertake this project?
What did you expect to learn from doing this architectural design project?
Probing on process/approach (first year / fourth year)
Can you tell me about the design process or the steps you took from the beginning to the end of the project?
When you were doing that, what were you thinking about?
When you say ... what exactly do you mean?
Can you give me an example of that in architectural terms?
Probing for difference in approach (fourth year)
How did you go about your architectural design project in the current year in comparison to the first year?
Was there anything you would like to add?
Probing for conceptions (first year / fourth year)
When you use the word learning there, what exactly do you mean?
When you say you want to get more knowledge about the coursework of architectural design, what do you mean?
What counts as understanding?
Is all learning the same?

The interviews were recorded and transcribed and an initial filtration and categorization was done through a random selection of five interviews for each of the fourth and first year architecture students. This initial filtration was based on the underlying intentions clearly reflected on the design process adopted by the architecture students in the design studio. They were as follows,

- to seek direction through the faculty in the design studio
- to see the design studio faculty as a medium of increasing self-knowledge in learning the design process
- to recognize the value of peer evaluation in the design studio as a medium of increasing one's learning and understanding of the design process
- To increase one's understanding of the design process through one's own analysis

This initial filtration using the underlying intentions to look into the strategies and intentions from the experiences of the students of architecture revealed some interesting directions with reference to the categories of description.

Identifying the Learning Approaches

Identifying the categories of description was based on the initial filtration, clearly pointed that the first year architectural students were predominantly approaching the coursework of architectural design as a product – oriented strategy by trying to follow the instructions of the design faculty as clear directions or as a learning approach. Concentration on

design as a process oriented approach by looking at the design faculty as a medium of increasing their self-knowledge was seen at a much lower level within the first year student population. The students of the fourth year were seen to be adopting a conceptual approach by dwelling into the abstract levels of design. They were seen to be developing their own conceptions; but the pressures and rigors of the final portfolio submissions were a digression towards a product – centric approach.

The interim findings gave a clear direction to the current study as its practice-based learning context with reference to architectural education and the learning approaches adopted by the students were clearly based on categories of description (learning approaches) that would vary from the learning context of fashion design, based on the earlier studies (Bailey, 2002; Drew et al., 2001).

Final Categories of Description (Learning Approaches)

The approaches to learning adopted by the students of architecture based on their experiences while undertaking the architectural design project were clearly reflected in the underlying conceptions as six distinct categories of learning approaches. The study has clearly reflected a wider range in comparison to the four categories of learning approaches identified with reference to the earlier studies in fashion design and the same has been extrapolated further in the analysis section.

The Categories of Description or the approaches to learning have been briefly described as follows:	
Approach A	An approach focused on the series of steps taken from the introduction of the design problem to the completion of the final solution with emphasis on presenting a good output and preparing a good portfolio.
Approach B	An approach focused on trying to understand or experience architecture using the experiences of the faculty as a scaffold or reflecting on their instructions to present the learning outcome.
Approach C	An approach focused on evolving perceptions of architecture by adopting a series of steps within the process of design which is based on a product focused outcome.
Approach D	An approach focused on evolving the perceptions of architecture through the process of design which is based on a process focused outcome.
Approach E	An approach focused on conceptualising the thought process and using the same in the evolution of architecture based on in-depth experiences directly correlative to the perceptual psychology within the experiences of each student.
Approach F	An approach that looked into the conceptual and abstract focus towards design based on an innately creative and experiential level of understanding architecture; reflected by the student.

The introduction of the architectural design coursework in the first year of the architecture program could be seen as the stage where the students were seen to tread their learning approach as a step – by – step approach from the design problem to its

final solution. This could be seen as learning approaches bordering to surface approaches stated by Marton & Saljo (1976). The final category was seen through the experiences of the architecture students where they expressed their learning approaches with reference to architectural design at a very conceptual and abstract level and these categories seemed to dwell within the parameters of deep approaches stated by Marton & Saljo (1976).

Approach A: An approach focused on the series of steps taken from the introduction of the design problem to the completion of the final solution with emphasis on presenting a good output and preparing a good portfolio

This approach to learning is focused on the series of steps taken by the student of architecture from the introduction of the design problem to the completion of the final solution. Here the intention of the students is on technically presenting and executing a solution to the design problem given. The learning approach adopted by the student is clearly aimed at the presentation of a good portfolio.

In the extracts below from certain first year students' experiences, we get a clear reflection of the learning approach. The tendency of students who have taken up the challenge of the architecture program and their learning approaches in the first year.

S: no sir, I don't think so. Like in engineering we can learn and study one night and give exam but for architecture we have to study step by step. Like in every class we learn something. We can't miss any class because we have only practical works. We have to make models, we have to make sheets. We learn from those sheets. We have to go for site visits and like if we are studying about doors. We have to see how door works.

S: In architectural terms, would be, you make a structure in such a way, whatever you are designing in such a way that it doesn't get monotonous. See, it's like you enter..aa.. you exit, but when you are exiting, you feel like this space made me, get into another world. Maybe this made me think that it's different than the others. Because, usually what you see is a block standing, levels are divided, ten bedrooms, you know, like, the entire thing is divided. It's monotonous, so, I think the word would be monotonous.

The coursework of architectural design is correlated with other coursework and ideas with the fundamental reasoning of the student to technically come up with a functional and correct solution and this is clearly reflected in this learning approach.

S: learning in architectural design is polishing your ideas and getting more imaginative. Unless and until you can't imagine a structure and sketch it out, you can't make it. So architectural design helps you in that.

S: I feel my designs are still limited, I'm still not getting out of the box and not exploring more. Like when I think of my project, I can think of various things but when it comes to building things, I restrict myself. I don't take any challenges you know. Like in this project, most of used…like 80% of use used paper, but there were few who used other forms of materials like glass or clay or something like that. So that is what you do, you challenge yourself to do it and what I'm doing is I'm still restricting myself. I would want to be more challenging in my designs and something which I think, I want to show it in my work rather than thinking no… no… I don't have time and also I want to speed up my work.

This learning approach was being taken by the fourth year students who seemed to be pressed for time and wanted to complete their design portfolio and technically reflect an acceptable solution.

S: No, it's not the same. For say example if for me to learn any of my technical subjects and for me to learn design is completely different. So technical subjects….I feel drafting is a..for me it works, because when I draft, I'm drawing and I learn so, if you ask me, I think that's great. But design can, I don't know, I think the approach towards design has to be different. So visualization, measurement, understanding scale etc. has to really weigh, you really have to be good in that. So learning is very different for different subjects. And I think it should be addressed in different ways. A generalized attempt towards it is not really affective.

S: aa… understanding of the process will help is come up with better solutions and faster solutions. In the best way possible…

S: So, they have a co-relation, but a lot of people, at least in my batch. They design, the standard says four meters setback, I follow four meter setback. Some people are very standardized.

Approach B: An approach focused on trying to understand or experience architecture using the experiences of the faculty as a scaffold or reflecting on their instructions to present the learning outcome

The learning approach adopted by the students is to focus on understanding or trying to experience architecture as a design oriented process through the instructions provided by the faculty in the design studio. The intention is to use the faculty as a scaffold and

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reflecting or replicating their instructions to come up with the right learning outcome. Approach B is a step ahead of Approach A as the student trying to evolve a learning approach which seems to move away from looking at just the functional and the visual aspects of the architectural design solution.

The extracts below of the first year students clearly reflect the clear pedestal on which the faculty of the design studio have been placed and the importance given to their instructions within the coursework.

S: first is the site analysis where you go and analyze the site, check the directions and approach routes and things like that. You take down the measurements and also we take care of any vegetation on that site, we are not supposed to cut down any tree. So then after that we go for many case studies of existing houses, rooms etc. how they can be improved and how they can be put into our design. After case study, we start with our drafting work which includes all views, elevations plans sections. Then we come to our own concept. Again we start by zoning our area, listing out all the activities, also taking care of the number of members that are going to use that space. Then we make a bubble diagram and decide what space has to be used for what purposes and construction material, we take care of that. Then we are asked to come up with many concepts. We have a panel of 4 teachers, they analyze our concept and tell us what to add or remove. Then with our final concepts we start drafting again and then draw all sections, views, etc. and in the end, we aa…make a model which is actually the best part of the project because then you can visually see how you project has come.

S: I wouldn't say that I'm 100% sure about my work. Every time I design something, I know it's not 100% right. There are flaws, there are good points too. And coming to faculty and discussing. They do tell you what you could do in order to make it better, so it's never like you are 100% right, you are always learning. Understanding is aa…basically how you think, how you perceive and how you make the other person believe in the idea. So you have to even convey your idea to the person.

Many of fourth year students went on to adopt this learning approach at certain intervals during their architectural design coursework with the intention towards successfully satisfying the learning outcome placed by the institution with reference to examinations and the pressure point of final submission of the design portfolio.

S: But that kind of enthusiasm that I used to have to design in general, has really been reduced to a chore, you know, like jus t finishing it off and you know just coming up with

something that the teacher likes and that everyone is happy 'ok my jury will go well' etc. So that passion is there but not as much as I started off with….

S: I don't know. I mean… we know how to….I mean, we do know what the process is ..yaa… sometimes we do get confused, so we keep looking at our professors, then they will tell us something, we go do something. Might not be right, might not be what they are looking for, but, we still have to, every… all our professors also have different opinions of how to go about things. So then, if you listen to one of them, then the other will tell you that that's not right, that's not the way to do it. You know, there is conflicting opinions within the teachers as well. That's sometimes; it gets a little confusing, right. So you need to take the best of everything like, put it together.

Approach C: An approach focused on evolving perceptions of architecture by adopting a series of steps within the process of design which is based on a product focused outcome

This learning approach, in comparison to Approach B gives a clear indication that the student's focus is the evolution of one's own perceptions of architecture. The intention of the student is based on a product focus outcome by adopting a series of steps within the process of design. These steps are fairly different from those of Approach A as they are intentionally taken by the student as a part of the experimentation process of experiencing architecture.

This innate quality seems to be adopted by a few students in the first year and they reflect the same in their experiences reiterating the change that needs to be achieved by the student in the very process of understanding design.

S: yea…in a way it's same and it's different also. Like in architecture, every subject is taken into consideration like psychology of a person, history of that place and structural elements, aesthetic elements. So yea learning is a bit different I would say. It's a bit open-minded. You can put every thought into it. It has to be technical also but it should be open minded also

S: getting more knowledge in terms of architectural design is for the betterment of us. So that we can put our creativity and our knowledge both together, compiling it and we can make a very good design because there is a limit to creativity, there is no limit but when it comes to reality, there is a limit and when this knowledge comes into the reality and combines with creativity, we can have better designs in future.

S: so the human comfort is also important. It's not just going abstract and designing whatever you want.. you have to think about the person staying there…so I designed according to human comfort as well keeping in mind something about the animal and also whatever I try to design…I try to keep a part of nature in it…like involve nature in it. Like that side had river and trees so I tried to bring in the river and create a peaceful environment inside…I created a small waterfall, a small swimming pool and planted trees around the house. So that you connect with nature…like the person. When you stay in house and if the living space has a connection with nature…so that feeling when you go out will also be carried out. So I think that is very important.

There seems to be a large number of fourth year students who have treaded this learning approach. The question as to why this seems to be the case would still require further analysis but Approach C seems to optimally resolve and balance two important aspects within the architectural design coursework. The students are able to dabble into the perceptual qualities of architecture clearly at a very superficial level and balance on the criteria set by the studio faculty and the institution with reference to the final submission.

S: But….it means a lot. I've… One aspect of it is design; the other aspect of it would…design of spaces, physical spaces. The other aspect would also be to do with philosophy, what is my philosophy, what am I communicating to people.

S: Understanding the human temperament and how we can optimize the space was our priority. It starts with analysis of site then we go to the case studies, by laws and references, area distribution, conceptual layout and proper area demarcation for villas, buildings etc… by calculating the footprint area, total area, floor area ratio, etc. and that how we went about doing this project. The road network connectivity were designed, plot areas were marked. There were setbacks and gradually the design got evolved and we come to the end result. It starts with the basic concept. Every architect has a concept and he wants to shape it the way he dreams about it but then you have restrictions but we try and use optimistic use of area. Optimistic use means maximum utility in the minimum area

Approach D: An approach focused on evolving the perceptions of architecture through the process of design which is based on a process focused outcome
The students following this learning approach have their focus at sensitizing themselves to the various aspects of architecture with an underlying intention to evolve the perceptions towards architecture that would lead to them towards Approach E. This

learning approach seems to be consciously applied to the very process of design and the student seems to be working towards a process focused outcome.

Very few first year students seem to adopting this approach at the first year level as their limited exposure to architecture is seen as a barrier towards added sensitivity towards the same.

S: well. Learning. It's … we acquire knowledge about architecture. We are new to architecture. It will be, just now. First year… so we are just learning about, just say, all the points above that I just stated like, what is comfort, what is comfort level and all that. It's all, you learn it only through literature study or, or by looking at different buildings, for example, this room which we are sitting right now. It's a class room but it should feel like a classroom. For that everything comes into play.

S: I think architectural design cannot be taught like a theory subject, it's what, by, when they give us more and more work, we realize, you know, we grow and realize that the changes that could be made and small things that come into our mind which we, you know, keep in mind the next time we are given another project. So, I think that's what learning is. Self learning, more than being taught.

S: experiencing space, basically is like.. see.. if you just going to see.. If you just take a narrow space. Anywhere, I don't think the person would enjoy the time that he gets frustrated, maybe gets annoyed of it. You make the space in such a way that your entire site is being used and at the same time, it gives the person, that entire energy of moving around and makes him think of more, like what is going to be ahead, you feel like roaming there, you feeling like experiencing things. You have a question in mind; let's see what going to happen, ahead. Maybe there is something interesting. So, that is what the whole thing is about me. Experiencing the space.

The fourth year students gradually seem to be moving from Approach C to D as their exposure towards architecture includes working in the industry and the scale of the projects they are handling is at an urban level. Thus their learning approaches seem to be focused on the sensitivities of various aspects of architecture which is clearly seen as the underlying intention in Approach D.

S: What did I expect to learn…see I expected a lot of things, like … when we started off with the whole thing... Like we had really high hopes... Because especially because of last year when … things were rushed at a very fast pace because of third year being a

university year... So we know, this year sit down and learn something. I had actually expected to learn... one was go through the process of... Trial and error... Trying to build something and you know...Trying to understand why it works or why it doesn't work or why it fails and working of that … But that's what I expected and not that it happened

S: everything that you learn registers in a different way, the books that we read. It doesn't come to us when we want... Maybe unconsciously we are using it….somewhere else… because we have read it somewhere... So for me that's the difference… different kinds of learning… some things come to us then and there but some things just come to us, involuntarily… you don't remember where you have read it.

Approach E: An approach focused on conceptualising the thought process and using the same in the evolution of architecture based on in-depth experiences directly correlative to the perceptual psychology within the experiences of each student

The students using this learning approach are subconsciously focusing their minds on conceptualising the thought process and using it in the evolution of architecture. The difference with Approach D is based on their innate and in-depth experiences of architecture which is seen as the underlying intention directly correlative to the perceptual psychology within the experiences of each student.

The first year students who portrayed these underlying intentions were not even cognitive of the fact that they were actually on the road towards using such an innate learning approach.

S: say there is something I'm able to perceive in my project during the learning process, I should be able to use that in any other design I do in future. So I guess that is what understanding is.

Very few forth year students were seen to be following this learning approach and the urban scale of the architectural design project coupled with the submission deadlines within the context of the institutions played an important role. The aspirations and the expectations of learning outcomes in specific directions with reference to the studio faculty also seemed to be an inhibitor in Approach E and Approach F being the learning approach for many students who tended to move back towards Approach C and D.

S: and in terms of a study, it is firstly, research, as I said absorption. Then you get the outputs out keeping your context in mind. For me personally, my context is very

important, so I need to understand my context and then, respond to it accordingly. Then, for me design will not get over till I understand the methods of construction to it. How I am going to do it, how I am going to execute it and till a point, if I cannot. For me a design will be, till a point of execution. A point I can execute. I personally feel, that no one can teach you architectural design.

S: Nowadays, learning has come up to … just living… we went for a play and we've just noticed some detail here and there and, nowadays I am starting to find that I am learning, you know more…in a open.. It's not learning in a classroom, in a studio, just end up learning wherever you are going, so I think that's how it has changed..

Approach F: An approach that looked into the conceptual and abstract focus towards design based on an innately creative and experiential level of understanding architecture; reflected by the student

There were glimpses of the fact that students could actually think of following this learning approach which looked into the conceptual and the abstract focus towards design. The intentions based on the individual's innately creative and experiential level of understanding architecture was reflected by the first and fourth year students in very rare occasions during while extrapolating their lived experiences about architecture.

S: like, you cannot hide yourself in your designs. Like what you are and how you perceive things and how you think about people and how sensitive, you are reflects in every way, in your designs, even in the smallest room that you will create. That is firstly my idea. Secondly, it is that you understand these different typologies, you expose yourself to different people, different ways of which situations comes about and how you work about certain areas. You gather information, you absorb it, and you make it a part of yourself, so much so that start, once you start sketching, it starts coming out in a very intuitive way, so for me, firstly… it's a lot off, for me, research is for what I am doing and whom I am doing, absorbing it, and to understand, what am I, what are the best solutions that I can provide I terms of a design problem. And then it automatically flows out with, of course; a sense of my own character. That is what I understand by architectural design for now...

S: to me…Architectural design is something... O... on the lines of daily life. It started off in the first year as a very... You know…very particular subject, you had to do …..And you go to college... And now... as time as progressed... It's sort of become … like... a daily thing... That...Wherever you look, you are learning something... Wherever… like even as you walk down the streets, you're looking at stuff and... So, this could have

been...in that way and we do that and … before you realize…and you actually realize...It's sort of taken over everything and sort off... you are doing... So that what architectural design is. What counts as understanding… I would say... understanding counts as…basically an acceptance... when you talked about knowledge…it's when we talked about awareness and when we are gaining, we are learning, we are aware…mind is open to different things…that's just knowledge.. It just about how you choose…to deal with it, your understanding of it. Your acceptance of it

Analysis & Discussion on the Study

The study has reflected that the learning approaches adopted by the students of the first year and fourth year of the architecture program shows a clear variation between product - focused and process - focused approaches moving towards concept - focused approaches. Here, the conceptual and abstract facets of the design process are reflected in an outcome space depicted as a Matrix. The outcome space or the findings based on the structural and referential dimensions with the former being focused on the approaches to learning; whereas the latter is based on the intention towards the act of the learning. This has been shown in Table 6.

The range of qualitative differences in the approaches to learning adopted by the students of architecture is reflected in the findings which clearly bring to the fore, the practice-based learning context of the architecture program and the depth of understanding required in perceiving the architectural sensibilities of the students pursuing this noble field. The findings reflects the very nature of the architecture program and the categories of learning approaches show the greater range that is available in comparison to the deep and surface approaches within the text-based learning context. The findings reflect that the range of the categories with reference to learning approaches is higher in the architecture program as the micro to macro level; encompassed is far greater to that within the fashion design program, based on the earlier studies (Bailey, 2002; Drew et al., 2001).

A detailed reflection on the relational order of the categories clearly shows that Approach A and B have a product focus with the students attempting to learning architecture as a clear attempt of following a certain set of steps and trying to execute the same as a solution centred learning outcome. Approach C seems to differ from Approach A and B as the experiential nature of understanding architecture slowly seems to be taking fore for the students but they appear to have a product - focus. Approach D and E clearly seems to elevate the students' understanding of architecture to a different level as they are trying to connect their experiences of architecture to a perceptual level. The learning

outcomes thus slowly evolves itself to a process - focused outcome and moving towards a conceptual level. Approach F truly brings out the innate characteristic of the architectural sensibilities that can be equated to the deep approach as here; we are truly looking at reflection from students which take us towards understanding the very ethos of architecture as an outcome.

With reference to the approaches to learning and how students of architecture approached the coursework of architectural design in the fourth year in comparison to the first year. The phenomenographic study has clearly reflected on the experiences of the students' approaches to learning and it was found that the first year students were predominantly approaching the coursework of architectural design as a product - focused strategy. Approach A, B and C was seen as the preferred learning approaches and this reflected that the first year students were still new to the architecture program and the field. Their intentions to follow a product - centred approach by trying to follow the instructions of the design faculty could be seen as a scaffold towards absorbing the most and quickly moving up the ladder of the practice - based learning context. There were rare moments when the first year students seemed to be following Approach D and Approach E which reflected their move towards a process - focussed strategy and their sensitivity towards understanding architecture at a deeper level. This has been reflected in Table 7.

A predominance of adopting Approach C and D with some moving towards Approach E was seen in the fourth year; with rare instances where the students were seen to be using Approach F. This reflected that, though the fourth year students were seen to be developing their own conceptions based on their perceptions and experiences of architecture; the pressures and rigors of the final portfolio submissions were seen as academic hurdles taking them towards the product - centric surface approaches from the process & concept - centric deep approaches. This has been reflected in Table 8.

Table 9 to 11 co-relates and compares each dimension of the approaches to learning within the practice-based learning context of architectural design and fashion design but also the text-based learning context by Marton & Saljo (1976). Table 9, 'The Focus on Approach to Learning' reflects the depth of the approaches to learning within the design process in the coursework of architectural design and comparing the same with fashion design within the overall framework of deep and surface approaches of text-based learning context. Table 10, 'The Act of Learning Intention' points towards the depth of architectural education within the practice-based learning context and where the macro to the micro level far exceeds the boundary of the context covered within fashion design

education. This is reflected in Table 11, 'Approaches to Learning Activities' and draws on the categories of approaches derived from the current study and comparing it with the earlier studies by Drew et al. (2001) and Bailey (2002). Table 9 to 11 give a new dimension to the practice-based learning context with specific reference to architecture education and further research that needs to be done within this context using phenomenography.

Architectural education – the learning approaches within the practice-based learning context

Broadbent (1973) has reflected on the notion of self - expression of the architect, which according to him is a thing of the past. He has described the crisis within the profession in the mid 1960's. His viewpoint on understanding architecture through perceptual psychology has been based on the way people perceive or experience the building. He has extrapolated on its relevance in understanding how an architect actually perceives or experiences architecture(Broadbent, 1988). The perceptual nature of experiencing architecture and its role in the learning approaches of the architecture student has a clear relevance to the current study. The final categories of description point towards inherent perceptual experiences embedded in the architectural students' minds that seem to play a role in their approaches to learning the coursework of architectural design in the first year; but more importantly seems to be playing a decisive role in the fourth year of the architecture program.

Schon's (1983) assessment of professional practice swaying "from technical rationality to reflection – in – action" is clearly seen as the distinctive difference within the learning approaches adopted by the first year architecture students who seem to agree to the faculty or studio coordinators and see them as scaffolds or a medium of direction in undertaking the architectural design project(Schon, 1996). Whereas; there seems to be a distinctive variation amongst the fourth year architecture students who seem to be reflecting upon their own experiences and perceptions of architecture rather than looking upon the faculty as the medium of direction in undertaking the architectural design project.

Learning Approaches in Architectural Education: The Way Forward

The findings of this study clearly reflect a further review of literature with reference to both; phenomenography as a research approach and connecting the same to architectural education. This will be further refined with reference to the categories of approaches; which would, in turn help in streamlining the focus and intentions of the current study's findings. The next step here would be to think about why is there a

change in the approaches to learning between the first year and the fourth year and what aspects of architectural education actually facilitate the same.

This study has been a comparison of the experiences of the learning approaches of architecture students from the first and fourth year and the way forward with reference to the current research are three further questions that need to be explored. What makes these changes happen and why is there a difference? What are the enablers? What are the barriers?

The categories of description and the findings of the current study reflected in the outcome space are based on the cross-section of the first and fourth year of architecture. A complete cross-section from the first to the fifth year in further studies will help in comparing the current findings and encompassing the same to the learning approaches within the entire spectrum of five years of architectural education and experiences of the architectural student.

This study was geographically limited to architectural institutions from a specific region and the next step would be to look at the learning context from an international perspective. The randomization of the participants was based; partly on the role played by the Design Faculty for the concerned year and the empathy shown by some participants to be a part of the semi-structured interview. This is being considered as a part of the collated data and the future studies to be conducted using phenomenography in architectural education.

Tables:

Table 1 – The strategy and intention dimensions of the categories of approaches to learning fashion courses

Strategy	Intention		
Focus of the learning	**Develop technical competence**	**Develop design process**	**Develop own conceptions**
Making an artefact (product focus)	Approach - A	Approach - B	
Experimenting with process (process focus)		Approach - C	
Visualising of concepts (concept focus)			Approach - D

Note. The strategy and intention dimensions of the categories of approaches to learning fashion courses.(Drew et al., 2001)

Table 2 – Outcome Space of approaches to learning fashion design

	Referential: intention / act of learning		
Structural: focus of the learning	**To develop technical competence through memorizing and reproducing**	**To develop one's own design practice through rehearsing and experimenting**	**To develop one's own conceptions of fashion through seeking meaning**
Production of artworks or artefacts Product focus	Approach - A	Approach - B	
Process of designing Process focus		Approach - C	
Visualization of concepts Concept focus			Approach - D

Note. Outcome Space of approaches to learning fashion design. (Bailey, 2002)

Table 3 – The Focus of Learning (Bailey, 2002)

	Deep_---_Surface		
Text – based	Meaning of Text		Task of reading text
Practice – based	Visualization of concepts	Design Process	Task of producing artefact

Table 4 – Learning Intention (Bailey, 2002)

	Deep_---_Surface		
Text – based	To understand		To reproduce
Practice – based	To develop one's own conceptions	To develop one's own design practice	To develop technical competence

Table 5 – Learning activities (Bailey, 2002)

	Deep_---_Surface			
Text – based	Organizing and integrating content			Memorizing content
Practice – based	Relating fashion to own life world	Experimenting with techniques and procedures	Rehearsing techniques and procedures	Memorizing techniques and procedures

Table 6 – Outcome Space of approaches to learning the coursework of architectural design

	Referential dimension (intention) Act of learning			
Structural dimension (focus) Approaches to learning	**To develop the series of steps from introduction to completion of design project**	**To develop an understanding based on an instruction based scaffold**	**To develop an evolution in understanding based on perceptual psychology**	**To develop one's own conceptions of architecture based on creative and experiential level of understanding**
production & execution of design project (Product focus)	Approach - A	Approach - B		
Production, evolution & execution of design project (Product Focus)			Approach - C	
Process of design based on perceptual psychology (Process focus)			Approach - D	Approach - E
Visualization of conceptual & abstract focus (Concept focus)				Approach - F

Table 7 – Outcome Space of First Year Students' approaches to learning the coursework of architectural design

	Referential dimension (intention) Act of learning			
Structural dimension (focus) Approaches to learning	**To develop the series of steps from introduction to completion of design project**	**To develop an understanding based on an instruction based scaffold**	**To develop an evolution in understanding based on perceptual psychology**	**To develop one's own conceptions of architecture based on creative and experiential level of understanding**
production & execution of design project (Product focus)	Approach - A	Approach - B		
Production, evolution & execution of design project (Product Focus)			Approach - C	
Process of design based on perceptual psychology (Process focus)			Approach - D	Approach - E
Visualization of conceptual & abstract focus (Concept focus)				Approach - F

Table 8 – Outcome Space of Fourth Year Students' approaches to learning the coursework of architectural design

	Referential dimension (intention) Act of learning			
Structural dimension (focus) Approaches to learning	**To develop the series of steps from introduction to completion of design project**	**To develop an understanding based on an instruction based scaffold**	**To develop an evolution in understanding based on perceptual psychology**	**To develop one's own conceptions of architecture based on creative and experiential level of understanding**
production & execution of design project (Product focus)	Approach - A	Approach - B		
Production, evolution & execution of design project (Product Focus)			Approach - C	
Process of design based on perceptual psychology (Process focus)			Approach - D	Approach - E
Visualization of conceptual & abstract focus (Concept focus)				Approach - F

Table 9 – The Focus on Approach to Learning (based on Bailey, 2002)

	Deep_---_Surface			
Text – based	Meaning of Text			Task of reading text
Practice – based (Fashion Design)	Visualization of concepts	Design Process		Task of producing artefact
Practice – based (Architectural Design)	Visualization of conceptual & abstract focus	Process of design based on perceptual psychology	Production, evolution & execution of design project	production & execution of design project

Table 10 – The Act of Learning Intention (based on Bailey, 2002)

	Deep_---_Surface			
Text – based	To understand			To reproduce
Practice – based (Fashion Design)	To develop one's own conceptions	To develop one's own design practice		To develop technical competence
Practice – based (Architectural Design)	To develop one's own conceptions of architecture based on creative and experiential level of understanding	To develop an evolution in understanding based on perceptual psychology	To develop an understanding based on an instruction based scaffold	To develop the series of steps from introduction to completion of design project

Table 11 – Approaches to Learning activities (based on Bailey, 2002)

	Deep ———————————————————————————————— Surface					
Text – based	Organizing and integrating content					Memorizing content
Practice – based (Fashion Design)	Relating fashion to own life world	Experimenting with techniques and procedures		Rehearsing techniques and procedures		Memorizing techniques and procedures
Practice – based (Architectural Design)	Conceptual and abstract focus based on creative & experiential level of understanding architecture	Conceptualising thought process in evolution of architecture based on in-depth experiences correlative to perceptual psychology	Evolving perceptions of architecture through design process based on a process focused outcome	Evolving perceptions of architecture within design process based on a product focused outcome	Understand architecture using experiences of the faculty as a scaffold to present the learning outcome	Series of steps from introduction to completion with emphasis on presenting a good output

Matrix depicting the categories of description with reference to the approaches to learning adapted within the outcome space using the phenomenographic approach

(Product Focus)
Production & Execution
Approach A
Approach B

(Product Focus)
Production, Evolution & Execution
Approach C

Approaches to Learning - Coursework of Architectural Design

(Process Focus)
Perceptual Psychology
Approach C
Approach D

(Concept Focus)
Conceptual & Abstract
Approach E
Approach F

Classification of the Approaches to Learning Adopted by Students of Architecture in their Design Coursework

Welsh School of Architecture – School Research Ethics Committee

Proposal Submitted – 12th December 2012

Approved – 20th December 2012

Approaches to Learning Adopted by Students of Architecture – A Classification

Ashok Ganapathy Iyer

Classification of the Approaches to Learning adopted by students of architecture in their design coursework

Title of Project:

A phenomenographic study in understanding the impact of the fundamentals of design and visual theory that is imparted as a part of the coursework of architectural design in the first year of the architecture program and its effectiveness in the approaches to learning and outcomes of students from the first year to the final year of the architecture program with specific emphasis to the coursework of architectural design

Purpose of the project and its academic rationale:

The aim of this study is to use the phenomenographic methodology in understanding the impact of the fundamentals of design and visual theory that is imparted directly or indirectly as a part of the coursework of the first year of architecture program within the preamble of the architectural design coursework or as a separate coursework titled basic design; and its effectiveness in the approaches to learning and outcomes of the students with specific emphasis to the coursework of architectural design from the first year to the final year of the architecture program. This qualitative study will explore the impact of the fundamentals of design and visual theory as a learning tool or as a teaching module; on the architectural students' approaches to learning the coursework of architectural design from the first year to the final year of the architecture program. The study will explore the approaches to learning adopted by the architecture students with reference to the coursework of architectural design with specific emphasis to the fundamentals of design and visual theory and its impact on their learning outcome.

Brief description of methods and measurements:

The study will be conducted using the phenomenographic approach which as per Marton (1981) "has been stated as the empirical study of the limited number of qualitatively different ways in which one can conceptualise, understand, perceive and apprehend the various phenomena in and amongst the aspects of the world around us. These differing experiences and understandings have been characterised in terms of categories of description which are logically related to each other and forming hierarchies in relation to the given criteria"(Marton, 1981). This study shall be done based on the methodological references of an earlier pilot study titled 'a phenomenographic study in understanding the design students' approaches to learning the coursework of architectural design' dated 6th February 2012 as a part of my on-going work towards my PhD studies at Welsh School of Architecture with specific reference to architectural education using the phenomenographic approach and two earlier studies on approaches to learning of fashion design students with reference to their design coursework(Bailey, 2002; Drew et al., 2001).

Participants: recruitment methods, number, age, gender, exclusion/inclusion criteria:

The learning context for the study would be the first year to the fifth year of the architecture program of four institutions; the first one being Welsh School of Architecture, Cardiff University, Wales – UK based on the RIBA model and where I am currently pursuing my PhD studies. The other two being institutions based in USA following the NAAB (National Architectural Accrediting Board) – North American Model; and the fourth one being Sir JJ College of Architecture, Mumbai - India which follows the norms prescribed by the Council of Architecture - India. The study will chart the approaches to learning adopted by the students of architecture in the coursework of architectural design with specific reference towards understanding the impact of the fundamentals of design and visual theory that is incorporated directly or indirectly within the coursework of architectural design from the first to the final year of the program. The study will also look into the learning and teaching approaches adopted by the faculty in incorporating the relevance of the fundamentals of design and visual theory within the Architectural Design Studio and its impact on the approaches to learning of the students of architecture by charting their experiences; that they undergo during their Architectural Design Studio. The sample will include 15 students from the first year to the fifth year of the architecture program. A similar sample shall be interviewed in the next academic year and the outcome of both the years shall be put into perspective. The sample will be based on a random selection and the age group of the student population will be from the range of 18 to 30 years.

Consent and participation information arrangements - please attach consent forms if they are to be used:

 The study will be conducted at the Welsh School of Architecture, Cardiff – UK; Sir JJ college of Architecture, Mumbai - India; and two institutions based in USA. The requisite permissions shall be obtained from the relevant authorities of the above institutions. Consent forms shall be duly filled as per the prescribed format and shall be attached as a formal part of the final study.

Research Question:

The study will focus on the experiences of the students of architecture by using the phenomenographic method that Drew et al. (2001) and Bailey (2002) have used in studying the approaches to learning adopted by fashion design students and the pilot study dated 6th February 2012 that has dealt into the approaches to learning adopted by the architecture students with specific reference to the architectural design coursework in the first and fourth year of the architecture program. The data will be collated and analyzed in two phases; the first phase starting from February to June 2013 and based

on the analysis and the initial outcome; the second phase of the study shall be repeated from February to June 2014. The final categories of description and the outcome space shall be based on the same and the research question, questionnaire and the general categorization of the approaches to learning will be based on the lines of the above studies. The research question will be as follows

What are the approaches to learning being adopted by the students of architecture in the coursework of architectural design with specific reference to the impact of the fundamentals of design and visual theory on the said coursework? Why do the approaches to learning evolve in the coursework of architectural design from the first year to the final year of the architecture program?

Semi-Structured Interviews:

The semi-structured interviews will endeavour to map the approaches to learning within the coursework of architectural design with specific emphasis to the fundamentals of design and visual theory and its impact on students' approaches to learning the said coursework. The teaching and learning outcomes shall also be charted using the phenomenographic approach. The experiences of the students shall be charted using detailed semi-structured interviews, documentation of the design process using photography and video documentation; with the aim towards identifying the underlying conceptions in their approaches to learning. The fundamentals of design and visual theory and its relevance within the Architectural Design Studio shall be presented to the students of architecture through a visual presentation.

The semi-structured interviews will be conducted on a sample of seven to fifteen students, chosen randomly from each year for the entire cross-section of the five year program and the design faculty from the selected schools of architecture.

The introductory questions (first / second / third / fourth / fifth year)
What can you tell me about the architectural design studio?
Probe – What is your viewpoint about coursework of architectural design?
What is the role of introductory design theory in the architectural design studio?
Probe – Why is it introduced as a part of the architectural design coursework; can you elaborate on introductory design theory?
Can you discuss the role of introductory design theory with reference to a design project from the architectural design studio?
Prompt – how did you undertake this design project? / How did you go about the design project and can you discuss the steps in detail?
What did you expect to learn from doing this design project with specific emphasis on introductory design theory?

Probe – What was the impact on the final outcome? / Prompt – Can you discuss ------------?
Probing on process/approach (first / second / third / fourth/ fifth year)
Can you tell me about _____ (with specific emphasis on aspect related to introductory design theory quoted by the student in the earlier question) that played an important role in the design process of the above project?
When you are doing that_____, what are you thinking about?
When you state _____, what exactly do you mean with specific reference to introductory design theory?
Prompt – Can you give me an example of that in terms of introductory design theory?
Probing for differences in approaches to learning (second / third / fourth/ fifth year)
How did you approach the architectural design studio in the current year in comparison to the first year / and the other years?
Prompt – Was there anything you would like to add?
Probing for conceptions of approaches to learning with specific reference to introductory design theory (first / second / third / fourth/ fifth year)
What do you understand by learning in the architectural design studio with specific reference to introductory design theory?
Probe – What is learning as an approach for you as a design student in the studio?
When you say you want to gain more knowledge in the architectural design studio with specific reference to the introductory design theory, what exactly do you mean?
Prompt – What is the meaning of gaining more knowledge in the architectural design coursework with specific reference to introductory design theory? / Probe – What counts as understanding in the architectural design studio?

Focus Group Discussion & Data Collection – Phase 2

Based on the interim analysis, phase 2 of the final study shall include a focus-group discussion with a group of six to eight students from entire cross-section of the architecture programs at Welsh School of Architecture, Cardiff, UK and Sir JJ College of Architecture, India. The focus-group interview questionnaire will focused on the findings of the interim analysis.

The design process adopted by the students in the architectural design studio
Can you discuss the design process adopted by the student in the architectural design studio?
Probe – How has the design process evolved in the design studio in the current year in comparison to the 1st / 2nd / 3rd & / or 4th Year?

Design theory introduced in early-stage of the curriculum as a part of the design coursework and its relevance in the architectural design studio
Can you elaborate on the significance design theory that were introduced in the in early-stage of the curriculum in your architectural design studio?
Focus Question - Can you further discuss _____ in detail?
Role of tutors and critique in the architectural design studio
Can you comment on the role of the Tutors in the architectural design studio?
Probe - Can you discuss the tutors role in the 1st / 2nd / 3rd & / or 4th Year in comparison to the current year?
Can you discuss the importance of critique in the architectural design studio?
Probe - Does it help you in the design process?
The philosophy of the school and its relevance in the architectural design studio
What do you understand by learning in the Architectural Design Studio with specific reference to introductory design theory?
Probe – What is learning as an approach for you as a design student in the studio?
Can you discuss the philosophy of _____ School of Architecture?
What is its relevance with specific reference to the design process that you adopt in the architectural design studio?
Probe - Can you elaborate on----------------------?

8. A clear and concise statement of the ethical considerations raised by the project and how is dealt with them: the study will qualitatively look into the approaches to learning adopted by architecture students with specific reference to the architectural design coursework and will try to look into the impact of the fundamentals of design and visual theory on their learning approaches. The category of descriptions that will be identified during the first phase and the second phase will eventually be seen as an outcome space that will look into the impact of the fundamentals of design and visual theory. The study will look at the approaches to learning from the students' perspective.

7. Estimated start date and duration of project:

February 2013 to June 2013 First Phase

February 2014 to June 2015 Second Phase

Approaches to Learning Adopted by Students of Architecture – A Classification

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Abstract:

The paper explores the ongoing PhD research work being done to classify the students' approaches to learning in architectural education through an international perspective. The research hypothesis and Phenomenography - the qualitative methodology used for this research are explored; in addition to learning approaches in architectural education are reviewed. The results of the pilot study conducted to understand the phenomenographic approach are discussed with reference to earlier studies in higher and university education. The paper attempts to present 'the way forward,' by initiating a discussion within the research community on this research journey adopted in search of this classification.

Key Words:

Phenomenography, Approaches to Learning, Architectural Education

Introduction:

The research has looked into the nature of students' approaches to learning in the architecture program through their experiences in the core coursework of design, presented within the research context of architectural education. What are the approaches to learning being adopted by the students of architecture in the coursework of architectural design, has led to another exploratory question on; how theory introduced in the first year architectural design coursework impacts on their learning approaches in the subsequent years? The above research hypothesis has been further reinforced by the research question; why do approaches to learning evolve in the architectural design coursework from the first to the final year? The basis to look at learning approaches in architectural education is due to the significant research gap in this field in comparison to the relative clarity within research in other disciplines. The aim is to classify the learning approaches adopted by students of architecture in their design coursework, with the vehicle for this classification being explored through theory introduced in early-stage curriculum and its impact on the learning approaches in the subsequent years. The main objective of the research is to identify the approaches to learning adopted by students of architecture in their design project work by looking at

theory introduced in the students' first year core coursework of architectural design and using that as a vehicle to evaluate their learning approaches in subsequent years. The research has endeavored to classify these learning approaches to understand how they actually manifest themselves in architectural education. The identified research methodology; phenomenography has been used to categorize the students' approaches to learning in the early-stage curriculum and subsequent years of their architectural program. The research outcome will be presented as categories of learning approaches presented through an outcome space.

Literature Review:

Approaches to learning with reference to students in higher education have been expressed in terms of surface and deep approaches (Marton & Säljö, 1976). The surface to deep approaches to learning within higher educational research has been variedly studied in a multitude of disciplines. Students' approaches to learning are directly correlative to their prior experiences of studying and understanding the key concepts of the subject matter; which is vital to the subsequent learning outcomes (Prosser & Trigwell, 1999). Thus research into the approaches to learning has been an endeavor towards reflecting on the student's experience within the domain of higher and university education.

Teaching and Learning in Higher Education – 3-P & Phenomenographic Model:

Research into the teaching and learning in higher education has evolved in the past century with a series of theories being put forward by various schools of thought following quantitative, qualitative and mixed methodologies. This journey includes the schism that has developed within research in higher education and at the university where the researcher and teacher are required to holistically look at learning and teaching as a living eco-system (Schon, 1987) with the introduction of various theories of learning from the implicit-theories-in-use to the explicit or formal theories of student learning; which includes classroom-based theories of learning, the institutional model, and the phenomenographic model (Biggs, 1994). A distinctive differentiation of the classroom-based theories of learning and the institutional model where the student's characteristics with reference to the teaching context and the approaches taken by the student in achieving the learning outcome, is seen through the 3-P Model or the Presage – Process – Product classroom teaching model; in comparison to the phenomenographic model where the learning is seen through the perspective or the experience of the learner i.e. the student (Biggs, 1994). The emphasis is to the use of the phenomenographic approach in the understanding of learning and teaching through the students' prior experiences and their prior understanding as the key towards looking

at the learning approaches, they take in their education and learning outcomes (Prosser & Trigwell, 1999).

3-P Model and the Phenomenographic Approach:

The 3-P or the Presage – Process – Product classroom teaching model is based on the model that was derived from Dunkin and Biddle (1974) and the present version by Biggs (1987-93) was visualized as a dynamic system within an educational event with a mutual interaction between the students' approaches to learning. This formed an important part within factors such as prior knowledge, their ability and preferred approaches to learning; the teaching context which includes factors such as objectives of teaching and assessment coupled with institutional procedures and environment; on-task approaches to learning or learning - focused activities, and learning outcomes from a quantitative and qualitative basis (Biggs, Kember, & Leung, 2001). The Study Process Questionnaire (SPQ) (Biggs, 1987) and Approaches to Study Inventory (ASI) (Entwistle & Ramsden, 1983) have been used as the quality indicators for the 3-P model and studied from an individual constructivist, social constructivist, or a cognitivist perspective with the three perspectives taking a dualistic viewpoint; wherein the individual and the world are seen as independent entities and the process of knowledge is studied accordingly. Trigwell & Prosser have argued for a constitutionalist perspective using the phenomenographic approach to reflect on the relational nature of teaching and learning and re-conceptualize the 3-P model to study their conceptions. Theoretically using the phenomenographic approach, they have pointed at a major task of teaching for the teacher in creating teaching and learning situations in similar ways in which students would experience the teaching and learning content that the teacher has designed (Keith & Michael, 1997; Trigwell & Prosser, 1997). Trigwell et al. (2005) have also used the phenomenographic approach by developing the structural component using the elements of the Structure of the Observed Outcome (SOLO) Taxonomy (Biggs & Collis, 1982) and pointed at qualitatively different ways in which university teachers' experiences change in their understanding of the subject matter, they have taught (Keith, Michael, Elaine, & Paul, 2005). This brings us back towards understanding phenomenography as a research approach and how can the phenomenographic perspective be used in understanding and classifying the learning approaches within the architectural design coursework.

The students of architecture are introduced to various theoretical constructs in the coursework of architectural design as a part of their architectural curriculum. The study has looked at the theory introduced within architectural design coursework in the students' first year as the research vehicle to evaluate their learning approaches in

subsequent years. The vehicle of the introductory theory-based model of looking at their design coursework is the most appropriate way of classifying the students' learning approaches instead of history and theory or technology; as architectural design plays a central role in the design studio through the years of their architectural education. The academic context has been explored from a historic background of literature review with the focus on approaches to learning in architectural education (A. G. Iyer, 2015). This review has explored facets of students' learning approaches in the coursework of architectural design (Roberts, 2006; Webster, 2001, 2004), the design studio (Schon, 1985); in addition to the historic and prevailing schools of thought with reference to the architectural curriculums (Bax, 1991; Gulgonen & Laisney, 1982; Littmann, 2000). The learning approaches shall be categorized using a phenomenographic study. The physical domain of the research has been taken from an international perspective by looking at the design curricula with reference to the architectural programs at four schools of architecture including one each from United Kingdom and India; with two from the United States of America (A. G. Iyer, 2014-15).

Research Methodology:

The focus of the research is to explore the approaches to learning of architecture students using the qualitative research methodology of phenomenography. Phenomenography has been defined by Marton (1992) as "the empirical study of the limited number of qualitatively different ways in which we could experience, conceptualize, understand, etc. various phenomena in and aspects of the world around us. These differing experiences, understanding, etc. are characterized in terms of categories of descriptions, logically related to each other, and forming hierarchies in relation to the given criteria. Such an ordered set of categories of description is called the outcome space of the phenomenon or concepts in question" (Drew et al., 2001). Using this research methodology, the researcher can put together a "range of different ways in which people understand and experience the same thing" and "is interested primarily in surfacing variation of experience and understanding" (Cousin, 2009). "Each phenomenon in our world can be seen and understood in only a limited number of distinctively different ways" and this understanding can be correlated by defining it "as the experiential relations between an individual and a phenomenon" (Marton, 1992).

Phenomenography helps the researcher in mapping the experiences of the research participants based on their understandings of the phenomenon. It reflects these understandings within a limited range or categories of description, helping further in building an outcome space for the said phenomenon and the final analysis. The approaches to teaching and learning in various fields of higher education and in creative fields within design education have been studied using phenomenography. With an

emphasis on design education, literature review on phenomenography points at further research that needs to be undertaken in the design curricula in reference to architectural education (Bailey, 2002; Drew et al., 2001; Trigwell, 2002).

Pilot Study & Results using the Phenomenographic Approach:

The pilot study looked into the architecture students' evolution in their learning approaches by comparing the first year and fourth year of the program; charting the variation and exploring the reasons for this change. The study was aimed to understand phenomenography as a methodology in identifying learning approaches from a qualitative perspective. A sample of thirty-nine students in two colleges of architecture in India participated in this study.

The semi-structured interviews undertaken using phenomenography; focused on the students' approaches to learning in the architectural design coursework of first and fourth year with the design project as the learning context. The study was done on the lines of earlier phenomenographic studies to understand the variation in the approaches to learning of fashion design students based in various institutions in the United Kingdom (Bailey, 2002; Drew et al., 2001).

A sample of first year and fourth year students from two schools of architecture were interviewed to understand the approaches to learning with reference to their architectural design course work. A semi - structured interview using the phenomenographic approach was designed and ethical approval for the interview questions was obtained. The interviews were conducted for a sample of ten students of each year, chosen randomly from the year's population for the selected schools of architecture. A qualitative analysis of the students' responses to categorize the approaches using phenomenography was undertaken and used for the final study. A paper was published in a peer-reviewed journal, outlining the full project (A. Iyer & Roberts, 2014).

Analysis:

The pilot study titled 'A phenomenographic study in understanding the design students' approaches to learning the coursework of architectural design' and its publication has given a clear direction to the final study of my on-going PhD studies (A. Iyer & Roberts, 2014).

The pilot study using the phenomenographic methodology helped in identifying the learning approaches adopted by the students of the first and fourth year of the architecture program as per Table 1 that reflects a variation between product-focused

to process-focused and in the direction of concept-focused approaches. Table 2 to 4 has presented a comparison between the dimensions of learning approaches within practice-based learning contexts of architectural design and fashion design; in reference to the text-based learning context by Marton & Saljo (1976). Table 2 represents the depth in the learning approaches required within the architectural design coursework in comparison to fashion design; and in the overall framework of deep and surface approaches of text-based learning context. Table 3, presents architectural education in the macro-to-microcosm which far exceeds the boundaries of fashion design education in the practice-based learning context. Table 4 is a comparison of the categories of approaches derived from the current study to the earlier studies done on fashion design and text based studies. Table 1 to 4 represent a new dimension in the practice-based learning context of architecture education and my ongoing work with the international perspective dwells into the entire cross-section of the five years of the architecture program.

The identified categories of approaches adopted by first and fourth year architecture students is connected to how the concepts of deep and surface approaches to learning manifest themselves in architectural education pointing towards a more complex set of learning approaches, than just a simple deep and surface division (A. Iyer & Roberts, 2014). It also raises a further question on do the categorized approaches form different points on a continuum between deep and surface, or are some in a different dimension. The literature review on students' learning approaches in architectural education has provided further pointers from the surface to the deep dimension, through years of training and reflective practice in architectural education (A. G. Iyer, 2015).

Discussion:
The approaches to learning in higher education was further reviewed by focusing on deep and surface approaches to learning adopted by the students' cohort and the various student learning models that have been used to map these approaches. The review furthered looked at learning and teaching models with an emphasis on the qualitative research methodology – 'Phenomenography;' and a differentiation of the 'phenomenographic approach' from 'phenomenological approach' or 'Phenomenology.' The students' experiences of their approaches to learning with specific emphasis to learning outcomes; as foreseen by them were also reviewed using phenomenography. The students' approaches to learning in architectural education were reviewed using the vehicle of theory introduced in the early-stage of the architectural curriculum within the coursework of architectural design. The review further looked at the manifestation of the approaches to learning in subsequent years of the architecture program and studies

conducted using phenomenography which has helped in formulating the research methodology for the proposed research. The review also presented a general overview of the physical domain of this research in architectural education with specific reference to the four schools of architecture and the introductory theory coursework of architectural design in the early-stage of the architectural curriculums in these schools. A paper has been published in a peer-reviewed journal and through research funding, I have attended an international conference on early-stage curriculum in design education which is outlined in this literature review (A. G. Iyer, 2015).

Implications & the Way Forward:

For the final data collection, a sample of the first to fifth year students were interviewed to understand and classify the conception of approaches to learning in architectural education. This was done through a series of semi-structured interviews to explore the learning experiences of the students' cohort using phenomenography by charting the theory introduced in the early-stage of the architectural curriculum on the advanced level architectural design coursework in the subsequent years of the architecture programs at two schools of Architecture in United Kingdom and India. A semi - structured interview was prepared for the students' cohort to get an in-depth perspective on the approaches to learning and eventual outcomes using phenomenography (qualitative method). Ethical approval was obtained from the Research Ethics Committee – Welsh School of Architecture (WSA), Cardiff University for the interview and questions. As a part of the phenomenographic study, semi - structured interviews were conducted using the learning context of the design project work done in the architectural design coursework. This was done with reference to the two schools of architecture as the physical domain of the research. The interview was piloted on a small sample of first and senior students in the United Arab Emirates with the data being used to refine the questions. Semi-structured interviews were conducted the on a sample of ten to fifteen students for each year from the first year to the final year, chosen randomly from the year's population and the design faculty from the selected schools of architecture. The interim qualitative analysis of the students' responses to categorize the same using phenomenography involved data collection through semi-structured interviews with the students on a one-to-one basis. These interviews were recorded and transcribed as per the guidelines set up by the Research Ethics Committee, WSA. The transcribed data from the students' cross-section of each school were codified manually and using NVivo; a qualitative and data analysis software. The transcripts went through a series of iterations where the experiences of the students with reference to the set phenomena within the research question were codified and de-contextualized from the original experience. These went through further iterations and were presented as categories of description with reference

to the approaches to learning for each year of the architecture program for the analyzed school. These categories of description were then placed within an outcome space for qualitative interpretations in the form of a conclusive discussion with reference to the research question.

The data collection done at one school was analyzed using the phenomenographic approach and this interim qualitative analysis was assessed by identifying the categories of learning approaches. These interim findings were presented in a research seminar to get the viewpoint of experts at WSA in February 2014. Based on the interim findings, the current analysis was further strengthened by a focus-group discussion with a group of six to eight students from each year for two schools which focused on four broad areas.

1. Theory introduced in early-stage of the architectural curriculum and its relevance in the architectural design studio
2. Role of tutors and critique in the architectural design studio
3. The design process adopted by the students in the architectural design studio
4. The philosophy of the school and its relevance in the architectural design studio

On similar lines, data collection through semi-structured interviews were conducted at two more schools of Architecture in the United States of America in 2015. The final analysis of the categories of description, outcome space and focus group discussions is being conducted manually and using NVivo to determine approaches of learning adopted by students with a focus on the architectural design coursework within the architecture program.

Table 1 - Categorized approaches to learning adopted by First & Fourth Year Architecture Students (A. Iyer & Roberts, 2014)

Approach A	Series of steps taken from the introduction of the design problem to the completion of the final solution with emphasis on presenting a good output and preparing a good portfolio
Approach B	Trying to understand or experience architecture using the experiences of the faculty as a scaffold or reflecting on their instructions to present the learning outcome
Approach C	Evolving perceptions of architecture by adopting a series of steps within the process of design which is based on a product-focused outcome
Approach D	Evolving the perceptions of architecture through the process of design which is based on a process-focused outcome
Approach E	Conceptualizing the thought process and using it in the evolution of architecture based on in-depth experiences directly correlative to perceptual psychology within the students' experiences
Approach F	Students' reflecting into the conceptual and abstract focus towards design based on an innately creative and experiential level of understanding architecture

Table 2 - The Focus on Approach to Learning (based on Bailey, 2002) (Bailey, 2002; A. Iyer & Roberts, 2014)

	Deep --- Surface			
Text – based	Meaning of Text			Task of reading text
Practice – based (Fashion Design)	Visualization of concepts	Design Process		Task of producing artefact
Practice – based (Architectural Design)	Visualization of conceptual & abstract focus	Process of design based on perceptual psychology	Production, evolution & execution of design project	production & execution of design project

Table 3 – The Act of Learning Intention (based on Bailey, 2002) (Bailey, 2002; A. Iyer & Roberts, 2014)

	Deep --- Surface			
Text – based	To understand			To reproduce
Practice – based (Fashion Design)	To develop one's own conceptions	To develop one's own design practice		To develop technical competence
Practice – based (Architectural Design)	To develop one's own conceptions of architecture based on creative and experiential level of understanding	To develop an evolution in understanding based on perceptual psychology	To develop an understanding based on an instruction based scaffold	To develop the series of steps from introduction to completion of design project

Table 4 – Approaches to Learning activities (based on Bailey, 2002) (Bailey, 2002; A. Iyer & Roberts, 2014)						
	Deep _--_Surface					
Text – based	Organizing and integrating content				Memorizing content	
Practice – based (Fashion Design)	Relating fashion to own life world	Experimenting with techniques and procedures	Rehearsing techniques and procedures		Memorizing techniques and procedures	
Practice – based (Architectural Design)	Conceptual and abstract focus based on creative & experiential level of understanding architecture	Conceptualizing thought process in evolution of architecture based on in-depth experiences correlative to perceptual psychology	Evolving perceptions of architecture through design process based on a process focused outcome	Evolving perceptions of architecture within design process based on a product focused outcome	Understand architecture using experiences of the faculty as a scaffold to present the learning outcome	Series of steps from introduction to completion with emphasis on presenting a good output

International Perspective: One - Sir JJ College of Architecture, University of Mumbai, India

International Perspective: One - Sir JJ College of Architecture, University of Mumbai, India

Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ), University of Mumbai located in Mumbai, India is one of the four institutions covering the international perspective for the current study. Table 19 presents an overall picture of the bachelor of architecture programs offered at the four schools with Sir JJ offering a total of three hundred and forty credits in the five year program and eighty-five courses. The five year program includes ten semesters with one semester dedicated to internship or professional training and is accredited by the Council of Architecture, New Delhi, India.

Name of School	Total Credits Hours	Equivalent Coursework / Core Modules	Accreditation Body
Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ), University of Mumbai - Mumbai, India	340	85 Courses offered in the 5 Year Program	Council of Architecture (CoA), New Delhi, India https://www.coa.gov.in/
School of Architecture, Oklahoma State University (OSU) - Stillwater, Oklahoma, USA	154	43 Courses offered in the 5 Year Program	National Architectural Accreditation Board (NAAB), United States http://www.naab.org/
School of Architecture, University of Texas at Austin (UTA) – Austin, Texas	161	47 Courses offered in the 5 Year Program	
Welsh School of Architecture (WSA) - Cardiff, UK	600	20 Core modules offered in the 5 Year Program	Royal Institute of British Architects (RIBA) and the Architects Registration Board (ARB)

Table 19: Data Collection at Four Schools of Architecture with Highlights of Program offered at Sir JJ College of Architecture

Sir JJ College of Architecture: An Indian Perspective

Sir JJ College of Architecture was first established as a part of the Bombay School of Art & Industry in 1857 and authorized by the British government to grant draughtsman's certificate to registered candidates. It was formally established as a department of architecture in 1913 headed by Prof. Robert Cable (Kabinettal & Karpe, 2012). The 1929 fourteenth edition of the Encyclopedia Britannica has recognized the architecture program offered at this department of Sir JJ School of Art, Bombay as being exempted from the RIBA intermediate examination (AARUK, 2007).

In 1952 the department was officially renamed as Sir Jamshetjee Jeejeebhoy (Sir JJ) College of Architecture under the University of Mumbai. Sir JJ is located in the heart of South Mumbai in a sprawling campus which includes the School of Fine Arts and Applied Arts. Chhatrapati Shivaji Terminus (Victoria Terminus) railway station is the next door landmark to name a few of the well-known heritage structures of Mumbai marking the importance of its physical location within the city. The college offers the five year

Bachelor of Architecture (B. Arch.) program recognized by the Council of Architecture; the official accreditation body established by the Government of India in 1972 to regulate education and practice in the country (Kabinettal & Karpe, 2012; NIC/NICSE & Architecture, 2015).

The professional degree is offered as an Indian credit-based semester and grading system as a part of the University of Mumbai syllabus for the architecture program. The fourth year includes the eight semester for professional training in the industry applicable to the syllabus that was implemented in the academic year 2012-13. In the earlier syllabus of the university, industry-based internship was offered in the tenth semester of the fifth year. This B. Arch program includes 30% of design-based coursework, 17% of construction & structures-based coursework, 20% of graphical & technical coursework, 18% of other theoretical coursework, 10% as electives and 5% for practical training. An amalgamation of eighteen courses in first year, twenty-one courses in second year, nineteen courses in third year, ten courses in fourth year and seventeen courses in fifth year are offered as a part of the five year B. Arch program at Sir JJ (Ad-hoc_Board_of_Studies_in_Architecture, 2012). Eighty-five courses in total are offered and distributed in six groups of coursework including architectural design, construction, technical, theory, electives and professional training as depicted in Figure18.

Figure18: 5 Years B. Arch Program Syllabus at Sir JJ College of Architecture, Mumbai, India

Architectural Curriculum at Sir JJ

The curriculum of the five year program offered at Sir JJ College of Architecture including the architectural design coursework has been explained in the introductory summery of the B. Arch Syllabus of the University of Mumbai for 2012-13. This summary is focused on architectural practice further highlighted through design and technology. The objectives reflecting this underlying focus includes a student-centric approach towards critical thinking, flexibility in the syllabus, non-linearity in the learning process with greater emphasis on theory, practice and research. The core coursework of architectural design has been supplemented by allied design in the design studio through the introduction of courses described in Sub-section-7.4.1 including visual studies, interior design, landscape design, graphic design, product design and town-planning (Ad-hoc_Board_of_Studies_in_Architecture, 2012).

The underlying structure of the architecture syllabus at Sir JJ has its emphasis on a four-areas with design-based coursework being central to the program, effectively representing the structural facet of students' approaches to learning. Technical or craft-based, technological and other theoretical coursework supplement the core design coursework with architectural practice seen as the backdrop to these four domains.

Architectural Design Learning Context at Sir JJ

Design studios have played their role of imparting the formal teaching and learning process for the students in the architectural design coursework at Sir. JJ. These studios have been used by the students from 7.00 AM to 7.00 PM on working days of the week and until 2.00 PM on weekends. The students use these studio facilities for interaction with the design faculty and visiting experts' as well as peer-based learning with senior students of the five years program. These facilities are not used as twenty-four hours, all-day working studios that has been the hallmark in architectural institutions internationally. The students from the first-to-fifth year of the architecture program are stationed at various locations within the two buildings and the workshop of Sir JJ College. The learning context at Sir JJ is a reflection of the school's historic relevance, its physical location as well as the architectural pedagogy imparted as a part of the five year program.

Architectural Design Coursework in First Year B. Arch Program at Sir JJ

The architectural design (eight credits) and allied design (eight credits) coursework are spread across the two semesters of the first year program covering 22% of the overall seventy-two credits. The other coursework offered includes building construction and materials, theory and design of structures, humanities, environmental studies,

representation and detailing, college project work and elective coursework that cover 78% of the total seventy-two credits offered in the first year as per Figure18.

Summarized Discussion: First Year Categories of Learning Approaches at Sir JJ

The collected data suggests that the first year students have largely approached their learning through *dependent* strategies focusing on *product-based* approaches to architectural design. There is evidence that the design coursework has centered on beauty and aesthetics as the principal domains of knowledge resulting from design exercises that the students' have done in the parallel coursework of allied design (Approach SJJ1A). This would be seen as students adopting a *surface* approach in their design work.

The data also suggests that this focus on beauty and aesthetics as well as the functional-cum-practical domains has led to students operating a *strategic* approach. These acts of completing the design process by following a series of pre-determined steps signifies students' learning ranging from the *surface-to-strategic* approaches (Approaches SJJ1B and SJJ1E). The data also suggests that students have depended on the faculty as well as collaboration with senior students in developing the various stages towards completion of the design project. These *dependent* and *product-based* Approaches SJJ1C and SJJ1D have also been classified within the range of *surface-to-strategic* approaches.

Categories identified in the 1st Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Allied Design as Product-based Approach through Reinforcement of Aesthetics in Architectural Design	Approach SJJ1A	Product-Based	Surface
Architectural Design Strategies as Product-Based Approach	Approach SJJ1B	Product-Based Strategy	Surface-to-Strategic
Architectural Design Process as Collaboration in Groups & Senior Students	Approach SJJ1C	Dependent & Strategy	Surface-to-Strategic
Architectural Design through Instructions & Directions of Faculty as Product-Based Approach	Approach SJJ1D	Dependent & Strategy	Surface-to-Strategic
Design Project as Step-by-Step Product-Based Approach	Approach SJJ1E	Product-Based	Surface
Table 20: Categorized Approaches to Learning in 1st Year B. Arch – Sir JJ			

Table 20 depicts five identified categories of learning approaches from the experiences of the first year students at Sir JJ, mapped onto the meta-categories identified in the pilot study (Chapter 5, Section-5.5; Table 13).

These categories have predominantly reflected *dependent* learning strategies with the focus on *product-based* approaches in the students' design coursework. The emerging classification in the first year has shown a connection between Approach SJJ1B, a product-based strategy and Approach A from the pilot study. This takes the form of a series of steps undertaken by the students in their design work in a singular direction as well as the identified learning approach of 'memorizing techniques and procedures' as per the fashion design studies described in Chapter 5, (Table 17) (Bailey, 2002; Drew et al., 2001; A. Iyer & Roberts, 2014). Both Approach SJJ1D as well as Approach B from the pilot study show the importance of the role played by faculty in the development of students' learning approaches in architectural design. Approaches A and B, the *directional* and *product- based* categories from the pilot study (A. Iyer & Roberts, 2014) have represented the emerging classification of students' approaches to learning (Approaches SJJ1A to SJJ1E) in the first year program. This is further illustrated in the two surface approaches of 'memorizing as well as rehearsing techniques and procedures' from the fashion design studies in Chapter 5, (Table 17) (Bailey, 2002; Drew et al., 2001).

Approaches SJJ1A and SJJ1E are *product-based* categories. In SJJ1A students appeared to focus on the aesthetic aspects of their design, over the deeper meaning, suggesting a *surface learning* approach. SJJ1E is similar to Approach A from the pilot study and the fashion design learning approach of 'memorizing techniques and procedures' from Chapter 5, Table 17 (Bailey, 2002; Drew et al., 2001; A. Iyer & Roberts, 2014). Both are further representations of surface learning approaches in practice-based fields.

Approaches SJJ1B, SJJ1C and SJJ1D are *product-based*, *dependent* and *strategic* categories where students focus on the process of design, through group-based, collaborative learning by relying on faculty instructions reflecting strategic learning approaches. Approach B from the pilot study and the fashion design learning approach on 'rehearsing techniques and procedures' from Chapter 5, (Table 17) (Bailey, 2002; Drew et al., 2001; A. Iyer & Roberts, 2014) have represented similar *surface-to-strategic* approaches. The first year students have gained an understanding of the design process through instructions given by the faculty including the work done in groups and

strategically completing the design solution representing the range of *surface-to-strategic* learning approaches in architectural design.

Approach SJJ1A: Allied Design as Product-based Approach through Reinforcement of Aesthetics in Architectural Design (Product-Based Category)

Approach SJJ1A has been the dominant theme amongst first year students. This product-based category has been explained through the allied design coursework offered in parallel and as reinforcement of the aesthetics within architectural design. 'Allied Design' has complemented the design coursework in the first year program at Sir JJ and has been considered as an important influence and starting point in architectural design. Based on the traditions of Bauhaus (Bax, 1991), allied design introduces the architecture student to the early-stages of design theory. This coursework has been historically offered in the first year of the architecture program at Sir JJ also known as 'Basic Design.' Majority of the first year students at Sir JJ have considered allied design as an important starting point with a majority of them discussing the influence of this coursework as the main theme for the commencement of an architectural design project.

Student-(SJJ-001-AR001) states that *"basic design or allied design actually teaches us to place things properly. So that they are visually appealing. So what distinguishes us, soon to be architects from engineers is that we make it …. interesting and aesthetically appealing. So basic design teaches us to incorporate that into our future buildings. So that we make them look better"* with this experience focusing on the importance of allied design as a learning tool or as a starting point to the architectural design project. The key phrases of *"….actually teaches us to place things properly…. teaches us to incorporate that…. So that we make them…"* can be considered as a reinforcement of allied design or as a starting point for the architectural design project. 'Teaching-to-place', 'teaching-to-incorporate' and 'then making something' is a reflection of this starting process being inbuilt into allied design and this has emerged as a major sub-theme its use as a learning tool in developing an understanding for architectural design. This identified category represents the allied design coursework as product-based approaches in completing the design project with the perception of being rewarded in terms of assessment.

Some of the other connected experiences include Student-(SJJ-001-AR002) who states that *"when we start understanding these principles ……… we can apply them in architectural design is by …… but, we have not studied …. designing yet. So, when we will …….. we will keep in mind these ……."* and Student-(SJ-001-AR010) stating *"…we're …… abstractions …… It's how we apply it in architectural design that means*

how we can create something different. ……… So how we apply that in architectural design…...." which reiterates on the connection of allied design coursework to architectural design. The repetitive reinforcement of metaphors such as 'starting,' 'applying,' 'keeping' and 'creating' reflects the students' perspective of allied design as a starting point in the design project approached as being taught or learnt and understood by them, representing a major sub-theme within this category.

The students' learning approach towards architectural design is reinforced from the superficial focus on aesthetic sensibilities and rational processes of the academic and aesthetic domain covered in the allied design coursework which is represented as another sub-theme. Student-(SJJ-001-AR007) has focused on both the visualization of design from the aesthetic perspective as well as on the design project as a product. *"It's moreover the basics of architectural design, like how we have to visualize. What colors? What patterns? I mean, it can be in any form.., the basic design concepts can be used in any damn part of the structure. I mean in the window forms, the tiles, and texture. How the composition should be done actually, how it should be made visually attractive. Like that. It's like, it gives you the idea of how .. things should be. How the final product should look like."* The aesthetic perspective is magnified through phrases including *"…… have to visualize. What colors? What patterns? …….. can be in any form …….in the window forms, the tiles, and texture. How the composition should be done ……should be made visually attractive…."* whereas the product-based approach is reemphasized through phrases including *"….. gives you the idea of how the things should be. How the final product should look like."*

Student-(SJJ-001-AR001) reinforces the aesthetic and product-based perspective through expressions including *"……visually appealing …..interesting and aesthetically appealing……. So that we make them look better."* The aesthetic perspective from the basis of an architectural product as art is reflected by Student-(SJJ-001-AR003) who states that, *"…. improves your aesthetic sense. ….is the composition, the color combination ……. an artistic viewpoint and it develops your aesthetic sense….. designing our future architectural structures …. have that artistic viewpoint while doing it."* The main sub-theme emerging in these series of first year students' experiences is the focus on the aesthetic facets of architectural design through repetitive phrases including 'visually attractive,' 'aesthetically appealing,' 'look better' and 'artistic viewpoint.' This sub-theme is coupled with the student's focus on completing the design project and traversing the product-based approach including key phrases such as 'final product should look like' and 'designing our future.'

Another minor facet that has emerged through the experiences of students in allied design has been the design faculty and senior students being seen as a directional pointer in the development of their learning approaches. Student-(SJJ-001-AR002) states, *"what I've understood over; through many lectures is that basic design and architectural design are the most connected, that's how every teacher is putting it, every professor is putting it.."* and Student-(SJJ-001-AR010)'s analogy of *"….our seniors that we need to apply the principles of basic design in architectural design"* are further reflections in this direction. The first year students' approach their learning experience in architectural design using allied design coursework as an introduction to architecture at large through product-based approaches. Though this identified category has been based on the spectrum of product-centric processes from the commencement to the completion of the project. The students who simultaneously consider allied design as a learning tool as well as an experience, this coursework can be considered as the superficial reinforcement of the aesthetic perspective in the academic domain of the architectural design coursework.

Approach SJJ1B: Architectural Design Strategies as Product-Based Approach (Product-Based Strategic Category)

Approach SJJ1B as one of the two themes that was much-discussed and has dominated the first year students' experiences are the strategies taken in understanding architectural design by undertaking the design assignment successfully using product-based strategic approaches as a continuation. A major sub-theme in this category included the functional and practical directions expressed by the students in their experiences that differentiates this category from Approach SJJ1A. Student-(SJJ-001-AR003) stated "*… when you get the concept, when you do it yourself, and when you understand it and you are able to apply it in somewhere else or, in practical method; that is what ….. means. But if you can use that thing and then you should understand it. Obviously just understanding and not applying it, won't make any difference. Understanding it and then, if you are able to apply it in your projects ….,"* thus reinforcing on the underlying strategy of functionality and practicality*.*

The strategy adopted by the student-(SJJ-001-AR003) is reinforced in the above experience through "*… … the concept, when you do it yourself, and …. are able to apply it in somewhere else or, in practical method; …. …. Understanding it and … are able to apply it in your projects ……"* The strategy involves understanding as the basis for designing, its application and practicality in the final project by focusing on the design as a product which is reflected in the expressions, 'applying it' and the 'practicality of the method' as well as the 'design project.' Student-(SJJ-001-AR007) reinforces this

strategy as a product-based approach through the experience, *"understanding for me is the crux of what is architecture. ..how you should be approaching a space? How you should be designing it so that it is useful to the client, first of all and it's attractive. I mean, it's not dull, it's not shabby. And it's attractive to the client and with that, the utility of it."* The student's focus is on developing the design as a product from both, the aesthetic and technical facets of architectural design through the repetitive expressions, 'of the design project being attractive to the client from a visual as well as practical perspective' and connecting it to the other major subtheme of function and practicality through '…. you should be designing it so that it is useful to the client.'

Students with this approach referred to an understanding of the process of design, its application and practicality which has been achieved by focusing on the design solution. Student-(SJJ-001-AR013) states that *"an architect or a designer needs to have a flair for design; where you can't do any sort of stuff and pass it off as a design. There have to be some components that … makes it qualified as, .. a viable design or something of that sort,"* thus reflecting the clarity in the design process from a product-based perspective through expressions including, 'flair for design,' and 'viability of design.' Thus the strategy of functional application of understanding architecture and reflecting a practical-basis in the design process is coupled with the aesthetic value connected in the design as a product. The architectural design process has its basis on the production of successful design solutions with strategies being developed in the first year student's repertoire as they progress through their design coursework after settling into the program. This product-based approach can be considered as the starting point in developing further strategies of learning in architectural design.

The strategy followed in this product-based approach is focused on the functional domain of architectural design as well as the practical aspects in the process of design. The design process has been based on the production of successful design solutions with these product-based strategies representing the starting point in developing further learning approaches.

Approach SJJ1C: Architectural Design Process as Collaboration in Groups & Senior Students (Dependent & Strategic Category)

The second major theme in the first year students' learning experiences was the understanding and development of the design process with a focus on the product-based approach through collaboration with students in the senior years and working in groups. This dependent and strategic approach includes the sub-theme embedded within this collaboration has a focus on the medium of design communication specific to

senior students which is expressed by Student-(SJJ-001-AR015) stating, *"mostly, when we talk about …, the best they can do is talk to the seniors…Okay, we … a lot from them, they help us with our work. Mostly we get these redo because we are pathetic since we're just beginners, so …., we run to our seniors, take help from them, understand what, why we went wrong and I think the professors also expect the same from us because it helps the seniors also to get better.."* The repetitive connection of communication through 'talking or discussion,' product development in the form of 'discussions of redoing a design assignment' and direct or indirect encouragement from 'design faculty towards collaboration with seniors' are interesting pointers in this identified approach. Architectural design process as a group-based collaborative learning process is further reinforced through the Student-(SJJ-001-AR010)'s experience that *"we have been told by our seniors that we need to apply the principles of.."* is seen as a connection to Approach SJJ1A with Allied Design being considered as a directional interface for a product-based collaborative learning.

Student-(SJJ-001-AR002) extrapolates on group formation, the other sub-theme initiated by design faculty as *"then … we were made to form groups. The first group which was made was told to come up with an idea, a logo.. So that went well, that taught us teamwork, our first effort towards teamwork.."* as an added impetus provided by the School towards collaborative learning. A further sub-theme in Approach SJJ1C is where students claimed to be following instructions of faculty in methods of collaboration with phrases such as 'being told,' 'being asked' or 'teaching teamwork.' Students stressed the importance given to faculty instructions suggesting dependent learning approaches. This theme also represents the dependent learning approaches that students are setting out for themselves reflected by Student-(SJJ-001-AR015) who suggests that *"…you read books, we talk to people, and I will talk to architects who have actually passed out from good colleges, who are experienced, who are working now,"* thus pointing towards strategies for the future being developed through collaborative group learning. Group-work based collaboration amongst the students through dependent strategic learning approaches has been presented in this identified category.

Approach SJJ1D: Architectural Design through Instructions & Directions of Faculty & Design In-charge as Product-Based Approach (Dependent & Strategic Category)

Approach SJJ1D is another minor and parallel theme that has resonated in many of the students' learning experiences was the centrality of the instructions and directions given by the faculty and design in-charge in the architectural design coursework, reflected as a dependent and strategic approach. This theme has further resonated as subthemes

in Approaches SJJ1A and SJJ1C represented in the students experiences both, indirectly and directly. Student-(SJJ-001-AR002) has reflected on this theme by expressing that *"What I've understood over; through many lectures is that basic design and architectural design are the most connected, that's how every teacher is putting it, every professor is putting it…"* and Student-(SJJ-001-AR014) reinforcing that *"It's not as much as ….; it's evolving. Because you know, we do something like, we do 'A' and then teachers have to write the sentence. It's something like that. We show them something, they tell us how to improvise it, make it better. They are making our work finer as such. So, that's what that is. And they are teaching.. us how to start making models, what if we are doing research on something…."*

The expressions including 'teacher or professor making a point' and 'faculty stating or teaching how to work out the design solution' are reflective of the design faculty's position in the evolution of students' learning in architectural design. The faculty introducing the architectural design coursework is the representation of the learning process that can be evolved for some of the first year students. This sense of reinforcement depicted in their experiences including Student-(SJJ-001-AR002) stating *"… that's how every teacher is putting it, every professor is putting it…"* and Student-(SJJ-001_AR014) reinforcing that *"… we do 'A' and then teachers have to write the sentence.. We show them something, they tell us how to improvise it, make it better… And they are teaching show us how to start making models.."* reflects the role played by the design faculty in the students' learning experience.

The instructions of the faculty are followed by the students both as directions towards completing the project as well as strategically approaching the senior students at Sir JJ as expressed in the earlier identified category of Approach SJJ1C. Student-(SJJ-001-AR015) presents the product-based approach of this theme leading to a collaborative learning experience stating *"Mostly we get these redo's because …… we get this redo, we run to our seniors, take help from them, ….. and I think the professors also expect the same from us because …."* The instructions of the faculty from a directional perspective are considered as important pointers by some students and this approach gets imbibed as a part of their development with Student-(SJJ-001-AR003) stating that *"I came to …. that they criticize you, they build up your actions, they build up your ideas, and they tell you to represent it yourself.."* Some of the students' experiences represents their tendency of focusing on the technical domains of architectural development through this approach like Student-(SJJ-001-AR001) stating that *"…. So there they asked us to consider all the measurements and that children will be playing there.."*

Approach SJJ1D has also been considered in developing further learning strategies towards collaboration in groups as well as the completion of the design assignment as a product from both the aesthetic and functional domains in architectural design. Though this identified category is represented as minor sub-themes within Approaches SJJ1A, SJJ1B and SJJ1C, faculty instructions and directions in the design coursework has emerged as an important theme amongst the first year Sir JJ students' learning experience.

Approach SJJ1E: Design Assignment as Step-by-Step Product-Based Approach (Product-Based Category)

The final Approach SJJ1E is a minor procedural theme is reflected in the student's experiences and has a consistent connection to the product-based perspective identified in the earlier approaches. This category has been represented as a step-by-step design process that is undertaken by students in the completion of their design assignments. This is reflected in the intent shown by some of the students in trying to complete a task with their expressions of the ongoing design process. They outlined the completion of a task while explaining the ongoing design process.

Student-(SJJ-001-AR001) reflects by stating *"..when we're designing, we're basically trying to design a pool for kids. So color is very vital part, and also that shape of the pool because..."* which is a reinforcement of this step-by-step approach that is expressed in terms of 'we are designing,' 'we design,' followed by the project which is a 'swimming pool for kids' and the design goals to be fulfilled including 'color' and 'shape' for the pool. This category has focused on representing the architectural solution as an artifact or a design product and is based primarily on completing the assignment. Students have a focus on various design ideas with the intention of completing the next step. Student-(SJJ-001-AR002) states this by expressing that *"… it is obvious that we should keep in mind the … major ideas such as focal point, contrast, direction, which will be used in the designing, because we cannot, blind-mindedly and just go on sketching."* The focus of the above experience is on the utilization of the various principles of design but in a step-by step manner by reinforcing on the expression of 'using it in the design process.'

A subtheme that has emerged and has been discussed in Approach SJJ1D is the role played by the design faculty as a directional pointer for the students in the technical aspects of the design process as well as the steps required to be taken to complete the design project. Student-(SJJ-001-AR013) explains the steps undertaken based on the directions given by the faculty stating *"…we started our first project recently, which was designing a splash pool for kids of age - three to six. So, it's starting to get really*

interesting because they asked us to find out anthropometric data and then we went to see the site. We physically got to measure it. So, you get like literally in the zone, you actually see that, this is physically what I am going to be doing...." The underlying expressions of 'the starting-point and end-point in the design process' reflects this step-by-step product-based direction that the students have embarked upon and which is based on their interaction with the design faculty in the architectural design coursework.

Architectural Design Coursework in Second Year B. Arch Program at Sir JJ

The architectural design (14 credits) and allied design (6 credits) coursework in the second year cover 28% of the overall 72 credits. The other coursework offered includes building construction, structures, building services, humanities, environmental studies, representation and detailing, architectural theory, college project work and elective coursework that cover 72% of the total credits offered as per Figure18.

Summarized Discussion: Second Year Students' Learning Approaches at Sir JJ

The data collected amongst the second year students has presented a continued focus of learning approaches towards *dependent* and *product-based* learning strategies with further evolution to *process-based* approaches in architectural design. There is a continued emphasis on beauty and aesthetics as the principal domains of knowledge in the design project with a balanced focus towards the functional and technical domains in architectural design. There is a transition from the aesthetic-to-functional domain signifying the *surface-to-strategic* range of learning approaches with the focus on the completion of the design project. The data suggests students' continued reliance on faculty instructions and guidance in strategically completing the design project. This is represented in Approach SJJ2C. This category however signifies the transition from *dependent-to-independent* learning strategies within the second year. Approaches SJJ2D and SJJ2E suggest an evolution in the students' learning approaches with a shift of focus from completing of the project towards an understanding of the underlying process of design

Table 21 depicts the five identified categories from the second year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section-5.5; Table 13). These second year categories are a continued representation of *dependent* and *product-based* learning strategies in architectural design from the first year evolving towards *process-based* strategic approaches in the second year. Approaches B and C, the *dependent, directional* and *product-focused* categories from the pilot study (A. Iyer & Roberts, 2014) have represented the emerging classification of learning approaches in the second year (Approaches SJJ2A to SJJ2E) with further illustration through the

two surface approaches of 'memorizing as well as rehearsing techniques and procedures' from the fashion design studies in Chapter 5, (Table 17) (Bailey, 2002; Drew et al., 2001).

Categories identified in the 2nd Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Allied Design as Reinforcement of Product-Based Approach in Architectural Design	Approach SJJ2A	Product-Based Strategy	Surface-to-Strategic
Architectural Design as Series of Steps using Product-Based Approach	Approach SJJ2B	Product-Based Strategy	Surface-to-Strategic
Architectural Design Process through Faculty Instructions & Guidance	Approach SJJ2C	Dependent & Strategy	Strategic
Architectural & Building Design as Process-based and Product-Focused Approach	Approach SJJ2D	Product-Focused Strategy	Strategic
Evolving Architectural Design Process as Process-Based Approach	Approach SJJ2E	Process-Based Strategy	Strategic

Table 21: Categorized Approaches to Learning in 2nd Year B. Arch – Sir JJ

Approach SJJ2A: Basic Design as Reinforcement of Product-Based Approach in Architectural Design (Product-Based Strategic Category)

Approach SJJ2A the continuation of the product-based strategic category discussed amongst an overwhelming majority of students reflected on the role played by allied design which is also termed as basic design at Sir JJ in the first year in their architectural design coursework. Their experiences in this category was reminiscent of the beauty and aesthetic domains of knowledge, further reflected as product-based approaches undertaken by the students in the early stages of the first year of the program. Student-(SJJ-002-AR004) has reflected on the visual and aesthetic aspects of this theme stating *"….unknowingly there is a rule of basic design in that. I mean, how you place the objects, how you; it should look aesthetically. And aesthetics are completely related to your user convenience. If you are just seeing it as an aesthetically good thing. Then why you are feeling it as aesthetically good? That is because if you go there, that will be convenient for you. So that's why in a way, basic design has got a major role in the design part of architecture…"* Student-(SJJ-002-AR005) has further reflected on this connection stating *"first thing was that Basic Design is the most important thing in Architectural Design. I mean without using the concepts we …… in Basic Design, making something really visually appealing which is required by most people."* This visual and aesthetic connection is reinforced through 'the aesthetic connection to Architecture' and 'the sense of visual appeal' that is repeatedly reflected in the students' experiences within this category.

The data suggests that these product-based strategic approaches appears to stem from the aesthetic as well as functional domains in architectural design and are further reinforced by the faculty's directions alongside the allied design coursework. Student-(SJJ-002-AR003) has reflected on this product-based approach focusing on the assignment as a design product, *"Basic Design studio is basically about the spaces, creating spaces, and, creating of the rhythm…epic shapes…. which helps a lot in creating our space in design, which also helps in our Architectural Design studio and making model…"* The directions given by the faculty in reinforcing this connection between basic design and architectural design has emerged as a minor subtheme in this category. Student-(SJJ-002-AR005) has stated that *"Actually, earlier I used to design something that wasn't actually related to Basic Design or anything we …….. in Basic Design, so our professors told me that using Basic Design would be more important, would be much better. Because when you play with shapes, there should be something; I mean those different shapes should correlate to each other."* Basic Design as a reinforcement of the product-based approach within the architectural design coursework is a reflection of the direction taken by the second year students based on their experiences in the first year through Approach SJJ1A.

Approach SJJ2B: Architectural Design as Series of Steps using Product-Based Approach

Approach SJJ2B as a product-based strategic approach is based on the second year students' description of the design process as a series of steps undertaken in order to complete the design project. This identified category represents the students' tendency to continue on the academic domain based on Chapter 6, Sub-section-6.10.2; Figure16 through the functionality as well as craft-based domains focusing on beauty in architectural design.

One of the two other dominant themes that has emerged as further reinforcement of the product-based approach in architectural design. Student-(SJJ-002-AR001) has stated *"but now I sort of get it you know, that a design doesn't just happen in one step. It's an evolution. You have to have a continuous process where you go step-by-step to your final product. And even though the final product looks just like it did when you started it, that evolution makes.."* reflecting on the direction taken in the core coursework. This categorized approach to learning represents the students' tendency to continue on the academic and craft-based domains in the structural facets of architectural design. Student-(SJJ-002-AR013) has articulated further stating *"there's a lot of difference. Now we are doing a waterfront development project. Since it's a really big project for us. Even*

the scale has been, first we used to work on the 1:100 now we are working on the 1:500. We had got no idea about whatever the dimensions of the structure and all. So we are trying to do it and even the landscaping to the main factor ...of our waterfront development. We are given 100m wide area all around the lake, It is a total design, so we have to give about landscaping, the points like the community center and the adventure sports has to be considered."

The experiences are dominated by expressions on 'the evolution of design from a product-centric perspective' including 'whole design,' 'final product,' or 'final Design' on one end of the spectrum, with further articulation on the actual stages of design development leading to product-based solutions on the other end. This category has signified the students' learning approaches as the basis for developing the final design solution further reflected in the second co-dominant theme of Approach SJJ2C as well as the first year product-based strategic category of Approach SJJ1B.

Approach SJJ2C: Architectural Design Process through Faculty Instructions & Guidance (Dependent & Strategic Category)

Approach SJJ2C with a continuing emphasis on the faculty's instructions and guidance is represented as the post-cursor to independent learning approaches amongst the second year students. This identified category has been a co-dominant theme to the series of steps undertaken by the students in the architectural design coursework. The instruction and guidance provided by the design faculty is a major subtheme that is reflected in this identified category with the focus on the design process from the technical and functional domains through the strategic way of approaching architectural design. Student-(SJJ-002-AR013) has stated *"like it's always we are given some project like at the starting, then we are told to work on it. We start with the zoning, and then, after the zoning we analyze, we start to design the structures or if we are told to open spaces and all. Sometimes it happens like first the designs are approved and after some time like as the time passes teachers tend to change the design….. Because, it changes everything after that. The sections and all.."* Within this categorized approach, the students are focusing on the repetitive process of faculty instructions and using their guidance in completing the design project in a step-by-step manner extrapolated in Approach SJJ1B.

Faculty instructions in completing the design project in a step-by-step manner represents the connection with the earlier co-dominant theme of Approach SJJ2B as well as the product-based strategic category of Approach SJJ1B from the first year of the program. Student-(SJJ-002-AR009) has reflected on this dominant sub-theme of faculty's instructions and guidance stating *"The teachers try to give us the practical side*

of what already exists and about what we can do to reclaim or actually architectural design is such a field which can be used by people for people." It brings us to the minor but emerging sub-theme of independent learning that is directly and indirectly encouraged in the architecture students' learning experience by the design faculty. Student-(SJJ-002-AR009) further extrapolates stating *"Architectural Design is they are giving us the practical side, which are actually existing and an open feature. We are trying to convert those open spaces into providing some activity which helps people in making environmental friendly structures kind of thing. I mean..,"* thus reflecting on this independence in the learning experience gained through interaction with the design faculty.

The minor but emerging sub-theme of independent learning is the direct as well as indirect encouragement given through faculty instructions and guidance in the second year students' learning experiences. This transition from dependent learning to independent learning is reflected through contrasting expressions including 'being told,' 'being explained' or 'being instructed;' to experiences like 'evaluation of a step,' 'getting to know' or 'understanding something.' This categorized approach to learning can be considered as a stepping stone for the students to develop their individual design process in the architectural design coursework through research and collaborative learning.

Approach SJJ2D: Architectural & Building Design as Process-Based and Product-Focused Approach (Product-Focused Strategic Category)

Approach SJJ2D as the lesser dominant but a much discussed theme represents the connecting thread to the students' focus on the design product or the final solution This identified category is based on the design process and correlated to the earlier product-based and dependent-strategic categories from the first year focusing on the allied design coursework (Approach SJJ1A), completion of the design solution (Approach SJJ1B) and product-based approaches on collaboration-cum-group work (Approach SJJ1C). Some of the second year students are seen dwelling on their learning experiences in this category from the academic as well as craft-based domain through strategic ways of approaching architectural design with the focus on the completion of the design project.

One major subtheme inbuilt in this identified category is the focus on developing the design solution of the building or the architectural development which is considered as the central task of the design coursework, representing a product-focused design process. Student-(SJJ-002-AR004) reflects on this process with reference to the

building design stating *"It should have some practical basis, it should have some constructional ease. And then, only if we are looking at, just it's looking good, if it's looking good. But it has, as a public use, or of no use, then that has changed. I mean from first year to second year, in first year, we are only thinking about the design part; but now we are thinking more about the practicality."* This building-centric design process reflects the product-focused approach, both from the academic as well as the craft-based domain of architectural design through expressions including a focus on 'the visual, technical and construction-based aspects of the building typology;' but also mapping the basis underlying this design process. The students' learning experiences have signified the academic-cum-aesthetic domain in parallel to the craft-based and functional domains in architectural design (Chapter 6, Sub-section 6.10.2; Figure16). The focus on developing the design solution of the building or the architectural development is considered as the central task representing product-focused approaches in the design process.

This building-centric design process is reflected through expressions including 'the visual, technical and construction-based aspects of the building typology;' but also mapping the basis underlying this process. Student-(SJJ-002-AR004) further extrapolates stating *"How it will be used, how it will have impact on the surroundings and everything, so we are not thinking just about this space, we are thinking as a whole, as a whole thing…"* which reflects on this minor subtheme inbuilt into this category where the students are reflecting on the understanding of design as a process-based approach. This category represents a balance of the process-based as well as product-focused learning experiences reflected by the students. Approach SJJ2D can be considered as a precursor for the second year students at embarking on a process-focused approach within the strategic domain of the design process in their architectural design coursework.

Approach SJJ2E: Evolving Architectural Design Process as Process-Focused Approach (Process-Based Strategy)

A minor theme reflected by a few second year students included the consideration of the architectural design process as learning approaches in evolution from a process-focused perspective. This included experiences that focused on the design process undertaken as well as those foreseen by the students during the course of their architecture program. Student-(SJJ-002-AR003) has reflected on this process stating *"architectural design is basically; it teaches about the design and structures, and all parts, and which has an importance, throughout the life. And, designing is the most, is the main tool in architecture. I think the thesis and all the design, we are doing from my*

first year to fourth year, it helps us lot in life." The key subtheme identified in this category is focused on strategically looking into the evolution of the design process across the architecture program and as a way forward into the profession.

A key sub-theme identified is the strategic understanding of the design process across the architecture program and in the profession. Student-(SJJ-002-AR012) reflects this focus stating *"architectural design studio basically makes us think how we have to design any, whatever topic they give us. So what should be our thinking process while we design and what facts we take into consideration while we design it? What are the requirements of that design? Who will use it, how will they use it. So according to their thinking we have to design it. Not just our lookout with… including everything, still we create a good space so that's all the functionalities, proper and the people come there… feel good.."*

The other sub-theme includes the development of strategies for architectural and building design and the centrality of this coursework within the program. Student-(SJJ-002-AR004) states that *"…… in, in architectural design (AD), Its actually, you have so many subjects …., so what you are ….. in all those subjects, that is what you are …. in there (AD), that all you have to put in somewhere, that subject is called architectural design. I mean, you are ….. services, then you are ….. construction, all these things that you are ….. around the current year, you have graphics, all the subjects have got an impact on architectural design, like, even the structural part, theory of structures that we have. So,.. in architectural design is as if you are, you are testing yourself after you've …. all the things from construction, from B. Tech, from all subjects like that."* Though this identified category represents strategic learning approaches, the students' focus on the design process has been linked to Approach C reflecting on the evolving perceptions of the design process from dependent and product-focused categories identified in the earlier pilot study as well as the two surface approaches of 'memorizing as well as rehearsing techniques and procedures' from the fashion design studies (Chapter 5, Table 13) (Bailey, 2002; Drew et al., 2001; A. Iyer & Roberts, 2014).

Architectural design Coursework in Third Year B. Arch Program at Sir JJ
The architectural design (16 credits) and allied design (6 credits) coursework in the third year cover 31% of the overall 72 credits. The other coursework offered includes building construction, structures, building services, humanities, representation and detailing, architectural theory, college project work and elective coursework that cover 79% of the total credits offered in the third year as per Figure18.

Summarized Discussion: Third Year Students' Learning Approaches at Sir JJ

The collected data from the third year students has suggested the emphasis on the design product through *process-based strategic* approaches towards the completion of the design solution. The continued reinforcement on the design process centered on building design within the architectural development has been the dominant theme through Approach SJJ3A, the *product-focused* and *process-based strategic* category. The faculty instructions and guidance categorized in Approach SJJ3B, the *independent* and strategic category and Approach SJJ3D, the *uncritical* and strategic category have signified the building design process-centric approaches representing the development of independent learning approaches.

The four categorized approaches are dominated by the focus given to the completion of the building design, the development of independent approaches emphasizing on functionality and practicality without critically looking into the process of design representing strategic learning approaches. Approach SJJ3C, the other product-focused and process-based strategic category has reflected on the first year allied design coursework and the steps undertaken in completing the design solution.

Categories identified in the 3rd Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural & Building Design as Process-Based and Product-Focused Approach	Approach SJJ3A	Product-Focused & Process-Based Strategy	Strategic
Architectural Design as Practical & Product-Focused Approach through Faculty Instructions & Guidance	Approach SJJ3B	Independent & Strategy	Strategic
Allied Design as Process-Based & Product-Focused Approach in Architectural Design	Approach SJJ3C	Product-Focused & Process-Based Strategy	Strategic
Architectural & Building Design as Process-Focused Approach	Approach SJJ3D	Process-Focused & Uncritical-Strategy	Strategic

Table 22: Categorized Approaches to Learning in 3rd Year B. Arch – Sir JJ

Table 22 depicts the four identified categories from the third year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These categories represent the evolution of *product-to-process - focused*, *independent* and *uncritical, strategic* learning approaches. The evolving third year classification is a continued representation of Approach C based on *dependent, product-focused strategies* moving in the direction of *independent, process-focused* learning approaches reflected in Approach D from the pilot study (A. Iyer & Roberts, 2014),

further illustrative of the surface to strategic range identified in the learning approaches of 'rehearsing as well as experimenting techniques and procedures' from the fashion design studies (Chapter 5, Table 17) (Bailey, 2002; Drew et al., 2001).

Approach SJJ3A: Architectural & Building Design as Process-Based and Product-Focused Approach (Product-Focused & Process-Based Strategic Category)

This category is represented as the dominant theme amongst the third year students of Sir JJ with the architectural development from the perspective of designing the building being the focus of their learning experiences. The students are undertaking the design project on the basis of the underlying design process with a focus on developing the final product or the design solution. A major subtheme that has emerged is the focus on the building design or the architectural development. Student-(SJJ-003-AR002) has expressed this subtheme stating *"in second year, we had a Bank Training Facility Design, so there, we, you know; we went, it was bank training facility, so it was like a school. So we were essentially designing a place of …….. So there, you know, we always start with a bubble diagram that leads to the function, to figure out the function and what connects to what, where; so this rhythm, interlocking of forms; helps a lot in that. I mean it's there for all the design projects that we're doing, but mostly I think, it's the interlocking of forms that helps us get somewhere."* The key aspects considered in these experiences focus on the design project that has been given in a specific studio of architectural design and the design process surrounding this specific project.

Student-(SJJ-003-AR006) reprises the steps undertaken in the specific design project as the design of a building stating *"yeah, first we began by the site; we zoned out where the parking; where the maintenance areas, and where the actual structure; and where the restaurants and all the viewing areas and all that. The zoning was done; then the next step was to actually decide how the spaces would follow; the hierarchy of spaces; you can call. That then, since this was an aquarium; so it had to be attractive to the public who passed through the adjacent highway; so the form of the aquarium was a major thing. So we had to develop a concept and a three-dimensional form which would be eye-catching so that the thing would attract visitors, and after that.."* The learning experiences from both the examples revolve around 'the specific design project' and 'the steps involved in completing the project.'

The other sub-theme reflected in this category is the emphasis given to the design process with the outcome being product-focused. Student-(SJJ-003-AR001) reflects on the juxtaposition of this evolving design process by connecting it to the final portfolio or the design solution stating *"now I know how to process, like, the bubble diagram. In first*

year, we used to think like; how we will build; just directly the plan. now, we know ; we should know the concept first. In the first year, first we used to do, we will design everything and in the portfolio, we will think what will be the concept for my plan, now we know the concept now; first and then we will process with the design". The design process which is in evolution has led to the minor subtheme within this identified category through its connection to the architectural profession and practice. Student-SJJ-003-AR010 further reflects on this subtheme stating *"First of all what I…thought was about the function, how function are important in architecture. It is not a big thing actually to know the requirements or the function as you, I think, when you become a professional that is already provided by the client to you."*

This categorized approach of focusing on the architectural development from a building centric perspective has its basis on the design process and leading to the design product or the final solution can be considered as strategic ways of approaching learning in the core coursework. The design process is centered on the craft-based and technological domains as well as functional domains of architectural design in this strategic categorized approach.

Approach SJJ3B: Architectural Design as Practical & Product-Focused Approach through Faculty Instructions & Guidance (Independent & Strategic Category)

One of the two lesser dominant themes, this identified category has revolved around the instructions and guidance given by the faculty in the coursework of architectural design. The interesting facets within this category are the product-centric nature of the independent-learning strategies evolving from the key role played by the faculty in architectural design and their directions towards functional and practical design solutions being developed. Student-(SJJ-003-AR002) has expressed the product-centric nature of their instructions and guidance stating *"so there I think, you know, it's really, our teacher was really good. So we were able to understand immediately, that what we put, as in what we did in plan, we were able to put elevations and stuff to it, and figure out the three-dimensional model to it. As in, that started, that initialization was really good, the way we started it, that helped."*

These product-centric directions of the faculty also focus on the sense of practicality required to be reflected by the students in their design solutions through the stages of the design process. Student-(SJJ-003-AR003) reflects on these sensibilities required in real-time architectural practice stating *"It's more like I design something and the (design) in-charge just brings you back to the ground; you know. Because we have big ideas, and in first year they didn't do that. They let us experiment with it. Because they wanted*

us to think of it in a design way, you know build that interest. But now when I say something, like when I want my design to be like that; the first thing that the in-charge says is, 'is it functional?.' You have to think like that. So, Yeah, You know you, whatever architectural design is all about what is inside you, your imagination, your creativity, you just need someone to tell you, if it is practical or no or is it functional."

This category is a reflection of the learning direction taken by the students in the third year of their program based on the instructions and guidance of the design faculty in the architectural design coursework from a product-focused and practical perspective. The experiences are further indications of independent learning being encouraged through the expressions including the students 'ability to understand,' 'ability to undertake specific tasks' and their 'ability to think in a certain direction' which is reflected in some of their experiences in this categorized approach.

Approach SJJ3C: Allied Design as Process-Based & Product-Focused Approach in Architectural Design (Product-Focused & Process-Based Strategic Category)

The second of the lesser dominant categorized approaches represents the continued emphasis on the role of the first year allied design (Basic Design) coursework in the students' learning experiences within architectural design. A major subtheme that has emerged in this category is the product-focused approach being undertaken in architectural design based on the experience of the first year basic design coursework. Student-(SJJ-003-AR011) has stated that *"basic design in the first year itself is… it gives us; you know…; it makes us see better. Because when we're designing, basic design gives us…it also deals with form, how form interacts with 3-D form…., how 2-D form interacts, how colors interact. So you know when thinking of an elevation for a building. And if we have to see the materials we're using, how they go with each other, how the color and texture and … sciography, ….is very important in basic design. So how the sciography works. It influences us a lot. If you know, if done properly, if taken into consideration everything that you have ….. in basic design, then it definitely helps, really."*

Another minor subtheme that has emerged is the design process-based approach undertaken by students. Student-(SJJ-003-AR011) states that *"you expect to enrich your project. I mean, you expect it to give you that edge …basically what we create are mind spaces. So when we have a mind space, where we can walk through what you have built, you want to create a stream of thought in their head. And to be able to do that, you have to understand a lot of things. You have to understand being the play of light, being the play of colour, texture, digital sound, smell, everything because all your*

senses create that thought. So to be able to do that, I feel basic design..., focuses on the visual part."

Expressions pertaining to product-based approaches to designing including 'the building form, both two-dimensional and three dimensional,' the technical requirements for the architectural design coursework such as 'plan, elevation and section,' and various 'design elements and principles' are linked to allied design. Whereas the students are also seen reflecting on 'spatial experiences' and 'understanding of various design interventions and its effect on the human senses' depicting the process-based perspective. This categorized approach is oscillating between the product-focused facets of approaching architectural design through the basic design coursework which is indirectly encouraging the students to undertake design process-based approaches in dealing with the design project.

Approach SJJ3D: Architectural & Building Design as Process-Focused Approach (Process-Focused & Uncritical-Strategic Category)

The minor but much discussed theme amongst the third year students was centered on the focus given to the design process in architectural design. The first of the two major subthemes that have emerged in this identified category has been discussed in Approach SJJ3A focusing on designing the building and the architectural development pertaining to the design project undertaken in the core coursework. Student-(SJJ-003-AR012) states that *"I think the design process they evolve gradually after you work on it. So when I used to apply, I should think about, 'Okay, now I have to think about the units. I need to create the entrance and circulation.' I used to work on the circulation. But at that time I also pay attention on the part that is how the other units will be placed. So I think when you apply those principles on…., one part of the design, one aspect of the design, automatically, it improves all the aspects of the design…."*

Whereas these learning experiences focus on the design process from a building-design perspective, the second major subtheme within this category is centered on the actual process of design in itself. Student-(SJJ-003-AR003) has stated that *"I think if this is not how it is supposed to be what I, you know I'm thinking is right. But, you have to know that you can't just design anything. You can't just design anything, you have to understand the needs of the site, of the people using it. And you know architecture is not to excite; it is wrong. People say that; you know what we design, it's for yourself, it's wrong, it's not your design, ..architecture is for people. So you have to understand that you can't just make anything and get away with it."* Here the experiences are centered

on 'the process of design,' 'the development of architectural design,' but also 'its influence and repercussions on society.'

Another minor sub-theme that has been discussed by students has been the importance of a design process-focused approach and its connection to the architectural profession. Student-(SJJ-003-AR011) *"I think in the beginning, your foundation should always be the basis of, you know, practicality of how it's going to work out, how… if it's actually going to be possible to make it and after that, you reach a stage when you try to enrich your design. So I think that, that process is finally going a little forward from you know, will really, you will bend and reach to how will it be overall? I think that progress has come."* Approach SJJ3D reflects the independent learning approaches being encouraged to be undertaken in the design coursework. This identified category is a further reflection on the faculty's role explained in Approach SJJ3B, the independent and strategic category on their influence towards process-focused, uncritical and strategic learning approaches.

Architectural Design Coursework in Fourth Year B. Arch. Program at Sir JJ

The architectural design (8 credits) and allied design (4 credits) coursework in the fourth year cover 23% of the overall 52 credits. The other coursework offered includes building construction, structures, building services, representation and detailing, professional practice, college project work and elective coursework that cover 46% with the rest of the 31% of the total credits offered as professional training for sixteen weeks (Figure18).

Summarized Discussion: Fourth Year Students' Learning Approaches at Sir JJ

The data collected amongst the fourth year students presented a balance in the *product* as well as *process* of design through *independent* and *critical* approaches. The design of the building within the architectural development is based on the *schematic* process of understanding design (Frederick, 2007). Approaches SJJ4A, SJJ4B and SJJ4C as product and process-focused categories represent schema-based learning approaches undertaken in the completion of the building design in the architectural development. Whereas the design solution is central within both SJJ4A and SJJ4B, Approach SJJ4C has focused on the process of design through the first year allied design coursework.

Approaches SJJ4D and SJJ4E represent the *independent* and *critical* approaches being developed in the fourth year with the emphasis on the functional domain of architectural design through practical experiences of the profession. These identified categories

represents the evolution in the fourth year in comparison to the earlier years with students approaching learning in architectural design by critically understanding the

Categories identified in the 4th Year	Nomenclature	Meta-categories	Position in Outcome Space
Architectural & Building Design as Process-Based and Product-Focused Approach	Approach SJJ4A	Product-Focused & Process-Based	Strategic
Architectural & Building Design as Process-Focused Approach	Approach SJJ4B	Process-Focused Schema	Strategic
Allied Design as Evolution of Process-Based Product-Focused Approach in Architectural Design	Approach SJJ4C	Product-Focused & Process-Based Schema	Strategic
Architectural Design as Profession & Process-Based & Product-Focused Approach through Faculty & External Experts Instructions & Guidance	Approach SJJ4D	Independent & Schema	Strategic
Architectural Design as Process-Focused Experiential Approach	Approach SJJ4E	Process-Focused & Critical - Experiential Schema	Strategic-to-Deep

Table 23: Categorized Approaches to Learning in 4th Year B. Arch. – Sir JJ

design process. In Approach SJJ4D, independent learning is triggered through the faculty as well as professional experts' instructions and guidance, whereas Approach SJJ4E represents the students' critical ways of approaching the design based on schema through the practical experience of their four years in the program.

Table 23 depicts the five identified categories of fourth year students' learning approaches as meta-categories based on the pilot study (Chapter 5, Section-5.5; Table 13). These identified categories have a predominant focus on the process of design through critical, schema-based strategies by undertaking the design brief given in architectural design. This process has focused on the architectural development and design of the building in-specific. These building-centric categorized approaches have reflected the pedagogical nature of the design coursework at Sir JJ College of Architecture. The classification of the fourth year learning approaches has represented the connection with Approach D which is based on *independent* and *process-focused* categories as well as the *critical* and *schema-based* categories of Approach E from the earlier pilot study in Table 13 (A. Iyer & Roberts, 2014). The fourth year classification further illustrates the strategic range of the learning approaches on 'experimenting techniques and procedures' from the fashion design studies (Chapter 5, Table 17) (Bailey, 2002; Drew et al., 2001).

Approach SJJ4A: Architectural & Building Design as Process-Based and Product-Focused Approach (Product-Focused & Process-Based Category)

A parallel to the dominant categorized Approach SJJ3A in the third year, students in the fourth year have reflected similar learning experiences with three subthemes in the identified category. The central focus of first two major subthemes is on the architectural development as a schema pertaining to the design of the building based on the completion of the design project or the actual solution as per the given brief.

The minor but well-articulated sub-theme has focused on the architectural profession representing the direction taken by students as they traverse the five year program to graduate and transition to professional practice. Student-(SJJ-004-AR002) reflects on this transition stating *"architectural design studio, like from first year to the fourth year, the transition that I've seen is, first year they ask more of things that are, that need not to be practical but has to be very creative. But as, like, as we go to the next years, there has been a change in the way we look at things. And now, things have become more technical and yeah, that is how things have all changed. So now what they want is now, they're more interested in our technical details and whether that really works in that particular area or not. Whereas in first year, it was very different, it was just a creative…it was, since you're very new to architecture then, they just wanted us to do something creative, …some wild idea, maybe it's really not possible, it doesn't happen that way, but yes, they wanted us to do something, that's all."*

This identified category has reflected on the pedagogical nature of architectural design at Sir JJ from the first-to-fourth year of the program where the centrality is on the design of the architectural development with the building in specific focus. Approach SJJ4A has represented the direct connection to the Approach SJJ3A, the product-focused and process-based strategic category as well as Approach SJJ3D, the process-focused and uncritical-cum-strategic category from the third year of the program. The second year Approach SJJ2D representing the product-focused strategic category as well as the first year product-based category of Approach SJJ1E have further reinforced this connection to the evolving learning approaches from the first-to-fourth year of the program. Whereas the design development in the first and second year has focused on the step-by-step process of completing the design solution by focusing on the aesthetic and functional domains, the third and fourth year have represented the transition of these product-focused approaches through the process of design based on the functional and utility domains of architectural design and further correlating the learning approaches to the profession.

Approach SJJ4B: Architectural & Building Design as Process-Focused Approach (Process-Focused, Schema-Based Category)

Approach SJ4B as one of the two less dominant themes is linked to Approach SJJ3D, the process-focused and uncritical-cum-strategic category from the third year as well as the earlier discussed category of Approach SJJ4A. This category has focused on the design process within the architectural development as schema-based approaches in the design of the building. Whereas the central focus of the two main sub-themes in the earlier category, Approach SJJ4A was pertaining to the design process of the architectural development, the key sub-themes in this identified category have focused on the design process and its impact on the architectural profession with similar undertones of the third year Approach SJJ3D.

Student-(SJJ-004-AR004) reflects on the design process stating *"first of all; architectural design gives us the freedom to include all the parts of your thoughts, imaginations into one part; but in a different context. Like, suppose you go on imagining about a particular topic, you don't have any end point there, but Architectural Design; like suppose you are given a project. So including those thoughts, you can put it in this project and make that project useful. ….."* Student-(SJJ-004-AR015) further reflects on this process and its impact during architectural practice stating *"understanding.., any particular project in all its aspects, from a point of view of client. What he wants, what the contractor wants, what society wants, so, as a responsible architect, we should look after all the things. Like…, we should not destroy the nature. We should not create extra, wastages of materials. So, it also makes us think in that manner. That we are the responsible person in the society."*

The point of differentiation within this identified category from Approach SJJ3D has been the transition of building design towards the architectural development as schema-based learning experiences reflected as the minor sub-theme. The students' have focused on the development in architectural development from the schematics of concept to the holistic design solution. Approach SJJ4B has represented the transition from third-to-fourth year focusing on the design process but remaining centered on the architectural development.

Approach SJJ4C: Allied Design as Evolution of Process-Based Product-Focused Approach in Architectural Design (Product-Focused & Process-Based, Schema-Based Category)

Approach SJJ4C as the second of the less dominant categories has been interconnected to Approch-SJJ3C, the product-focused and process-based strategic

category from the third year. Both categories have looked at the role played by the first year allied design coursework in the evolution of the design process. A dominant sub-theme is the continued focus on the process leading to the final product through schema-based design of the building in the architectural development.

The other minor sub-theme in-line with Approach SJJ3D, the process-focused and uncritical-cum-strategic category in the third year is centered on the process of design. The transition from the third-to-fourth year has been based on the evolution of the design process centered on schema-based approaches. Student-(SJJ-004-AR013) states that *"It would be like considering the site's surrounding, the elements available on, the elements on the site, the history of the site, the nature of the site. So yeah, basically these are the things which I'm learning and related to basic design, there's not much, in this project, I have applied roofing systems in form of basic design. Roofing I've created again radiating patterns. So yes, that principle I have again used."*

This transition through expressions including 'site analysis in the larger context' and 'correlating architectural experiences to the design process' and referencing it to the design of the building within the architectural development is the progression of Approach SJJ4C from the similar third year category, Approach SJJ3C.

Approach SJJ4D: Architectural Design as Profession & Process-Based and Product-Focused Approach through Faculty & External Experts Instructions & Guidance (Independent & Schema-Based Category)

Approach SJJ4D as the minor fourth year theme has been dominant in the third year Approach SJJ3B, the independent and strategic category as well as Approach SJJ2C, the dependent and strategic category in second year. This categorized approach has evolved with the two major sub-themes including faculty instructions and guidance focusing on the design process as well as continuation of product-centric facets of developing the design solution.

The transition of design pedagogy towards the demands of the architectural profession is the third minor sub-theme where the faculty as well as external experts have been orienting the students to the practicality of design solutions and profession-based independent approaches to design. Student-(SJJ-004-AR001) reflects this stating, *"for example, professors tells you, this will not work in the outside world and when you take your design into some technical subjects; you get to know all the flaws that are there. So then, it actually plays a major role in the architecture student's life."*

Approach SJJ4E: Architectural Design as Process-Focused Experiential Approach (Process-Focused & Critical, Experiential, Schema-Based Category)

Approach SJJ4E as a minor theme is the evolution in the learning experiences of few students towards understanding the experiential facets of architectural design and its incorporation within the process of design as critical and schema-based approaches.

Student-(SJJ-004-AR009) shares this evolving experiential approach stating "w*hat counts as understanding for us, ..its probably very broad, because even when we read up or whatever, we don't really get what exactly the architect or whoever's book it is, is trying to say, we interpret it in our own way. I think understanding is very personal because whatever happens, whatever someone says, even if whatever the faculty says, whatever you read, you are going to interpret it in your own way. You are going to derive your own conclusions and analysis, and that is how you understand it in a way, so I think understanding is very personal. We all probably hear the same thing, but we understand it in a different way. So it's what we come out of it.. with.*" This identified category has presented glimpses of students delving into the deeper domain of learning approaches through aesthetics and beauty in the academic domain as well as functionality and utility in the craft-based and technological domains of architectural design.

Architectural Design Coursework in Fifth Year B. Arch Program at Sir JJ

The architectural design (8 credits), design dissertation (20 credits) and allied design (5 credits) coursework in the fifth year covering 46% of the overall 72 credits. The other coursework offered includes building construction, structures, building services, environmental studies, representation and detailing, professional practice, advanced theories and elective coursework that cover 54% of the total credits offered as per Figure18.

Summarized Discussion: Fifth Year Students' Learning Approaches at Sir JJ

The data collected in the fifth year is represented through similar lines of learning experiences in continuation with the fourth year focusing on the product as well as process of design through *independent, critical* and *schema-based* approaches. Approaches SJJ5A, SJJ5B and SJJ5E, the product as well as process-focused categories involving schema-based categorized approaches have represented the students' learning from the perspective of building design within the architectural development. Approach SJJ5B has depicted the product as well as process in design through the students' experiential journey of architecture and correlating it to the first year coursework of allied design.

Approaches SJJ5C and SJJ5D are independent and critical, schema-based learning categories focusing on the architectural profession in continuation with Approaches SJJ4D and SJJ4E from the fourth year. Approach SJJ5E has represented the summation of the five year program as a reinforcement of the design pedagogy followed in architectural design at Sir JJ.

Categories identified in the 5th Year	Nomenclature	Meta-categories	Position in Outcome Space
Architectural & Building Design as Process-Based and Product-Focused Approach	Approach SJJ5A	Product-Focused & Process-Based Schema	Strategic
Allied Design as Evolution of Experiential Design Process-Based Product-Focused Approach in Architectural Design	Approach SJJ5B	Product-Focused & Process-Based, Experiential, Schema	Strategic-to-Deep
Architectural & Building Design as Process-Focused Profession-Based Approach	Approach SJJ5C	Process-Focused Critical - Schema	Strategic
Architectural Design as Profession, Process-Based & Product-Focused Approach through Faculty & External Experts Instructions & Guidance	Approach SJJ5D	Independent & Schema	Strategic
Architectural Design Pedagogy at Sir JJ College	Approach SJJ5E	Product & Process-Focused Schema	Strategic

Table 24: Categorized Approaches to Learning in 5th Year B. Arch – Sir JJ

Table 24 depicts the five identified categories from the experiences of the fifth year students at Sir JJ, mapped onto meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13. These building-centric categories have represented the pedagogical standpoint at Sir JJ College of Architecture for the design coursework. The classification of the fifth year learning approaches is a reinforcement of the connection with Approaches D, E and F, the perceptual, experiential, practical, independent and process-focused, schema-based approaches from the earlier pilot study (Chapter 5, Table 15) (A. Iyer & Roberts, 2014). The classification of learning approaches at Sir JJ are also represented through the four surface-to-deep approaches of 'relating fashion to own life world as well as experimenting, rehearsing and memorizing techniques and procedures' from the fashion design studies (Chapter 5, Table 17) (Bailey, 2002; Drew et al., 2001).

Approach SJJ5A: Architectural & Building Design as Process-Based and Product-Focused Approach (Product-Focused & Process-Based, Schema-Based Category)

The dominant fifth year category of Approach SJJ5A is parallel to Approach SJJ4A as well as SJJ3A from the fourth and third year with both being product-focused and process-based categories through schema-based and strategic approaches. Approach SJJ5A has been represented through two major sub-themes focusing on the architectural development through schema-based categorized approaches pertaining to the design brief with the minor sub-theme focusing on the profession. The fifth year students' transition into the industry is presented in the learning experiences of this identified category.

Student-(SJJ-005-AR011) sums it up stating *"architecture as if… before entering into the college, Architecture is like too much different than engineering but once I entered into the college, it is like similar to each and every subject and has its own statistics, own points how to calculate and in and all. So architecture, in a way it is 95% it is calculative and only 5% creative. The creativeness depends on how maturely you're doing. As in there are a number of factors like the construction has to be done for costing, availability, and a number of things. So I think doing abstract form or something like that is not architecture, but architecture, over the period of time, what I understood is statistics lined up as 95%, 5% is experimentation."*

Approach SJJ5A has reflected the pedagogy followed in fifth year architectural design at Sir JJ with a continued emphasis on the design brief with building typology in specific focus. This identified category represents the learning curve that a large cohort of students have undertaken and is further connected to Approaches SJJ4A and SJJ4B, the product-focused, process-based as well as schema-based categories in the fourth year. Approaches SJJ3A and SJJ3D, the product and process-focused, uncritical-strategic categories in the third year as well as Approaches SJJ2D and SJJ1E, the product-focused, strategic categories from the second and first year of the architecture program represent this connection in the fifth year.

Approach SJJ5B: Allied Design as Evolution of Experiential Design Process-Based Product-Focused Approach in Architectural Design

Approach SJJ5B is represented on similar lines of Approch-SJJ3C from the third year as well as Approach SJJ4C from the fourth year on product-focused and process-based strategic as well as schema-based categorized approaches. The first of the two lesser dominant themes, this identified category has focused on the first year allied design

coursework in the evolution of the design process as an experiential journey in architectural design through the fourth year Approach SJJ4E, the process-focused and critical, schema-based category. The dominant sub-theme in Approach SJJ5B has focused on the design process as the final design solution. This fifth year category represents the continuing evolution of the design process as schema-based categorized approaches in the experiential journey of architecture in line with the fourth year category.

Student-(SJJ-005-AR003) has expressed this evolution and experience stating *"I think basic design always came, subconsciously to the designs, never thought that, I will be doing 'a' particular thing which came from basic design. Even in the first year; when basic design was taught, things just came sub-consciously. Either they were liked or disliked, no issues with it. But then everything that happened was with some things that you see in the world; in and around you. See, like if you see Vistara; the movie, the short documentary. There are lot of things that you see, in daily life which become a part of your design. And, it is a very sub-conscious process. And like that, in these five years, basic design has come very sub-consciously into the designs."*

The predominance of allied design and its connection to their experiential journey in understanding architecture sets Approach SJJ5B as well as Approach SJJ4E apart from other categories of the first-to-fifth year. These categorized approaches have represented the connection to Approaches E and F, the experiential and practical, process-focused, schema-based categories evolving towards perceptual and conceptual categories that has been identified in the pilot study, Table 13.

Approach SJJ5C: Architectural & Building Design as Process-Focused Profession-Based Approach (Process-Focused, Critical, Schema-Based Category)

Approach SJJ5C as a continuation of Approach SJJ4A from the fourth year and Approach SJJ3D from the third year have focused on the process as well as the design product through schema-based and strategic learning approaches. Student-(SJJ-005-AR002) has focused on both the design process and its expansive role in the profession stating *"Architectural studio as in, …. About the subject. Design. We call the classroom, It's been my favorite subject…., I grade myself and; I grade myself on that; and.., I judge by my architectural design performance, very particular about how I fare, about what I do in the architectural design studio than anything else. It's been, it's been my key subject and I try and incorporate other subjects in my architectural design, and although most of the times I fail, architecture design has its own; it gives me a lot of freedom,*

which the other subjects don't; but probably, that's why architecture..." Whereas Student-(SJJ-005-AR003) reflects on the design process from a practice-based perspective stating *"See I believe that … if a structure is supposed to be built; it has to be functional, no doing away with it. And, if the functionality satisfies; is being satisfied by a building, then whatever the design maybe; it is a usable space and there is no, it is not a useless space. So, after that; it's just the skin of the building that needs to be; you know, see like the research that I usually do, of what the surroundings need; takes care of how the people will use it; and how the spaces will be there for people."*

This identified category, the second of the two lesser dominant themes has focused on the process of design and its expansive role related to the design brief and centered on the architectural profession. Approach SJJ5C has been considered as a continuation to the earlier category of Approach SJJ5A representing the learning experiences of a large cohort of students.

Approach SJJ5D: Architectural Design as Profession, Process-Based & Product-Focused Approach through Faculty & External Experts Instructions & Guidance (Independent & Schema-Based Category)

Approach SJJ5D is represented on similar lines to the fourth year Approach SJJ4D as independent and schema-based category. As a minor theme in the fifth year, Approach SJJ5D represents the faculty's role as instructors, guides and facilitators as well as a window into the architectural profession. This categorized approach has further explained on the focus given to the design solution based on the evolving process at one end of the spectrum and emphasizing on the role of faculty and external experts on the other end. This role is discussed in terms of the practicality of design and its basis within the profession.

Student-(SJJ-005-AR002) reflects their role focusing on the architectural design solution based on the evolving design process at one end of the spectrum stating *"It was ….. easier in first year, understanding now is I think, that is only because how, because of the questions and in first year, I had only one question that was out there; what is the professor saying; and whatever he says; okay, that is there and then I say, okay this is it, this is how you approach it."* On the other end of the same spectrum, the role of faculty and external experts is discussed in terms of the practicality of design and its basis through the profession with Student-(SJJ-005-AR004) stating that *"….. with contours makes us understand how to design a structure and what my teachers have taught me. Maybe just that they taught me. When you are making, you don't only think about the form, think about the function also, think how things will happen out there. And as I'm*

…., I think that my in-charge, Mr. AN, who is my inspiration, because what he did.... he taught me in simple terms, think that you're that person and you're going to enter that structure and then according to the functions given to you, just think if you will go here or there. Put yourself in the client's shoes. That is the biggest learning that I learnt."

Approach SJJ5D represents the diminishing role of faculty as well as external experts in architectural design as the students' progress from the first-to-fifth year. It exemplifies the architectural development as schema-based and evolution of independent learning approaches through five years of the program.

Approach SJJ5E: Architectural Design Pedagogy at Sir JJ College (Product & Process-Focused Schema-Based Category)

The minor category of Approach SJJ5E has focused on the architectural design pedagogy at Sir JJ College of Architecture. Based on the students' experiences during their professional training and its connection to architectural design, a large cohort of students opposed the design studio-based work environment at Sir JJ. This was based on the meager provision of infrastructure that has been further extrapolated in the architectural design learning context at Sir JJ in Section 7.3. Students who discussed various aspects of the design studio focused on the direction taken in the design coursework towards process-based, product-centric and profession-focused learning approaches.

Student-(SJJ-005-AR006) has discussed the role of the studio environment stating that "if I tell about the studio, and only the studio, the professors generally expect us to work in the studio and that is what we students think we can. But it doesn't happen, because, we need that space and that environment to think and understand and design, because, in studio when you are told to design, you are; it is something that you are forced to indirectly, Ke Nahi karna hi hain (It just that, you have to do it), so you have to do. So; we generally don't prefer that and we end up wasting time eventually. Like there is a three hour studio. Maximum work that is done in a three hour studio is from half an hour to twenty minutes to half an hour. Max to max. baaki (the rest-of the) time just goes in thinking ki (that) what will work, how will work, is this right, is that right."

The Outcome Space for the Classification of Approaches to Learning for the B. Arch Program at Sir JJ College of Architecture, Mumbai – India is explained in Chapter 7

International Perspective: Two - School of Architecture,
Oklahoma State University, Stillwater, USA

International Perspective: Two - School of Architecture, Oklahoma State University, Stillwater, USA

Oklahoma State University (OSU) - Stillwater located in Oklahoma State of the United States of America is one of the four institutions covered in the current study. Representing a dominant branch of architectural education internationally, the more intimate context of OSU within Stillwater in the American rural settings is in contrast to University of Texas at Austin (UTA) that has inherited the rich cultural urban ambience of the north-American context. Table 26 presents an overall picture of the programs offered at the four institutions with the School of Architecture at OSU offering a total of one hundred and fifty-four credits in the five year B. Arch program and forty-three courses.

Name of Institution	Total Credits Hours	Equivalent Coursework / Core Modules	Accreditation Body
Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ) India	340	85 Courses 5 Year Program	Council of Architecture (CoA), India https://www.coa.gov.in/
School of Architecture, Oklahoma State University (OSU) - Stillwater, Oklahoma, USA	154	43 Courses offered in the 5 Year Program	National Architectural Accreditation Board (NAAB), United States http://www.naab.org/
School of Architecture, University of Texas at Austin (UTA) – Austin, Texas	161	47 Courses 5 Year Program	
Welsh School of Architecture (WSA) - Cardiff, UK	600	20 Core modules 5 Year Program	Royal Institute of British Architects (RIBA) & Architects Registration Board (ARB)
Table 26: Data Collection at Four Institutions with Highlights of the Architecture Program offered at School of Architecture, Oklahoma State University			

The school is part of the College of Engineering, Architecture and Technology (CEAT) at OSU and offers the five-year professional degree program in architecture and architectural engineering that are accredited by the National Architectural Accrediting Board (NAAB) and the Accrediting Board for Engineering & Technology (ABET). The program includes ten semesters of coursework with 104 credits for the required courses including electives with architectural content for all students and rest of the 50 credits offered as general (non-architecture) studies (School of Architecture, 2010; University, 2015).

School of Architecture, Oklahoma State University: A North American Perspective

The School of Architecture at Oklahoma State University - Stillwater was first established in 1909 as the Department of Architectural Engineering within the College of Engineering. The bachelor of architecture program at OSU went through its first NAAB review in 1949. The five-year professional degree programs in both architecture and

architectural engineering caters to the school's philosophical doctrine for professional education (CEAT, OSU, & Architecture, 2010).

The curriculum of the B. Arch program includes a sequence of three phases as depicted in Figure 21. The first phase or the Lower Division includes four semesters with coursework in general-studies offered from a university-wide selection to architecture-specific courses focusing on the professional studies of design, theory and technology. In this phase of studies, the students are provided the experience of understanding various coursework of architecture and architectural engineering. This phase helps the students in choosing either of the stream or a combination of both towards fulfilling their objectives both in education and career. This is followed by admission to the next phase termed as Upper Division. The third year of the B. Arch program includes the core architecture courses required for the design studio and professional studies. The fourth and fifth year, also known as the final phase or the Professional School has a reduced focus on the required architectural coursework with increased availability of credit-hours for professional practice-based elective coursework. The School of Architecture, OSU

Figure 21: 5 Years B. Arch Program Curriculum at School of Architecture, Oklahoma State University, Stillwater, USA

has designed these three phases as a sequential experience in architectural education termed as "finding out," "fundamentals," and "development/specialization".

Architectural Curriculum at the School of Architecture, OSU

The architectural curriculum at the School of Architecture, OSU is based on the pursuit to provide a high level of quality in liberal and professional education. These include an

integration of the elements required in the lifetime as a citizen of the world "and for achievement in the private practice of architecture: strong design ability, solid technical skills, clear understanding of ethical issues and management / practice aspects of architecture, and a liberal education sufficiently broad to engender understanding of the larger societal context of the profession" (CEAT et al., 2010). The curriculum has been formulated by integrating these elements as a continuation from the first-to-fifth year by gradually raising the scope and the complexities of the program to match the progression of the students. This continuum of the curriculum is reflected in the specificity of the courses offered in various years under a closely monitored teaching pedagogy delivered by the OSU faculty under the umbrella of the 'learning culture' initiated in 2010 as-well-as 'design studio: the integrative experience' (ARCHITECTURE, 2014; CEAT et al., 2010; O. S. University, 2016).

Architectural Design Learning Context at OSU

Architectural design in the first year includes the introduction of the principles and communication of design, whereas second and third year studios are focused on large scale and technically advanced architectural projects emphasizing on "creative problem-solving, relationship to context, sustainability, and systems and materials integration" (O. S. University, 2016). Computer-aided design through a design-build experience towards deeper understanding of the design process, materials, hands-on construction and field trips give the students a firsthand experience of architecture. The fourth and fifth year design coursework is focused on integrating built environment with building systems and a deeper understanding of architecture in urban environments (O. S. University, 2016). The learning context for architectural design at OSU is represented within the learning ecosystem through the student-cum-faculty driven studio culture where the solution-based, functional and aesthetically oriented sensitivity to the built-environment is inculcated in the five year program (ARCHITECTURE, 2014).

Architectural Design Coursework in First Year B. Arch Program at OSU

The architectural design (6 credits) and theory (5 credits) coursework are offered as professional studies in the fall and spring semester of the first year program covering 36% of the overall 31 credits. The other general studies coursework offered includes freshman composition, general physics, calculus, American government, and general education electives that cover 64% of the total credits offered as per Figure 21. The first phase of architectural education at OSU is known as 'lower division' and is part of the sequence of educational experiences termed as 'finding out' that includes the second year (CEAT et al., 2010).

Summarized Discussion: First Year Categories of Learning Approaches at OSU

The data collected from first year OSU students suggests *product* as-well-as *process-focused strategic* approaches that are dependent on faculty instructions in architectural design. There is evidence that the design coursework has been balanced between the beauty and aesthetics domain as-well-as skills and craft-based domain with the focus on the design project (Approach OSU1A). The students are strategically undertaking the design project based on the instructions of the faculty by focusing on the design solution through the dependent and product-centric Approach OSU1B. Both OSU1A and OSU1B represent the range from *surface-to-strategic* learning approaches. The *strategic* approaches to learning is signified within Approach OSU1C where the focus is on developing the process of design.

Categories identified in the 1st Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Process-Based Product-Focused Approach	Approach OSU1A	Product-Focused & Process-Based Strategy	Surface-to-Strategic
Architectural Design through Faculty Instructions & Direction as Process-based Product-Focused Approach	Approach OSU1B	Product-Focused & Process-Based Dependent - Strategy	Surface-to-Strategic
Architectural Design as Process-Focused Approach	Approach OSU1C	Process-Focused Strategy	Strategic

Table 27: Categorized Approaches to Learning in 1st Year B. Arch – OSU

Table 27 depicts the three identified categories of learning approaches from the experiences of the first year students at OSU, mapped onto meta-categories identified in the earlier pilot study (Chapter 5, Section 5.5; Table 13).

These categorized approaches have focused on the design solution transitioning towards the process in architectural design using *dependent* learning strategies in the first year of the program. Approaches OSU1A and OSU1B, the product as-well-as process-focused, dependent categories represent the surface-to-strategic range of learning approaches parallel to Approaches A and B in the pilot study (Chapter 5, Table 13) (A. Iyer & Roberts, 2014). These categorized approaches are further amalgamated into Approach OSU1C, the process-focused category and its connection to Approaches C and D, the product and process-focused, dependent strategies leading to independent learning categories in the pilot study (Chapter 5, Table 13) (A. Iyer & Roberts, 2014). The first year classification is further connected the three identified approaches of 'memorizing and rehearsing as-well-as experimenting techniques and procedures' from the earlier fashion design studies (Chapter 5, Table 17) (Bailey, 2002; Drew et al., 2001).

Approach OSU1A: Architectural Design as Process-Based, Product-Focused Approach (Product-Focused & Process-Based Strategic Category)

One of the two dominant themes discussed by the first year students is this identified category that delves into their learning experiences based on the process of design focusing on the product or the final design solution. There is an emphasis on acquiring the skills and techniques required for architectural design. Student-(OSU-001-AR007) has looked at the design process stating *"they wanted us to essentially think about how…whether the spaces created by the planes were proportional themselves to ...human's proportions which were given as a three-inch in this specific project. Then on the second part of the project, we essentially expanded upon the three planes to create an abstract living space, creating a primary, a secondary, and a tertiary space. And we wanted to think about how those spaces worked together, and also just how they themselves felt in addition to using planes as added sticks into the component to further communicate what feelings or how a space should be perceived essentially, and also building upon what kind of movement, … that they would have."*

The design process is based on 'the nature and sequences of the spatial experiences,' 'finding or exploring a system,' and 'collaboration towards actual application.' These experiences revert back to a product-focused approach with Student-(OSU-001-AR003) stating that *"right now we're building a bridge. So, basically, like if I were to build a bridge, …I would sit here and say, "Would the construction company have problems building this?" or, "Would it look good? Would it be attractive to society?" Or things like that, "Is it cost effective? Is it…? Like would it cost too much to build it?" Or, "Would the price be okay to build it?"* These experiences have reverted back to product-focused expressions including 'building,' 'constructing,' and 'creating' in addition to visual and aesthetic expressions that include 'being attractive,' 'looking good' and a focus on 'the making' and 'finishing' of the design solution.

There is further reinforcement on this sub-theme with the focus on skills and craft-based domains depicting its importance in architectural design (Chapter 3, Section 3.5). Student-(OSU-001-AR001) reflects on this stating *"things that you've … from it now, sketching, is a thing that I was really weak at. I wasn't really good at sketching and with the…this sketching classes that we've been going through and the sketching assignments, I mean, that's really opened up my mind towards free-will sketching. Usually, I'm really… technical but, once you're taught to, it's okay to make the errors in order to come up with the perfect thing, it open you up quite a bit. That's one thing that I… from it that I'm using right now. And then of course, craftsmanship."* These sub-themes represent further connections to Schon's expression of 'learning by doing' and

the importance given to skills and techniques captured through the discussions between students and design faculty (Chapter 3, Figure 13) (Schon, 1983, 1987).

Approach OSU1B: Architectural Design through Faculty Instructions & Directions as Process-based, Product-Focused Approach (Product-Focused & Process-Based, Dependent Strategic Category)

The second dominant theme looks at the role played by the design faculty in the architectural design studio. There was a consensus amongst students on the faculty's role with under three subthemes. This included the emphasis given to the design process but also focusing on the completion of the final design solution. Student-(OSU-001-AR006) has reflected on this balance based on the faculty's role within the studio stating *"well, we're presented with a project and they're very different. So, sometimes they're based upon …just the design concept and sometimes we're given an idea like designing a bridge or something like that. And then we're given the freedom to create sort of a prototype based on our guidelines. And then we have a series of crits – critiques with different professors and they rotate throughout our sections and we're given feedback, what things work, what doesn't work and then we start again back to the design process and work towards a finished product and then we start over."*

The students have further reflected on using the faculty's instructions and directions as a strategy towards understanding the process of design with Student-(OSU-001-AR001) stating *"we are working on a bridge project and we're told to whether use a stick, planer or a composite system."* The directional quality reflected within these experiences include expressions like 'to be presented,' 'to be given,' 'to get a feedback,' and so on is representational of the instructional nature of the studio in the first year of the program.

Approach OSU1B has represented the role played by the design faculty in the studio elaborated in Chapter 3, Section 3.7 as-well-as Schon's description of the students and faculty-based discussions in Chapter 3, Figure 13 (Schon, 1983, 1987). In addition Approach SJJ1D, the dependent and strategic category from the first year of Sir JJ classification (Chapter 7, Sub-Section 7.4.4) and Approach B, the product-based multidirectional category from the pilot study (Chapter 5, Table 13) (A. Iyer & Roberts, 2014) represent variations of the faculty's role in the design coursework.

Approach OSU1C: Architectural Design as Process-Focused Approach

This categorized approach was a less-dominant but much discussed theme amongst the first year students where the focus of the learning experiences was on the process of design. The nature of architectural design where the focus of the pedagogy was

towards the introduction of design fundamentals in addition to the skills and technical requirements of architecture played an important role in this identified category. Student-(OSU-001-AR005) has expressed this role stating *"well, with our first project with the cube project, it was…basically spatial awareness and with that, we were made to place planes within an eight by eight cube to figure out, using the golden ratio, to figure out how spaces are assigned and how to use the spaces and then we extrapolated further from there. With this, we're getting more into the design technique and then the theory in process of design."*

The students' expressions including 'to conceptualize,' 'to absorb,' 'to approach,' 'a different perspective,' 'to develop,' 'to extrapolate …design technique… design theory,' 'prior experience,' 'architecture and limitations' as-well-as 'human standpoint as-well-as logical standpoint' are reflections of this transformation within their learning experiences from a product-focused outlook towards understanding the process of design in the architectural design studio.

Architectural Design Coursework in Second Year B. Arch Program at OSU

The architectural design (12 credits) and theory (3 credits) coursework are offered as professional studies in the second year program cover 50% of the overall 30 credits. The other general studies coursework offered includes statistics and education-based electives that cover the rest of the 50% of the total credits as per Figure 21. The second year at OSU is based on the continuation of the first phase known as 'lower division' and part of the sequence of educational experiences termed as 'finding out' (CEAT et al., 2010).

Summarized Discussion: Second Year Students' Learning Approaches at OSU

The collected data suggests that the second year students have focused on the product as-well-as process through *dependent* and *independent strategic* categories in the design coursework. They have been focusing on the completion of the design solution through *process-based* learning strategies that has depended on the various technical steps taken during the development of the design explained in Approach OSU2A. The students have undertaken the design project through *independent strategies* based on the faculty instructions by focusing on the process of design through *product-focused* approaches as discussed in Approach OSU2B. Approaches OSU2C and OSU2D have further represented product-centric approaches with a basis on the process of design centered on the program offered in architectural design. These identified categories have reflected *unidirectional* and *practice-based* as-well-as the *collaborative, strategic* learning approaches.

Table 28 depicts the four identified categories from the second year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These second year categories are *product-focused* progressively moving towards *process-focused* approaches. The *unidirectional* emphasis on the design program centered on architectural practice through *independent* learning strategies has been the highlight in the second year.

Categories identified in the 2nd Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Program-Focused, Process-Based and Product-Focused Approach	Approach OSU2A	Product-Focused & Process-Based Dependent - Strategy	Surface-to-Strategic
Architectural Design as Process-Based and Product-Focused, Instructions and Guidance of Faculty & Crit	Approach OSU2B	Product-Focused & Process-Based Independent - Strategy	Strategic
Architectural Design as Design Program and Process-Focused, Practice-Based Approach	Approach OSU2C	Process-Focused & Unidirectional - Strategy	Strategic
Architectural Design as Collaborative, Skills and Craft-Based Approach	Approach OSU2D	Product-Focused & Process-Based Strategy	Surface-to-Strategic

Table 28: Categorized Approaches to Learning in 2nd Year B. Arch – OSU

The emerging classification in the second year at OSU continues to represent Approaches A, B and C, the *product-focused, unidirectional* as-well-as *multidirectional, dependent* and *strategic* categories identified in the earlier pilot study (Chapter 5, Table 13). The evolving process-focused, independent, unidirectional and strategic categories of OSU2B and OSU2C are further connected to Approach D, the independent and process-focused, schema-based category from the pilot study (A. Iyer & Roberts, 2014).

Approach OSU2A: Architectural Design as Program-Focused, Process-Based and Product-Focused Approach

This identified category was the dominant theme of discussion amongst the second year students as a part of their learning experiences in the architectural design studio. Amongst the three subthemes that emerged included a focus on the design program that has been offered in the design studio with Student-(OSU-002-AR004) stating *"so for this project, this port of entry project, it was taking it and starting off with… just general square footage of what I needed and then trying to put it in a good proportion. And then taking that proportion, that's sizing how large I need the space and then being able to put the repetitious structure into it. So it would be looking at the general size of what*

each space needs to be and then constructing it into a proportional space, and then from that proportional space creating a repetitious structure through it."

The second subtheme focused on the development of the final product or the design solution following the technical requirements in architectural design. Student-(OSU-002-AR010) has reflected on this product-centric process stating *"It's just a new tool for me to use. That really helps so I didn't have to build model after model after model like kind of I could visualize it and draw it. And then like from that kind of perspective of how I would see it, I was able to produce like elevations and sections and plans and it goes from there."*

Whereas in the earlier subtheme, the focus was on 'the design project and the developmental aspects around it,' the product-focused subtheme included expressions that were centered on 'the various stages of architecturally developing the solution as an architectural portfolio.' The students' focus on the process of design is in continuation to the evolving learning experiences from the first year categories including Approaches OSU1A and OSU1C, the product as-well-as process-focused strategic approaches. Approach OSU2A has represented the process-based, dependent strategic category centered towards solution-centric approaches.

Approach OSU2B: Architectural Design as Process-Based & Product-Focused, Instructions & Guidance of Faculty & Crit (Product-Focused & Process-Based, Independent & Strategic Category)

One of two lesser dominant themes, this categorized approach was a continuation of Approach OSU1B from the first year explaining the role of the design faculty and crit in architectural design. This category is based on independent learning strategies correlated to the earlier product-focused and process-based, dependent strategic category from the first year (Approach OSU1B). One subtheme that was prominent in this identified category focused on the design process and the technical input given to the students through the instructions and guidance of the design tutors in architectural design. Student-(OSU-002-AR010) has expressed the importance given to this process stating *"On the first studio, it's like kind of everything was more guided like each time that you did something, they would tell you the direction you should head in and they taught you a lot basically like just the hand drawing the practices and how your graphic communication really aids in like what you're designing. So I guess coming here, in the studio they expected more from you. So …those basic communication skills in that studio to help influence like our design to help get it across to like our professors now, it's really important. And so I think it's mostly just, mostly that."*

The process-focused and product-centric category includes expressions in reference 'to be given an idea,' 'to give directions on the skill-based and technical aspects of Design' and 'to explain visual and aesthetic aspects moving towards a design solution or product.' Student-(OSU-002-AR002) has reflected on the design process stating *"there are still a lot more to …, that I should remain teachable. To recognize that I'm just scraping the surface, and that the architecture is a lot more than, you know, gluing some sticks together. And just try to remain teachable and open-minded, and just soaking on the knowledge as much as possible"*

The faculty's formal instructions are considered as important steps in developing the independent learning process differentiating Approach OSU2B from the first year Approach OSU1B. A minor sub-theme in this category reverts back on the product-focused strategies adopted by students since the first year.

Approach OSU2C: Architectural Design as Design Program & Process-Focused Practice-Based Approach (Process-Focused & Unidirectional, Strategic Category)

The second of the less-dominant themes, Approach OSU2C is based on the students' learning experiences who have a focus on the process of design with the emphasis on the design program. Student-(OSU-002-AR002) has emphasized on this process through the design program offered in the studio stating *"currently our project is centered around structure. So, this particular project is emphasis on structure and circulation. So, trying to understand how vehicle circulation, bus circulation, pedestrian circulation, how it moves around the site. And the structure of the canopy which is very important because it's in Arizona, it's very hot, so there needs to be shade. And the other thing is that, although shade is important, it has to be modulated so that there's still light coming into the canopy. So, it's not completely black, it's regulated light. So that the person who's in a car for example, pulls out of the canopy, there's light coming in, but it's shaded. So, it's not so dark that their eyes dilate to the darkness, so that when they pull out of the canopy they're not hit with bright light all of a sudden. So, you have a lot of different conditions to try to consider, structures, emphasis, circulation, and how the canopy regulates light."*

The students' experiences based on this emphasis centered on the 'discussion around the design program focusing on the particular project elaborating various facets of the design,' 'stages of the design process and correlating it with architectural practice,' and 'elaborating on one architectural element / principle relevant to the design project.' There

was further emphasis given to the design process through the program offered as a strategic learning approach. The design process focused on current architectural practice represented as a minor theme in this unidirectional, strategic category.

Approach OSU2D: Architectural Design as Collaborative, Crafts & Skills-Based Approach (Product-Focused & Process-Based Strategic Category)

Approach OSU2D, a minor theme has presented the students' collaborative learning experiences with continued emphasis on the skills and craft-based domain. Group-based learning is encouraged in architectural design. This identified category represents the product-focused directions undertaken by the students through process-based strategic approaches in architectural design.

Student-(OSU-002-AR010) on collaborative learning, "they taught you a lot basically like just the hand drawing the practices and how your graphic communication really aids in like what you're designing. So I guess coming here, in the studio they expected more from you. So learning those basic communication skills in that studio to help influence like our design to help get it across to like our professors now, it's really important."

Student-(OSU-002-AR007) on "what I learned from this library project is that was mostly…. The first project that we had to have a well-presented, well- crafted, well everything has to be well-crafted."

Architectural Design Coursework in Third Year B. Arch Program at OSU

The architectural design coursework of 12 credits in the third year covers 38% of the overall 32 credits. The other professional studies coursework offered includes architectural materials, architecture and society, architectural science and computers coursework that cover 62% of the total credits as per Figure 21. The third year design coursework at OSU is the continuation of the second phase known as 'upper division' and is part of the sequence of educational experiences termed as 'fundamental' (CEAT et al., 2010).

Summarized Discussion: Third Year Students' Learning Approaches at OSU

The data collected from third year students has suggested the continued focus on the product as-well-as process of design through *dependent-cum-independent, multidirectional* and *uncritical, strategic* approaches in architectural design. The students' focus on the transition from the analogue-to-digital domain through process-based learning strategies that are *dependent* on the completion of the design solution, is elaborated in Approach OSU3A. Approaches OSU3B and OSU3D represent the third

year students' focus on the design process through *multidirectional* and *strategic* approaches of engaging with the design program offered.

Collaborative learning as *uncritical strategic* approaches through group work is encouraged in architectural design and further elaborated in Approach OSU3D. Approach OSU3C has elaborated on students' experience of the faculty instructions in undertaking the project through *independent strategies* focusing on the process of design and its relevance to current practice. These categorized approaches represent the importance given to practice-based as-well-as group-work and collaborative learning strategies.

Categories identified in the 3rd Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Transition from Analogue-to-Digital, Process-Based, Program-Specific and Product-Focused Approach	Approach OSU3A	Product-Focused & Process-Based Dependent - Strategy	Strategic
Architectural Design as Design Program-Specific, Process-Focused and Practice-Based Approach	Approach OSU3B	Process-Focused Multidirectional - Strategy	Strategic-to-Deep
Architectural Design as Practice& Process-Based with Transitionary Role of Faculty-Crit from Instructor and Guide to Collaborator	Approach OSU3C	Product-Focused & Process-Based Independent - Strategy	Strategic-to-Deep
Architectural Design as Collaborative Group Learning	Approach OSU3D	Product-Focused & Process-Based Uncritical - Strategy	Strategic

Table 29: Categorized Approaches to Learning in 3rd Year B. Arch – OSU

Table 29 depicts the four identified categories from the third year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These categories have focused on the design solution with group-based learning formally structured as a part of the program offered in architectural design. There is further focus given to the process of design through *multidirectional strategies* with prominence on the transition from analogue-to-digital medium in the context of current architectural practice using uncritical learning strategies.

The third year classification represents the continuing evolution from *dependent, product-focused strategies* to *independent, process-focused, multidirectional strategies*. This represents a continuing connection to Approaches C and D, the product as-well-as process focused, dependent and independent strategic categories identified in the earlier pilot study (Chapter 5, Table 13) (A. Iyer & Roberts, 2014). The third year classification is further connected to strategic range moving towards deeper approaches in 'experimenting as-well-as rehearsing with techniques and procedures' identified in the fashion design studies (Bailey, 2002; Drew et al., 2001).

Approach OSU3A: Architectural Design as Transition from Analogue-to-Digital, Process-Based & Product-Focused Approach (Product-Focused & Process-Based, Dependent - Strategic Category)

The dominant theme amongst the third year students is this transitionary approach taken from the analogous process to the digital domain and evolution towards a design process-based development from the product-centric nature of the architectural design studio. One of the two major subthemes represented in Approach OSU3A was the connection to the first year studio and its impact on the design process. Student-(OSU-003-AR001) reflects on this connection stating *"they get you in there, and they engage… the senses, like you draw and you interact physically with your project. And I think that that has helped me a lot here. Because you, like reinforced what you're understanding because you're like reacting rather than just clicking a mouse all the time."*

The other major subtheme was the continued focus on the design program of the specific design studio. A minor sub-theme that was discussed here connecting this identified category to the product-centric nature of the studio was this transition from the analogous process to the digital domain and its impact on the design process. Student-(OSU-003-AR009) has expressed the mindset behind this process stating *"the studio has been a lot more computer oriented, so I definitely…that's super valuable in career field wise because we're looking for an internship this summer, and it's really important than and you have to do AutoCAD, Revit, Rhino, things like that. And so the studio is definitely more focused on developing those skills instead of continuing on hand drafting and like artistic composition and graphic quality because they expect you to have learned it about in your first two years. So, now it's like creating real world things, and real world skills based on your creative skills that you've already built up."* Approach OSU3A represents the continued dependence on the practice-based design pedagogy in architectural design and strategically ties up with the mission and vision of the School explained in Section 8.2.

Approach OSU3B: Architectural Design as Design Program Specific & Process-Focused Practice-Based Approach (Process-Focused, Multidirectional, Strategic Category)

As one of the less dominant but much discussed theme, Approach OSU3B represents the continued focus on the design program offered with the process taking prominence. This identified category depicts multidirectional and strategic approaches undertaken by students connected to the issues discussed in the current architectural practice. Approach OSU3B represents the continuation of Approach OSU2C, the process-focused and unidirectional, strategic category from the second year.

Student-(OSU-003-AR007) reflects on this experience stating *"So being able to work out the issues of circulation, how people are going to need the ground floor plane with this massive building, trying to attract people from the Dallas area into this region because not a lot of people from Dallas went into this area. It was …..actually a vacant parking lot, and so now we're trying to bring people into this area. So there was a lot of challenges but it was very rewarding at the end because you get to ….how even on a large scale, you have to think even more critically on how things are composed and designed and things like that. And so now switching from such a huge scale and scaling down to this tiny home, you would think that it wouldn't be as challenging, but it shows that it still is. Because it may not be the same problems, but there are still problems arising anyways so, yeah."*

The multidirectional approaches adopted by the third year students represents the steps being undertaken by them at various stages of the design process at specific moments which is part of their group-work based collaborative learning process inculcated at OSU. This category addresses the focus on the process of design from the conceptual level to its impact on practice, further explained in the product-focused and dependent strategic category of Approach OSU3A. Student-(OSU-003-AR001) reflects on these varied extremes stating *"Let me think here. Well, like, I mean, we've had a very wide variety of abstract thinking and you know, and a concrete analysis thinking, and they have kind of very… two extremes, or both where you're using, of course, both abstract thinking and concrete analysis."*

Approach OSU3C: Architectural Design as Practice& Process-Based with Transitionary Role of Faculty-Crit from Instructor & Guide to Collaborator (Product-Focused & Process-Based, Independent Strategic Category)

The other less dominant theme of Approach OSU3C represents the transition in the role of faculty and crit from the mode of giving instructions and guidance to being the design collaborator. This identified category is in continuation of Approach OSU2B, the product-focused and process-based, independent strategic category from the second year. Student-(OSU-003-AR005) reflects this transition stating *"it's a lot freer in the first design studios because they're trying to instill kind of good habits design-wise and to kind of get you in the mindset and the frame of mind for thinking in the way that you need to think while you're working in such a design-based field. It's a lot more kind of structured."*

This collaborative role focuses on the professional relationship in current practice and being replicated within third year architectural design. Student-(OSU-003-AR005) reflects on this transforming relationship between the tutor and the student stating *"when*

I can take an idea that I had that I thought might potentially work, and be able to flesh it out and discover that it may…it actually does work or it doesn't work before I have to talk to a professor about it. It's again, it's less asking, 'Is this right?' And it's more of, 'Well is this better than option two?' I was…when I can understand, or I can say that I understand something when I can flesh it out and kind of come up with some iteration…my own iterations, my own conclusions about something, and then seek kind of professional opinion before.. yeah." This transforming relationship with the faculty is further representational in the development of independent learning approaches amongst the students' cohort as they transition into the fourth and fifth year of the program.

Approach OSU3D: Architectural Design as Collaborative Group Learning (Product-Focused & Process-Based, Uncritical Strategic Category)

A minor theme and a continuation of Approach OSU2D from the second year is this identified category that has focused on the design program offered in the third year design studio where students are required to work in groups. Student-(OSU-003-AR006) has introduced group-based design project work stating *"my current studio is the third year design studio. It's a design-build studio. So, what we're doing is we'll design a project, and then by the end of the semester have it fully built to scale. So, right now we've just been working on the same project for the last six, seven weeks now, building a small tiny house. It's a team-based project, so we're all on groups."*

This identified category is considered as a continuation of Approach OSU2D, the product-focused and process-based strategic category from the second year. This requirement leads to an uncritical collaborative group learning process expressed by Student-(OSU-003-AR006) who states that *"I would say …through a collaboration which happens, I think, through all of the years. But especially this year, I found myself sitting down with various people and taking up whole sketchpads of paper to work out an issue, and you know, almost a train of thought conversation where you're sketching all different sorts of variations that you can do with this one detail or this one part of the building. And it's both a verbal communication and then a written communication whereas a lot of your first couple of years it's very independent. And you can collaborate with other people. It's best to collaborate with other people, but it's also conceptual to the project, sort of what you want them. This year it's more of how is the best project going to come about."*

This requirement within the design studio represents the starting point for inculcating collaborative group learning amongst students through uncritical strategic approaches.

The focus in this categorized approach is on the process of design moving towards the final solution with current architecture practice representing the backdrop in the design coursework.

Architectural Design Coursework in Fourth Year B. Arch Program at OSU

The architectural design and comprehensive design coursework of 12 credits in the fourth year cover 40% of the overall 30 credits. The other professional studies coursework offered includes architectural materials, architectural project management, architectural science, seminar and controlled electives that cover 60% of the total credits as per Figure 21. The fourth year design coursework is based on the third and final phase known as 'professional school' and is part of the sequence of educational experiences termed as 'development / specialization' that includes the fifth year (CEAT et al., 2010).

Summarized Discussion: Fourth Year Students' Learning Approaches at OSU

The collected data amongst fourth year students have evolved into *independent* and *multidirectional, critical* and *schema-based* learning approaches representing these categories as the differentiator in fourth year architectural design. These identified categories have continued their focus on the *product* as-well-as *process* of design using *strategic* approaches from the third year. Approaches OSU4A, OSU4B and OSU4C are focusing on the transition from the *product* to *process-based* learning strategies in completing the design solution and the importance given to practice.

Categories identified in the 4th Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Process-Focused, Design Program and Practice-Focused Approach	Approach OSU4A	Process-Focused Critical - Schema	Strategic-to-Deep
Architectural Design as Product-Focused, Design Program and Process-Based Approach	Approach OSU4B	Product-Focused & Process-Based Independent - Strategy	Strategic
Architectural Design Process as Transition from Abstract- to-Technical	Approach OSU4C	Product-Focused & Process-Based Multidirectional - Strategy	Strategic
Architectural Design Process as Transition from Analogue-to-Digital	Approach OSU4D	Process-Focused Independent - Schema	Strategic
Faculty as Collaborator through Crit in Architectural Design	Approach OSU4E	Process-Focused Independent - Schema	Strategic-to-Deep
Table 30: Categorized Approaches to Learning in 4th Year B. Arch – OSU			

Approach OSU4D presents the design process through *independent, schema-based* approaches reinforcing the importance given to the transitionary role of the analogue-

to-digital domain. Approach OSU4E represents the transformational role of faculty as collaborators in the *independent learning* approaches being taken by students in the design process and its relevance to current practice.

Table 30 depicts the five identified categories from the experiences of fourth year students at OSU, mapped onto meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These identified categories reflect the design process-centric nature of the learning experiences connected to current practice through the design program offered. Prominence is given to the design solution reflected in the *multidirectional* and *independent* transition of the design process from abstraction to its technical detail. Architectural design is being understood through critical and *schema-based, strategized* approaches representing the transition from the analogue-to-digital domain from the perspective of the design solution.

The fourth year classification has represented the connection to Approaches D and E based on *independent* and *process-focused strategies* as-well-as the students' *practical-cum-schema-based* approaches from the earlier pilot study in Table 13 (A. Iyer & Roberts, 2014). Approaches OSU4C, OSU4D and OSU4E further illustrates the strategic-to-deep range of the learning approaches on 'experimenting techniques and procedures' to 'relating fashion to own life world' from the fashion design studies (Chapter 5, Table 17) (Bailey, 2002; Drew et al., 2001).

Approach OSU4A: Architectural Design as Process-Focused, Design Program & Practice-Focused Approach (Process-Focused, Critical Schema-Based Category)
One of the three dominant themes in the fourth year, the process-focused category of Approach OSU4A is centered on the design program offered and its connection to architectural practice. This identified category represents the continuation with Approaches OSU3B and OSU2C, the process-focused, multi as-well-as unidirectional strategic categories from the third and second year. The centrality of the architectural design studio is expressed by Student-(OSU-004-AR003) who states that *"I guess, the description of this design studio is you know, it's comprehensive, it's you know, you go from everything you …. in school and you apply it in every single class, and I think that's a great thing, you know. Like, there's many majors in which you take all our classes and then you don't really apply them all together and this really does it."* The process of design traversed by the students is reflected in their experience connected to the practical and technical aspects of architecture as a schema-based approach.

Student-(OSU-004-AR005) explains this process stating *"well, in the beginning, we really were pushed on establishing a solid concept, and that concept being backed by either your own design opinion or some mathematical reason behind it. We are kind of following that into our studio now, but we've began to kind of elaborate it and make it more real. The concepts have become less abstract and more realistic. They're derived from things like sunlight or context, rather than the form or something in nature, like we used to focused on before. …it's the same idea, but in a more realistic, applicable kind of way."*

The focus of the design program is centered on current architectural practice with Student-(OSU-004-AR010) stating that *"this semester. I think this studio has more been about learning how reality affects architecture. Because in the first year it's all pure design. You're designing, designing. In this one, it's like you're getting into actual architecture and codes and specs and you had to think about all these things that people actually use. So it's more about I'm ….how I can apply this in real life now. I can't just design something just because it looks cool or whatever like I actually have to think about how people are going to actually use it and what material they're going to use, how things are going to feel. And so that's what this studio has been mainly about for me. Like, I need to actually start thinking about reality. You know, you can't just do whatever you want because it looks great."*

The design pedagogy propagated in the architectural design studio at OSU is reflected in this identified category and is further emphasized in reference to current architectural practice and its impact on the design program. The design program is undertaken as a part of the process through the practical-utility and technical domains of architectural design as schema-based approaches.

Approach OSU4B: Architectural Design as Product-Focused, Design Program & Process-Based Approach (Product-Focused & Process-Based, Independent Strategic Category)

The other dominant theme of Approach OSU4B represents the continued connection of Approach OSU4A, the process-focused, critical and schema-based category that is centered on the process of design through the program offered in the backdrop of architectural practice. Student-(OSU-004-AR012) reflects this solution-based approach stating *"I expected to …. I mean every single year, we just get more and more complex. And on that particular project we took, or we knew that we would take this design, we would design it, and then we were going to have to like break it down even further than what we'd ever done before by doing a detailed wall section. And then we were going*

to have to do a big model like a half-scale model, these models. And we had to actually like, for the first time break it down and be like, 'Okay, how does this actually work? How could we actually build it?' And then we have to actually …build it to see if it would, you know, if it actually works."

Student-(OSU-004-AR010) sums-up the process stating that "well I usually always start with looking at precedents. So I do precedent research about what other people have done and then I do site analysis. And then after I analyses the site, I start with an over, like arching concept which I kind of want to have. And then from there I gather ideas from that concept on how I can accomplish that concept. And then I just start creating. I always usually do physical models and do a site context and then start generating ideas of how it fits into the site and how it's going to relate to everything else. And then from there on, I just pick a finalized massing model because I always start with the form first and then try to just work into it." This category presents the solution-driven experiences focusing on the final product. Aproach-OSU4B has emphasized in the final design solution through independent and strategic approaches.

Approach OSU4C: Architectural Design Process as Transition from Abstract-to-Technical (Product-Focused & Process-Based, Multidirectional Strategic Category)

Approach OSU4C as another dominant theme represents the product-centric process of design through the connection of technical and abstract domains in architectural design. This identified category is connected to the earlier categorized Approach OSU4B as-well-as Approach OSU3A, the product-focused and process-based, dependent and strategic category from the third year. Student-(OSU-004-AR003) reflects on this approach stating that *"even in the current design studio, we go from really abstract to like, you know, we have… this is how my building started, so like a very conceptual model and then we're doing very detailed stuff, very structural calculations, looking at volumes, how are you going to connect things."*

An important sub-theme discussed is the relevance of first year architectural design in the fourth year. This is an important aspect discussed by students in their experiences is the relevance of the 'fundamentals' design studio of the first year in their current work with Student-(OSU-004-AR009) reflecting on this connection stating *"so really I see the fundamentals coming in handy during our conceptual phases. So going back to just the basics of how you I guess analyze the site and how you create a concept for your library. So you're looking at how you want the space to feel I guess, what form it's going to take, what different ordering systems you can use in a library. And during the conceptual*

phase, I guess that's when you're using those basics to generate a starting point for your library if that makes any sense." The transition mapped in this identified category reflects the juxtaposition between the focus given to the process of design and product-centric outcome in the design studio.

Approach OSU4D: Architectural Design Process as Transition from Analogue-to-Digital (Process-Focused, Independent Schema-Based Category)

Approach OSU4D as the minor theme has explained the importance given to the analogous process in design and its transition towards the digital domain which is an underlying requirement in architectural practice. This identified category has presented a connection to the dependent Approach OSU3A, the product-focused and process-based, strategic category from the third year. Approach OSU4D is connected to the solution-centric, schema-based, independent learning experiences undertaken by the fourth year students.

Student-(OSU-004-AR003) reflects on this transition stating *"so we took this hand drawn model and that was that. And for our fourth studio of the semester after that, we took those drawings, scanned them, and started …to translate them into AutoCAD. So we started with the same project. So there was a lot to figure out the design while doing that. There was a lot just …the program. That was nice we also have this other project going on at the same time. So it was… very abstract, it was very creative but at the same time it was just a very harsh transition. So yeah, we went from the project, hand, computer, and then from CAD we went to Rhino. The semester after that we entered into Revit which is a lot more detail-oriented. So I understand why that progression happened, but I feel like it could've gone a lot smoother than it did."*

Student-(OSU-004-AR010) reflects on this transition with reference to the design process stating *"I always usually do physical models and do a site context and then start generating ideas of how it fits into the site and how it's going to relate to everything else. And then from there on, I just pick a finalized massing model because I always start with the form first and then try to just work into it."* Approach OSU4D can be considered as a connection to the solution-centric, schema-based, independent learning experiences reflected by the students in the fourth year of the program.

Approach OSU4E: Faculty as Collaborator through Crit in Architectural Design (Process-Focused, Independent Schema-Based Category)

The minor and less discussed category of Approach OSU4E represents the evolving role of faculty from an instruction-based perspective to a collaborator in the development

of independent and schema-based, process-focused strategic approaches in architectural design. Student-(OSU-004-AR005) has reflected on this transformation stating that *"it's… more grasping the actual concepts of rather than just looking at my teacher draw it and then I don't know. I'm just copying it. I really am interested in ….why you put all these things and how that helps the architecture better itself, how it keeps water out, how it insulates the building, things like that. I feel like that what's I'm …now. And that's how understanding for me, is that way rather than before, I kind of just followed what my teacher did. I copied them. Now, I'm doing it independently, understanding it."*

Architectural Design Coursework in Fifth Year B. Arch Program at OSU

The architectural design coursework of 7 credits is offered in the fall semester of the fifth year program covering 22% of the overall 31 credits. The other professional studies coursework offered in the fall and spring semester includes management of architectural practice and a series of theory and controlled electives that cover 78% of the total credits offered as per Figure 21. The fifth year design coursework is also based on this final phase known as 'professional school' which is a continuation from the fourth year and is part of the sequence of educational experiences termed as 'development/specialization' (CEAT et al., 2010).

Summarized Discussion: Fifth Year Students' Learning Approaches at OSU

The data collected in the fifth year is represented as the continuation of the product as-well-as process-focused learning approaches from the third and fourth year. These *independent* and *multidirectional, critical* as-well-as *schema-based* learning categories are the differentiator in the fourth and fifth year at OSU. Approaches OSU5A, OSU5B and OSU5C represent the continued focus on architectural practice, the transition from the conceptual-to-technical domains in design and the collaborative role played by faculty as the direct connection with the client. The students' experiences are based on the pedagogical requirements in the third and fifth year design coursework at OSU focusing on *collaborative* and *peer-based learning* approaches represented by Approach OSU5D.

Table 31 depicts the four identified categories from the fifth year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These identified categories are a continuation of the fourth year categorized approaches focusing on the design process connected to architectural practice. The prominent *multidirectional* and *design process-based strategic* approaches focusing on the abstract and technical domains of architectural design are balanced by *critical* and

schema-based categorized approaches. The fifth year classification is a further reinforcement towards Approaches D and E based on independent and process-focused strategies as-well-as practical-cum-schema-based approaches based on the pilot study (Chapter 5, Table 13) (A. Iyer & Roberts, 2014). Approach F representing the perceptual and conceptual as-well-as schema-based category from the pilot study is not represented in the OSU classification of learning approaches reflecting on the school's physical context within Stillwater in the American rural settings as discussed in the introduction to the current chapter.

Categories identified in the 5th Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Process-Focused, Design Program and Practice-Focused Approach	Approach OSU5A	Process-Focused Critical - Schema	Strategic-to-Deep
Architectural Design Process as Transition from Conceptual-to-Technical and Practical	Approach OSU5B	Product-Focused & Process-Based Multidirectional - Strategy	Strategic
Architectural Design Process as Professional Collaboration with Faulty and Client	Approach OSU5C	Process-Focused Independent - Schema	Strategic-to-Deep
Architectural Design Process as Peer-Based Collaborative Learning	Approach OSU5D	Process-Focused Independent - Schema	Strategic

Table 31: Categorized Approaches to Learning in 5th Year B. Arch – OSU

Approach OSU5A: Architectural Design as Process-Focused, Design Program & Practice-Focused Approach (Process-Focused, Critical Schema-Based Category)

The dominant fifth year category of Approach OSU5A represents the continuation of Approach OSU4A, the process-focused, critical and schema-based fourth year category. Approaches OSU3B and OSU2C, the process-focused, multidirectional and unidirectional strategic categories from the third and second year are represented as further connections to the four years of architectural design. The design program offered with an emphasis on current practice is the reinforcing factor in this process-focused, critical and schema-based category.

Student-(OSU-005-AR007) has reflected on the preeminence of the design program offered in the fifth year design studio stating *"well, our fifth year design studio focused on issues of urban design. So, we were broken up into groups of approximately six to seven people. And we focused on an area of Boston that has existing transportation infrastructure. And we, as groups, tried to design a new masterplan for the infrastructure of the train station and to incorporate new kind of livable urban spaces into that part of town which right now is dominated by a coastal facility and is really inaccessible to the waterfronts. We wanted to kind of reactivate the space for the public and to make it more prominent and usable."*

The focus of this categorized approach remains focused on the design process but it hinges on the backdrop of current architectural practice with Student-(OSU-005-AR004) stating that *"I think you know, the understanding of the clientele or the presentation of the communication with those types. I think currently, in our design been built which is you know, you're designing your building and then you're also bidding the contracts. So as that now, it's understanding of how to, everything I've …through the process of… the fifth classes, through the design studios, through the actual fabrication. It's now actually implementing that and trying to make that possible with actual outside of the school, university and making a profit and being an actual designer or whatever. So at the moment with the job that now, with the design build, now it's taking everything and… and implementing that through an actual rea- life experience."*

Approach OSU45B: Architectural Design Process as Transition from Conceptual-to-Technical and Practical (Product-Focused & Process-Based, Multidirectional Strategic Category)

The less dominant theme of Approach OSU45B represents the focus given to the design process as multidirectional design strategies. This identified category has connected the aesthetic and abstract domains to the technical domain in architectural design as product-centric workable solutions. Approach OSU5B represents the continuation of OSU4C and OSU3A, the product-focused and process-based, multidirectional and dependent, strategic categories from the fourth and third year.

Student-(OSU-005-AR006) has reflected on this process of transition stating *"In the earlier semesters, it's more of trial and error. There's not a lot of research and that's the biggest thing that you …along the way is that, …a lot about an area can kind of guide your proposal in the end and give you a lot of, a really strong foundation to build off from the beginning in the first year studio. I remember it's like what they'd asked you to do when you're developing a project is come up with maybe five to ten of these smaller forms that you think could work and then we'll go from there. We'll see which ones you like or which ones you know, are aesthetically appeasing. But then when you get into the later years, it's more of how strong are your founding arguments. Like, what led you to this solution, and that's what makes your project successful in the end. It's where you started from and how you perpetuated that idea into your final solution."* This identified category has presented the transition in the process leading to the design solution.

Approach OSU5C: Architectural Design Process as Professional Collaboration with Faculty and Client (Process-Focused, Independent Schema-Based Category)

The minor but important theme of Approach OSU5C is represented as the collaboration established by the students with the design faculty and the client in the current architectural practice. This categorized approach is a continuation of Approach OSU4E, the process-focused, independent schema-based category from the fourth year. This category represents the evolving role of the faculty and the independent learning approaches undertaken by students' through schema-based approaches.

Student-(OSU-005-AR001) has reflected on this professional collaboration with the tutor and the client stating *"Like in other studios, the professor would never help me on a project, or they wouldn't do work for me on a project, they wouldn't do a drawing for me, or a rendering. In this studio, professors also does just as much as work on the presentation, and the drawings, and the design as we do, so…. And also the architects we have in Italy are helping as well. So, we're working with actual architects, licensed architects in Italy. So, it's lot different than just working on your own as a student."* Approach OSU5C further presents the pedagogical direction taken in architectural design at OSU.

Approach OSU5D: Architectural Design Process as Peer-Based Collaborative Learning (Process-Focused, Independent Schema-Based Category)

The other minor theme of Approach OSU5D represents the focus given to collaborative learning amongst the students' cohort through peer-based learning approaches. This category is in continuation with Approach OSU3E, the product-focused and process-based, uncritical strategic category from the third year.

Student-(OSU-005-AR004) has described this learning experience stating *"…we had to present and everything, and I think the team environment here where I'm working on, most of my projects, except for two were all team experiences. So I think …that, I don't…it is important as working in a team because you grab more knowledge, you grab more understandings, and your project becomes better than just a single individual designer. But I think it's, I'm all about the people. Like you're working for the people and then you're getting the best project for the people. That's the most important thing is your client, it's your team, it's… You also have to have a good design, doing a good sustainable building, but if the people don't work together as good, you're not going to be very successful. So, yeah. It's the understanding I guess kind of, of architecture, that's the importance to me right now, or the knowledge that I've…"*

Architectural design at OSU has inculcated peer-based learning through an array of group-based projects from the third year to the fifth year. The students' experiences based on the requirements of the academic curriculum represent the transformation to collaborative and independent, schema-based learning approaches.

The Outcome Space for the Classification of Approaches to Learning for the B. Arch Program at School of Architecture, Oklahoma State University is explained in Chapter 8

International Perspective: Three - School of Architecture,
University of Texas in Austin, Texas, USA

International Perspective: Three - School of Architecture, University of Texas in Austin, Texas, USA

School of Architecture, University of Texas at Austin (UTA), Austin located in Texas State of the United States of America is one of the four institutions covered in the current study. Table 33 presents an overall picture of the bachelor of architecture programs offered at the four institutions with UTA offering a total of one hundred and sixty one credits in the five year program and forty-seven courses.

Name of Institution	Total Credits Hours	Equivalent Coursework / Core Modules	Accreditation Body
Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ), India	340	85 Courses 5 Year Program	Council of Architecture (CoA), India
School of Architecture, Oklahoma State University (OSU), USA	154	43 Courses 5 Year Program	National Architectural Accreditation Board (NAAB), United States http://www.naab.org/
School of Architecture, University of Texas at Austin (UTA) – Austin, Texas	161	47 Courses offered in the 5 Year Program	
Welsh School of Architecture (WSA) - Cardiff, UK	600	20 Core modules 5 Year Program	Royal Institute of British Architects (RIBA) & Architects Registration Board (ARB)
Table 33: Data Collection at Four Institutions with Highlights of the Architecture Program offered at School of Architecture, University of Texas in Austin			

School of Architecture, University of Texas at Austin (UTA), Texas has inherited the rich cultural urban ambience of the North American context through the city of Austin. The five years program offered includes ten semesters. The school is located within the University of Texas at Austin campus "in four adjacent buildings: the historically significant Battle Hall (1911); Sutton Hall (1918, renovated in 1982), designed by distinguished American architect Cass Gilbert; Goldsmith Hall (1933, expanded and renovated in 1988), designed by noted architect Paul Philippe Cret, one of the primary planners of the forty-acre campus; and the West Mall Office Building (1961)" (Registrar, 2016). The Architecture and Planning Library and the Alexander Architectural Archive located in the Battle Hall building are the other significant features of the school.

School of Architecture, University of Texas in Austin: A North American Perspective

Professional architectural degrees are offered at the University of Texas in Austin (UTA) since 1910. First established as a part of the Department of Engineering, the School of Architecture - UTA became an independent division in 1948 under the College of Engineering and was granted full autonomy by the university in September 1951. As a member of the Association of Collegiate Schools of Architecture and the Association of

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Collegiate Schools of Planning, the undergraduate and postgraduate programs at the school of architecture are accredited by the National Architectural Accrediting Board and satisfy the registration requirements of the Texas Board of Architectural Examiners (Registrar, 2016).

5 YEARS B. ARCH PROGRAM - UTA

Design ■ Visual Communication ■ History ■ Const.-Env.Ct.-Site Des.-Pro.Pr. ■ Add.Coursework

YEAR 5
- 10 Credits Archiitectural Design
- 3Credits History
- 3Credits P.P.
- 18Credits Add. Coursework

YEAR 4
- 10 Credits Archiitectural Design
- 3Credits Tech. Comm.
- 6Credits History Com-Reg.Pl.
- 3Credits Const.V
- 12Credits Add. Coursework

YEAR 3
- 10 Credits Archiitectural Design
- 3Credits History
- 14Credits Const.III & IV Env. Control I & II
- 3Credits Add.Cr.wk.

YEAR 2
- 8 Credits Architectural Design
- 2Credits Vis.Co.III
- 3Credits History
- 11Credits Const. I & II Site Design
- 7Credits Add. Coursework

YEAR 1
- 6 Credits Archiitectural Design
- 6 Credits Vis.Com. I & II
- 6Credits History
- 14Credits Add. Coursework

Figure 24: 5 Years B. Arch Program Curriculum at School of Architecture, University of Texas at Austin, Texas, USA (Registrar, 2016)

The bachelor of architecture is a five-year professional degree program and is being offered since 1910. The focus of this program is "a rigorous design-oriented curriculum with a solid foundation in technology and the history and theory of architecture" (Registrar, 2016). The curriculum is structured to give a grounding to the students in architectural professional practice. The five year program has a total of 161 credit hours that includes 44 hours of design coursework, 11 hours of visual communication coursework, 21 hours of history-based coursework, 31 hours of construction - environmental controls - site design - professional practice and 54 hours of other courses in addition to electives as well as additional coursework as per the core curriculum depicted in Figure 24. This undergraduate program is structured with 32 credit hours in the first year, 31 hours in the second year, 30 hours in the third year and 34 hours each in the fourth and fifth year. The school also offers a six-year dual professional degree in the Bachelor of Architecture and Bachelor of Science in Architectural Engineering with a total of 197 credits amalgamating the students' interest in both architectural and engineering facet of the built environment; in addition to the Bachelor of Architecture and Bachelor of Arts - Plan II Dual Degree Program with a total of 186 credits amalgamating architectural education and liberal arts (Registrar, 2016).

Architectural Curriculum at the School of Architecture, UTA

The curriculum of the program at the school of architecture, UTA is reflected on the exhaustive orientation towards the coursework of architectural design. This is coupled through a sound platform in construction technology in addition to architectural history and theory being the focus of this program (Registrar, 2016). The central focus of the architectural curriculum pertains to the coursework of design with advance design studios being offered in the fourth and fifth year of the program. History, both from a world-view perspective as well as a focus on American history including architecture and society with community and regional planning is also emphasized, representing the second major strand that is offered in parallel to the design coursework. Construction technology including coursework on environmental controls, site design and professional practice forms the third major strand of the curriculum (Registrar, 2016).

Architectural Design Learning Context at UTA

The three major strands of the curriculum including 'design,' 'history' and 'construction technology' are amalgamated in architectural design and play an important role in the students' learning process at UTA. The mission of the School is in providing a platform "to develop knowledge, sensitivity, and skill in design, planning, and construction" in the quest for future architects, interior design and planning consultants towards improving the built environment for humanity. The architectural curriculum also provides a broad educational spectrum of professional courses within the field of arts and humanities. The school has pursued the enhancement of architectural knowledge and skills of the students by reinforcing their exposure to "actual and theoretical problems, necessary to link understanding to experience, theory to practice, and art to science in ways that respond to human needs, aspirations, and sensibilities" (Registrar, 2016). Architectural design is offered through a series of six design courses in the first-three years followed by four advanced design courses offered in the fourth and fifth year of the program.

Architectural Design Coursework in First Year B. Arch. Program at UTA

Architectural design, visual communication and history coursework with an equivalent 12 credit hours is offered across the first and second semester of the first year program covering 56% of the overall 32 credits. Other required coursework including physical sciences, mathematics, approved electives and core curriculum courses of 14 credits are offered as per Figure 24. Architectural design offered in parallel to the Visual Communication coursework, popularly termed as 'Viscom' by students as well as faculty has been the highlight of the first year program. The first year at UTA has a focus on two out of the three major strands of the architectural curriculum including design and history.

Summarized Discussion: First Year Students' Learning Approaches at UTA

The data collected from first year UTA students suggests *product as well as process-focused, independent strategic* approaches in the design coursework. Though the dominant Approach UTA1A represents the *product-centric* approaches adopted through *unidirectional strategies* in completing the design solution, the students are have based their learning approaches on the process of design. Both UTA1B and UTA1C fall in the range of *surface-to-strategic* learning approaches centered on the coursework of Viscom conducted in parallel to architectural design. These product-cum-process focused strategic categories look into the role played by Viscom and faculty in developing the process of design. Approaches UTA1D and UTA1E have focused on the process of design as *independent* and *analytic* learning strategies by focusing on the project offered in architectural design and collaboration in the design studio.

Categories identified in the 1st Year	Nomenclature	Meta-categories	Position within Referential Facet in Outcome Space
Architectural Design as Series of Steps-Based Process-Based Product-Focused Approach	Approach UTA1A	Product-Focused & Process-Based Unidirectional Strategy	Surface-to-Strategic
Viscom in Architectural Design as Process & Product-Focused Approach	Approach UTA1B	Product-Focused & Process-Based Dependent - Strategy	Surface-to-Strategic
Role of Viscom & Design Faculty in the Architectural Design Process	Approach UTA1C	Product & Process-Focused Dependent-Strategy	Strategic
Architectural Design as Project-Based & Process-Focused Approach	Approach UTA1D	Process-Focused Analytic & Independent Strategy	Strategic
Design Studio as Collaborative & Process-Focused Approach	Approach UTA1E	Process-Focused Independent - Strategy	Strategic

Table 34: Categorized Approaches to Learning in 1st Year B. Arch – UTA

Table 34 depicts the five identified categories of learning approaches from the experiences of the first year students at UTA, mapped onto meta-categories identified in the earlier pilot study (Chapter 5, Section 5.5; Table 13).

These categorized approaches have evolved from *product-based, dependent* and *unidirectional strategic* categories transitioning to *process-focused, independent* and *analytic* strategies. The first year design coursework represents the *project-centric* perspective with the students being oriented to the process of design. The first year classification of Approaches UTA1A, UTA1B and UTA1C are in parallel to Approaches A, B and C, the *unidirectional-cum-dependent, product-focused* approaches identified in the pilot study (Chapter 5, Section 5.5; Table 13) (A. Iyer & Roberts, 2014). The *surface-to-strategic* range of approaches from the UTA classification differ from the pilot

study through the process-centric strategies that have developed within UTA1A, UTA1B and UTA1C. There is further contrast represented in the less dominant themes of Approaches UTA1D and UTA1E, the *analytic-cum-independent, process-focused* learning strategies. These categories are connected to the *strategic* range of Approaches D and E, the *independent, experiential and practical, process-focused* categories in the pilot study (Chapter 5, Section 5.5; Table 13) (A. Iyer & Roberts, 2014).

Approach UTA1A: Architectural Design as Series of Steps-Based, Process-Based & Product-Focused Approach (Product-Focused & Process-Based Unidirectional Strategic Category)

Approach UTA1A is the dominant theme discussed by the first year students delves into their learning experiences based on the process of design with a focus on the final design solution. There is an emphasis on the series of steps taken by the students as unidirectional strategic approaches in this product-focused categoty. Student-(UTA-001-AR007) has reflected on these steps stating *"it was a performance center, as for a public space, so we started with one large box of the maximum space we could use, and we broke it up into, it's called puzzle pieces; and then from that we got our main idea of the form, because it was supposed to be all 'stereotomic,' and as we got the idea of the form, we further developed it to be more for the human scale; to put more functions into it and then, from that point is when we went on to studying, in section, in plan and also with the two-point perspective, so we started with model-building for the ideas, and then learnt how to further it with other uses."*

Though the focus is on arriving at a design solution, the students are taking these series of steps reflecting on the underlying process of design. Student-(UTA-001-AR005) has stated, *"so last semester when we had to design a Performing Arts, like <u>a</u> public space, we started with just creating puzzle pieces that we like; we were supposed to have a general concept of what we wanted, say it's like circulation in a certain way, and then, we make puzzle pieces based on that, and then from that abstract form; we like, keep refining it and generating like, we would subtract puzzle pieces, ..create volumes like, ..negative space and then we kept refining it, until we got like closer to, what we wanted our end result to look like."*

Expressions in the students' experiences of taking a certain step including 'to build,' 'to draw,' 'to develop' or 'to work' is focused on the completion of the design solution. There is also a reflection on the underlying process of communicating the design through terms specific to the technicalities of design including 'various ways of approaching architectural drawings,' as well as discussions on the process of design through

expressions such as 'stereotomic,' 'tectonic,' 'abstraction,' 'subtraction,' 'dissection' and so on.

Approach UTA1B: Viscom in Architectural Design as Process & Product-Focused Approach (Product-Focused & Process-Based Dependent – Strategic Category)

Approach UTA1B elaborates on the role played by the visual communication coursework, popularly known as *'Viscom'* which is offered in parallel with architectural design in the first year at UTA and was one of the three less-dominant themes of discussion. There was a consensus amongst students on a balanced emphasis given to both the design process with a dependence on strategically completing the design solution. Student-(UTA-001-AR004) has elaborated the role of viscom as a product-focused approach stating *"so we were developing…, our model making skills; first semester in our first studio, so we were working with chipboard in our visual communications class, and we eventually started to work with that more in our design studios, just for our design rearrangements, and as well as that, we did a lot of perspective drawings; but in order to be better at them for designs and we actually used them as a design tool, we started with them in Viscom doing a lot of different perspective drawings, and one-point, two-points; learning how to really master that tool and how to apply it to the design process."* This identified category underlines the balance of process and product where viscom has played an important role in propagating the students' focus towards the underlying process of design.

Student-(UTA-001-AR006) has reflected on this underlying process stating *"…which came with the production of this house, and then for viscom, we had to do, floor plans and sections of this house, we had to draw them and then; when it came to design, we had to select a certain moment of the house, and we had to construct it, as if it was our own, and …viscom definitely helped, because without drafting and without researching the house, and without gaining that information, and learning how to research houses, because that's kind-of different from; this typical research, we have to look at different things, and that definitely helped, we wouldn't have been able to create the moment in design; we wouldn't have been able to focus on a particular moment in the house without knowing everything else about the house, and viscom; kind-of opens that new lens for research and makes you look at your design process in a different way so."* Whereas the product-focused expressions were centered on 'the technicalities of developing two-dimensional and three-dimensional aspects of architecture,' the process-based expressions included 'bridging the process' or 'transitioning into Design' and the dialogue between 'analogue-vs-digital.

Approach UTA1C: Role of Viscom & Design Faculty in the Architectural Design Process (Product & Process-Focused Dependent-Strategic Category)

The other less-dominant theme of Approach UTA1C has presented the importance of the first year viscom coursework running in parallel with architectural design. The importance of viscom is also discussed through Approach UTA1B as well as the dominant first year category, Approach UTA1A. A major sub-theme is the faculty's role in both these coursework reinforcing their interconnection as dependent and strategic learning approaches.

Student-(UTA-001-AR006) reflects on the role played by the faculty of both these courses in reinforcing this interconnection stating *"but the expectations are once again overlapping, because in our design studios, they are, the professors are aware of what we are being taught in viscom, because they work in a changeable, and professors in both design and in viscom… to better teach us, and so a specific example is, we have begun to use paraline drawings or perspectives or technical skills that we learnt in viscom to help us sketch and show our ideas to professors, to other students, to our studio-mates, so that we can show our ideas and get critiqued, should we pursue this idea or should we stop it, what's right or what's wrong here, and so specifically, right now we are working on our project and we have our views in eight days."* Expressions including 'we are taught to think in a specific way' and 'what they have been … and showing us, and re-sculpting our minds to think things differently' have focused on the design process-as well as product, dependent on the faculty instructions as strategies for learning architectural design.

Approach UTA1D: Architectural Design as Project-Based & Process-Focused Approach (Process-Focused Analytic & Independent Strategic Category)

The third less-dominant theme of Approach UTA1D has focused on the process of design through the project offered in architectural design. Student-(UTA-001-AR006) has reflected on this developing process through the design project stating *"I was looking at the way that, not only this building would impact the site as a whole; but the way that, every viewer on the street would see this and how it would impact Austin, so like looking at, how it fits in, not only like; to the building next to it, but to the Austin Scene, where it adds to Austin, specifically as the music venue, it adds to the different cultures to Austin, so we have a lot of, like different ones, so we have like folk music, we have Indie; but we don't have a very strong hardcore scene, so that's very specifically the one I went after, and add that layer of hardcore music to the scene by creating a venue specifically to help that part of music."*

The students' focus throughout the design project has permeated through *analytic* expressions including 'the cultural facets of the urbanity of ….(city).. and its connection to Architecture' leading to independent learning strategies. This categorized approach further reinforces the advancement in the process of design amongst a few of the students' in the first year cohort with Student-(UTA-001-AR002) reflecting this in-depth focus on the design process stating *"that's pretty much where our main focus is, thinking outside of the box, it's not hard to just to make a room, it's like; make a box, and that's not what architecture is about; it's about making something different; and conveying meaning with it; cause it's like a lot of people, you can make something."*

This categorized approach has further reinforced the advancement in the process of design in the first year cohort. Approach UTA1D represents the learning curve achieved through the focus on 'the various stages of the design process' to 'its interconnection with the given design project' and permeating further to the 'social and cultural aspects embedded within the process of design.'

Approach UTA1E: Design Studio as Collaborative & Process-Focused Approach (Process-Focused Independent – Strategic Category)

The minor theme of Approach UTA1E has emerged through the collaborative nature of the design coursework at UTA and the continued emphasis on the process of design. Students have expressed this collaborative process as 'excellent culture' and 'friendly atmosphere' to the 'development of technical, drafting and drawing skills,' as well as 'the huge learning curve' attained in the first year. This identified category represents the importance given to collaborative learning as independent strategies which goes beyond attaining new skills towards peer-based learning and self-introspection.

Student-(UTA-001-AR004) has elaborated the importance of the collaborative learning process as independent strategies which goes beyond attaining new skills towards peer-based learning and self-introspection stating that *"I would, I think that, the process that of developing your own design skills is really refined by what other people see out of your design, so they look at and they make their assessment, they critique you as you learn more about your project, as to what it says to other people, more than what it says to yourself."*

Architectural Design Coursework in Second Year B. Arch. Program at UTA

Architectural design and viscom for 10 credit hours, with construction-based and history coursework for 14 credit hours is offered in the second year covering 78% of the overall 31 credits. Other required coursework including physical sciences and core curriculum

courses of 7 credits are offered as per Figure 24. Architectural design is amalgamated with the two other important strands of the curriculum including construction and history, representing the thrust for the second year at UTA.

Summarized Discussion: Second Year Students' Learning Approaches at UTA

The collected data suggests that the second year students have focused both on the *product* as well as the *process of design* through *analytic* and *independent learning strategies*. These *multidirectional* and *schema-based* approaches have focused on the aesthetics as well as craft-based domains of the design project from the *strategic-to-deeper* range of learning approaches. Approaches UTA2B, UTA2C, UTA2D and UTA2F have focused on the academic and aesthetic domains as well as the craft-based and technical domains of architectural design in the strategic range of learning approaches. This has included the transition from the analogue-to-digital domain with a key focus on the viscom coursework, the faculty's role in inculcating *process-based* approaches as well as the emergence of studio culture. Approaches UTA2A and UTA2E represent the *strategic-to-deeper* range by looking into the development of *schema* and understanding the *experiential* approaches of learning architectural design.

Categories identified in the 2nd Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Project & Process-Focused Approach	Approach UTA2A	Process-Focused Analytic & Independent Schema	Strategic-to-Deep
Viscom in Architectural Design as Process & Product-Focused Analogue-to-Digital Approach	Approach UTA2B	Product & Process-Focused Independent - Strategy	Strategic
Architectural Design as Series of Steps-Based Process & Product-Focused Approach	Approach UTA2C	Product & Process-Focused Multidirectional Strategy	Strategic
Role of Design Faculty in Architectural Design as Process & Product-Focused Approach	Approach UTA2D	Product & Process-Focused Independent-Strategy	Strategic
Architectural Design as Process-Focused Experiential Approach	Approach UTA2E	Process-Focused Analytic & Independent Multidirectional Schema	Strategic-to-Deep
Studio Culture as Part of Architectural Design Process-Focused Approach	Approach UTA2F	Process-Focused Independent & Analytic Strategy	Strategic

Table 35: Categorized Approaches to Learning in 2nd Year B. Arch –UTA

Table 35 depicts the six identified categories from the second year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13) (A. Iyer & Roberts, 2014). These second year categories present the development of *process-focused, independent, analytic* and *multidirectional strategies* with emphasis on the design project offered. The learning approaches classification have presented the transformation with marked similarity to Approaches D, E and F from the pilot study of process-focused strategies developing into independent and analytic, schema-based approaches (Chapter 5, Table 13) (A. Iyer & Roberts, 2014).

Approach UTA2A: Architectural Design as Project & Process-Focused Approach (Process-Focused, Analytic & Independent Schema-Based Category)

The first of the two dominant themes discussed in the second year students' experiences has focused on the design process in the project offered in the design studio with an emphasis towards advancement of this process through independent analysis from a critical perspective in architectural design as schema-based approaches. Two major subthemes in this identified category includes the central focus on the design project reflected is many experiences and on the continued emphasis towards the process-centric analytic approach reflected in the design project within this identified category. Student-(UTA-002-AR017) has stated that *"our current architecture studio, this semester is about, urban planning and designing according to a set of parameters and looking at specific area of Austin that is currently under a kind-of, a tipping point, where there are, it's an older area that is not been developed, so there are developments that are said to be happening in the next few years, and we are taking a look at those and also, taking part in and take on it and coming up with our own development plan for the area as well, to kind-of integrate with Down-town Austin, and its East Austin, that's the area and, try and make the neighborhood more integrated, and that kind-of thing, yeah, this semester is basically about urban planning and design."*

The students have continued on the process-centric analytic approach reflected with reference to the design project as the second major subtheme in this categorized approach. Student-(UTA-002-AR018) has extrapolated on this process-centric and project-focused approaches stating that *"well the experience of flying from an enclosed space to an open space, and how the movement itself and how views can be obscured, lead to a more intense experience, and that's at the end of the realm, so I took the geometry from the wing in the bat and I tried to take the experience from the movement, from darkness, into light; almost like the bat itself exiting the bridge, which we were assigned to make an observation platform for, so it was those two aspects together which made the project what it was, so the idea of the wing ended up being the obscuring factor in the design that, it blocked the view of the bridge until you reach the very end of the platform, when everything suddenly became clear."*

A few students have further extrapolated on the design process from a critical perspective with Student-(UTA-002-AR011) stating that *"what is different? I guess we are doing or we were doing theory and research recently, so I guess I am trying to stay critical of the things that I have encountered and trying to think about pros and cons of everything that I read, instead of just like, believing in everything, everything is a good idea. So just trying to be critical and applying that knowledge to studio."* This identified

category has set the tone for the second year architecture students with a majority of them reflecting on the focus given to the design process in reference to the design project offered in the architectural design studio.

Approach UTA2B: Viscom in Architectural Design as Process & Product-Focused Analogue-to-Digital Approach (Product & Process-Focused, Independent & Strategic Category)

The second dominant theme discussed amongst the second year students is the role of the visual communication coursework in the architectural design studio. Viscom as it is popularly known in UTA is also offered as a two credit coursework in the second year of the program focusing on the transition from the analogue-to-digital domain as an independent strategy which was a major subtheme in this identified category. Student-(UTA-002-AR016) has reflected on this transition stating that *"what I started out with doing was drawing it, kind-of getting my ideas together and then, making a model, and then from there, building it in Rhino and just making it 3D in Rhino, and went doing all of that, and so; through that I was able to get; through that digital model, I was able to get all of my digital drawings and then print them out, trace over them and then upload that traced image into; into my computer and then go over that and Photoshop and Illustrator."* The balance on the product-focused facet of design in correlation to the design process are the other two subthemes reflected by the students.

Student-(UTA-002-AR012) has reflected on the product-focused approach stating that *"I think it helps a lot when it comes to the actual presentation of the project, as well as process, I think it helps across the board, with building models and creating the pin-up boards, just across the board, I think, its helps the entire process."* Whereas Student-(UTA-001-AR010) has focused on the design process stating that *"yes I guess its kind-of interesting to think about visual communication of design, and then ways of learning in both of them; because design studio is more about like learning; sort-of an abstract notion, the technique, an idea of investigation and redoing things and asking why, whereas viscom; feels more geared to learning, something more tangible, some technique that is then used to re-enforce the process that we learned from design, so in a way; design, I feel is learning more about abstract notions of how to do things, whereas viscom is learning, more about techniques to do things and then it's about merging those two things to be able to create something tangible but still abstract."* This identified category in parallel to Approach UTA2A represents the centrality of process-focused approaches traversed in second year architectural design. The strategic balance of product-focused aspects of design in correlation with the design process are two other sub-themes.

Approach UTA2C: Architectural Design as Series of Steps-Based Process & Product-Focused Approach (Product & Process-Focused, Multidirectional Strategic Category)

A less-dominant but much discussed theme, this identified category has reflected on the steps undertaken by the students towards the final design solution. Two subthemes that have emerged follow the central strand of the earlier identified categories focusing on the process of design as multidirectional strategic approaches to undertake the final product. Student-(UTA-002-AR015) has reflected on the product focused approach stating that *"so first off, with analyzing the area and then after that, became you know, starting to sketch and starting to, kind-of manifest the ideas, making models was a big part of that, whether you would be with like, pieces of wood or pieces of chip wood and then, you know, revising that until finally, you know architecturally have like, revised drawings and revised ideas that I could start making computer models with, and then after that, came the final additions, the final models, final software renderings, the final renderings of the design."*

The underlying design process reflects the focus on the transition from the analogue-to-digital domain reflected in Approach UTA2B. Student-(UTA-002-AR010) has reflected on the design process stating that *"so in that regard; it was somewhat, more interesting to see how they did that, because when we started out; it was very easy for them to just tell us to make a model; and it was easy for us; to hear to that method, I guess; because it was more; sort-of a, visual; more real, also to create something with your hands, but sort-of moving us into the idea of the designing something with drawing, that's when we started having to, sort-of switch into a more dynamic, sort-of thought process."*

Approach UTA2D: Role of Design Faculty in Architectural Design as Process & Product-Focused Approach (Product & Process-Focused Independent, Strategic Category)

Approach UTA2D, the other less dominant but discussed theme is a continued reflection of the design faculty's role in the design process undertaken by the students towards the final design solution. Student-(UTA-002-AR017) has reflected on their impact on the design process stating that *"…trying to create something either by experimenting with different programs or different methods of representation, and then by coming in and getting feedback, and I think, learning from that feedback and then improving or changing or altering, what we have already made and then getting better, whatever, its learning like how to convey, largely; I think this is consistent throughout our studio, learning how to convey what you want to, and gathering the tools and knowledge in order to do that, and the professors service like a filter for that."*

Student-(UTA-002-AR010) has further reflected on the product-centric facet of the design faculty in the students' learning experiences stating *"…so that in one of our final projects, when we were designing a space, they made us do some perspectives of that space, considering them as almost blank canvases; we can make direct changes on that, without having to rebuild an entire new model; so in that regard; it was somewhat, more interesting to see how they did that, because when we started out; it was very easy for them to just tell us to make a model; and it was easy for us; to hear to that method"* as independent strategic approaches.

This identified category represents the impact on the design process as well as the product-centric aspects being reinforced by the faculty as independent strategic approaches. This category in parallel to Approaches UTA2A, UTA2B and UTA2C represents the process-focused strategies traversed within architectural design based on the project offered with a continued emphasis on the final solution.

Approach UTA2E: Architectural Design as Process-Focused Experiential Approach (Process-Focused, Analytic & Independent, Multidirectional Schema-Based Strategic Category)

One of the two minor themes, this identified category reflects the experiences of a few students raising the process of design from analytic-to-independent and multidirectional in aspects of experiential learning by exploring the realms as schema-based approaches beyond the requirements of the design project offered in the design studio.

Student-(UTA-002-AR018) has reflected on this experiential journey stating *"so you are never really done designing; you will always have the ideas from previous projects left over; but as you go on, you gradually refine them and refine them and refine them; until you start to assemble an idea of what architecture should be; and I think that continues all the way until you are practicing, like an architect; like a lot of architects really don't make anything significant, until another twenty years into the job, so this is just like the very beginning; and even when you graduate school, you are still not done learning per-say, so yeah, the understanding will probably hit, like thirty years down the line for me, if it ever does."* These multidirectional strategies have been explored through schema-based approaches going beyond the requirements of the design project offered.

Approach UTA2F: Studio Culture as part of Architectural Design Process-Focused Approach (Process-Focused, Independent & Analytic Strategic Category)

The second minor theme discussed is a continuation of Approach UTA1E reflecting on the importance of studio culture in inculcating process-focused, independent and analytic strategies amongst the students' cohort in architectural design. Student-(UTA-002-AR017) has reflected on studio culture stating that *"I think, learning from that feedback and then improving or changing or altering, what we have already made and then getting better, whatever, its learning like how to convey, largely; I think this is consistent throughout our studio, learning how to convey what you want to, and gathering the tools and knowledge in order to do that."* This minor category has also portrayed the importance of collaborative learning in the design studio at UTA.

Architectural Design Coursework in Third Year B. Arch. Program at UTA

Architectural design for 10 credit hours, with construction-based and history coursework for 17 credit hours is offered in the third year covering 90% of the overall 30 credits. Additional coursework from the core curriculum for 3 credits is also offered as per Figure 24. The design coursework termed as 'sound-building studio' is further reinforced through construction-based coursework in addition to history, continuing on the thrust of the undergraduate architecture program into the third year at UTA.

Summarized Discussion: Third Year Students' Learning Approaches at UTA

The data collected from the third year students suggests the continued focus on the process of design through the program offered in the *sound-building studio*. Approaches UTA3B, UTA3C and UTA3F have explored the role played by the first and second year viscom coursework discussing the transition from analogue-to-digital domain, the *theoretical* aspects covered in various stages of design as well as the collaborative learning process as *independent, multidirectional* and *strategic* learning approaches. Approaches UTA3A, UTA3D and UTA3E represent the *strategic-to-deeper* range of learning approaches by focusing on the schema-based process of design developed for the program offered, the faculty's role in inculcating *theoretical* as well as *pragmatic* approaches and continuing the process of understanding the *experiential* facets of architectural design.

Table 36 depicts the six identified categories of learning approaches from the third year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13) (A. Iyer & Roberts, 2014). These identified categories represent *process-focused, independent and analytic, theoretical and pragmatic, experiential and multidirectional, schema-based* approaches and learning strategies. The third year classification of *strategic-to-deeper* range of learning approaches represents the parallel to Approaches D, E and F, the *independent and analytic, process-focused strategies* as

well as *theoretical and pragmatic, multidirectional and schema-based* categories identified in the earlier pilot study (Chapter 5, Section 5.5; Table 13) (A. Iyer & Roberts, 2014). The third year UTA classification is further differentiated from the *strategic-to-deeper* range of learning approaches within the pilot study as Approaches D, E and F are predominantly adopted amongst a small cohort of fourth year students.

Categories identified in the 3rd Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Program & Process-Focused Approach	Approach UTA3A	Process-Focused Analytic & Independent Schema	Strategic-to-Deep
Viscom in Architectural Design as Process-Focused Analogue-to-Digital Approach	Approach UTA3B	Process-Focused Independent - Strategy	Strategic
Architectural Design as Stages of Process & Program-Focused Approach	Approach UTA3C	Process-Focused Multidirectional & Theoretical Independent-Strategy	Strategic
Role of Design Faculty in Architectural Design as Process-Focused Approach	Approach UTA3D	Process-Focused Theoretical & Pragmatic Independent-Schema	Strategic-to-Deep
Architectural Design as Process-Focused Experiential Approach	Approach UTA3E	Process-Focused Analytic & Independent Experiential Schema	Strategic-to-Deep
Architectural Design Studio as Collaborative Learning Approach	Approach UTA3F	Process-Focused Independent & Analytic Strategy	Strategic

Table 36: Categorized Approaches to Learning in 3rd Year B. Arch – UTA

Approach UTA3A: Architectural Design as Program & Process-Focused Approach (Process-Focused, Analytic & Independent Schema-Based Category)

The dominant theme amongst the third year students, Approach UTA3A reflects on their learning experiences focusing on the design process surrounding the design program for the third design coursework called the sound building studio studio. The advancement in the design process as analytic and independent, schema-based approaches is reflected by the strong emphasis on construction and technology in the second and third year of the architecture program at UTA. Student-(UTA-003-AR021) has reflected on the process-focused approach stating *"so it's all about spatial thinking which is very different like anything like, you just can't study that, you have to train yourself differently, and I guess the more you progress in architecture school, the more you are trained to think that way."*

Student-(UTA-003-AR023) has extended this focus on the process of design with reference to the design program being undertaken stating *"Like what we're designing? We're designing like a train station for the city of Austin. So we're looking at the current situation where they have fake rail and it's also accommodated with an N-track train but we're looking to increase the infrastructure to allow to be a commuter rail for Austin to think, to better the transportation system. So we're trying to figure out how to design to accommodate for the new infrastructure."* This categorized approach represents

students' experiences transitioning to reflective learning and independently taking steps towards the advancement of the design process.

Student-(UTA-003-AR022) has reflected on this transition stating *"you learn by…yes, you always like, you're confronted with set of problems usually, that you kind of like construct yourself to…and then you just learn by doing, trying to solve the problem then doing things and testing out versions and that's how, I guess, it's always been. Kind of like iterative learning processes."* The transition in the three sub-themes of focusing on the design process and the design program with an advancement towards analytic as well as independent learning and schema-based approaches are presented in Approach UTA3A.

Approach UTA3B: Viscom in Architectural Design as Process-Focused Analogue-to-Digital Approach (Process-Focused, Independent Strategic Category)

One of the four less-dominant themes in the third year, Approach UTA3B has reflected the importance of visual communication coursework offered in the first and second year of the program. The students' experiences are based on the process of design undertaken independently in the design studio and the strategic relevance of viscom. Student-(UTA-003-AR027) has stated that *"it relied heavily on materiality, so there is lot of experimentation in model-making with concrete, and another kind-of concrete substances, in that, kind-of, I will only be able to do that, because in Viscom, in one of the Visual Communications studio, they teach us not only drawing skills, but also model making skills, so there was a, one of the beginning exercises was pouring, casting concrete."*

The students have also discussed the transition from analogue-to-the digital domain in the design studio with Student-(UTA-003-AR021) stating that *"visual communications, is like, very first semester, is very much like using your hands and drawing, and it helps train your hand, and your; like hand-work in architecture, but later on you get into more digital stuff, so we worked in some Rhino, some Revit, so I would say that like, learning Rhino helps like, being able to work like, digitally, and like, really helps, like being able to understand the program, and do your design through computer, and also like Revit, we didn't; we have not just learnt the basics of it and actually, right now, we are taking Revit Classes, more like applying to what we need to know right now, like how it's used to create shapes and everything, fairly different components; and how to understand how the whole program works, for before we really didn't understand how that works, we kind-of just knew the very basics and now, we are actually applying it. So I guess like, they kind-of like help you; get the foundations for these programs, really."*

Approach UTA3C: Architectural Design as Stages of Process & Program-Focused Approach (Process-Focused, Multidirectional & Theoretical, Independent-Strategic Category)

The second of the four lesser dominant themes, Approach UTA3C has reflected the key stages taken by the students in the design program offered within the architectural design coursework based on the underlying development of the design process as multidirectional and theoretical as well as independent strategic approaches. Student-(UTA-003-AR027) has focused on the design program offered within this specific design studio stating *"so this is 'sound building,' this is the sixth design studio in the curriculum for the under-graduate students in the five year program, …its designed to be an integration of all the classes we have been taking, so visual communications, our previous design studios, construction which is sizing members, and structure and that kind-of thing and environmental controls, which is systems, mechanical systems, ventilation systems, air conditioning, that kind-of thing. That comes together in this course, we are teamed with one engineering student from the Cockrell School of Engineering, and we meet several times during the semester, just to, kind-of collaborate our structural theories."*

Student-(UTA-003-AR019) has elaborated further on this underlying design process stating *"that was our first time working with an existing building and so working with the challenges I personally like but I learned a lot about manipulating space within a construct that exists and kind of.... I also learned how views and day lighting. They were very restrictive on day lighting because it was all coming from the front in the street and kind-of manipulating the ceiling plane to create some day lighting possibilities. I learned a lot about kind-of that vertical transportation and the relationship between the second floor and the first floor and those views and the accessibility."* This identified category has reflected on the continued focus given to the process of design within the framework of the design program offered in architectural design.

Approach UTA3D: Role of Design Faculty in Architectural Design as Process-Focused Approach (Process-Focused, Theoretical & Pragmatic, Independent Schema-Based Category)

The third of the four lesser dominant themes, Approach UTA3D has reflected on the continuing and evolving role of the design faculty in the design studio towards the transition of the student's focus on the process of design through independent ways of approaching architectural design from theoretical and pragmatic cum schema-based perspectives.

Student-(UTA-003-AR022) has reflected on this stating *"we have more…kind-of a more self-driven approach to our process. In design-I and II, they would give us like, tiny projects along the way. 'Do this, study about water, do this thing, do this thing.' And then, you can have used that as process to feed into your design. Whereas now, it's more self-driven. What are you interested in architecture, what do you think architecture should do for people? If it is a train station, what do you think the train station should be doing? Our program is a train station this semester, so yeah. So it's more self-driven that professors are kind-of looking to see how you as an individual are interested in the project. And let your interest drive on…drive the project, I guess."*

Student-(UTA-003-AR027) has discussed collaborative learning encouraged by the faculty stating "that this is the sixth design studio in the curriculum for the under-graduate students in the five year program, so not the four year program; its designed to be an integration of all the classes we have been taking, so Visual Communications, our previous design studios, construction which is sizing members, and structure and that kind-of thing and environmental controls, which is systems, mechanical systems, ventilation systems, air conditioning, that kind-of thing. That comes together in this course, we are teamed with one engineering student from the Cockrell School of Engineering, and we meet several times during the semester, just to, kind-of collaborate our structural theories."

Approach UTA3E: Architectural Design as Process-Focused Experiential Approach (Process-Focused, Analytic & Independent, Experiential Schema-Based Category)

The last of the lesser dominant themes, Approach UTA3E represents a few of the students transcending the process of design, analytically and independently through the experiential facets of understanding architecture.

Student-(UTA-003-AR025) has extrapolated on these experiential facets stating that *"I guess I have, in my experience, I guess I have moved on, in architecture school, it's harder to feel like I understand it, but I don't know if I understand it better now, than I did, first year I feel like, there is been a lot of having to realize that, just going off with my experiences with, interacting with architecture is not enough, just trying to understand the culture of the people will not be enough either, I feel like just understanding, you have to evolve and just try to find as many sources of data and trying to understand emotionally, its physical needs, economic needs, like there are so many facets of architecture, that you have to try to control, and I don't know, it's I guess, understanding is realizing that there are a lot more things, that you have to try to get some grasp of, to*

make something of a successful project, in that just realizing that there are things going, in trying to find all, like every, like trying to find all individual things that you can impact with your design. That's I guess, everything just goes on getting more complex as you move on." This identified category represents the transformational nature of exploring the design process as reflective learning amongst the students' cohort.

Approach UTA3F: Architectural Design Studio as Collaborative Learning Approach (Process-Focused, Independent & Analytic Strategic Category)

Approach UTA3F as a minor theme has reflected on the continued development of studio culture through collaborative learning including peer-based discussions as independent and analytic, strategic learning approaches amongst the students' cohort.

Student-(UTA-001-AR023) has reflected on this development from the first to the third year of the program stating *"…and that was our first, our first assignment was each of us pick two different systems and overlaid them and found contrast. Like we're not only just learning from our own overlays but from everyone else's problem solving. It's like we all share it among each other. And so even if I find an interaction in one area, someone else was able to find those are totally different interactions in another area and I was able to see that and drop on that. Versus before in earliest of years, we didn't look at each other's work as much and we were just kind-of more isolated target and we've realized that there is more help when it comes to our peers and knowing that like in the field, we're not going to be working by ourselves and that we'll be working with each other even if we are designing independently, we still have more to learn with each other and stuff."*

Architectural Design Coursework in Fourth Year B. Arch. Program at UTA

Architectural design as advance design studio and technical communication coursework for 13 credit hours, with construction-based and history coursework for 9 credit hours is offered in the fourth year covering 62% of the overall 34 credits. Additional coursework from the core curriculum and electives for 12 credits is also offered as per Figure 24. The design coursework termed as *'Advance Design'* is the vertical studio offered across the fourth and fifth year of the undergraduate program at UTA.

Summarized Discussion: Fourth Year Students' Learning Approaches at UTA

The collected data from the fourth year students suggests the importance given to the design process through *strategic* and *schema-based* approaches in the advance design studio. Approaches UTA4A, UTA4C, UTA4D, UTA4E and UTA4F have represented the *strategic-to-deeper* range of learning in architectural design. The focus on the program

offered in the advanced design studio is centered on the process of design from *holistic* and *idealistic, experiential* and *schema-based* approaches following the known themes including the role of viscom, collaborative learning and importance of design faculty. The strategic range of Approaches UTA4A and UTA4G have focused on various stages in the process of design based on the program offered as well as identifying the design process as an integral part of the studio culture at UTA.

Categories identified in the 4th Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Program & Process-Focused Approach	Approach UTA4A	Process-Focused Holistic & Idealistic Independent Schema	Strategic-to-Deep
Architectural Design as Stages of Program & Process-Focused Approach	Approach UTA4B	Process-Focused Multidirectional & Intellectual Independent-Schema	Strategic
Viscom in Architectural Design as Process-Focused Analogue-to-Digital Approach	Approach UTA4C	Process-Focused Analytic & Independent - Strategy	Strategic-to-Deep
Architectural Design Studio as Collaborative Learning Approach	Approach UTA4D	Process-Focused Independent & Analytic Schema	Strategic-to-Deep
Architectural Design as Process-Focused Experiential & Conceptual Approach	Approach UTA4E	Process-Focused Holistic & Independent Experiential Schema	Strategic-to-Deep
Integral Role of Design Faculty's Studio in Architectural Design as Process-Focused Approach	Approach UTA4F	Process-Focused Holistic & Independent Perceptual Schema	Strategic-to-Deep
Identifying with Design Process of Architectural Design Studio at UTA	Approach UTA4G	Process-Focused Independent & Analytic Strategy	Strategic

Table 37: Categorized Approaches to Learning in 4th Year B. Arch – UTA

Table 37 depicts the seven identified categories from the fourth year students' learning experiences as meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These identified categories focus on the design program offered in the advance design studio through *process-focused, independent* and *holistic, analytic* and *intellectual, perceptual* and *experiential, multidirectional, schema-based* approaches and *strategies* representing the *strategic-to-deeper* range of approaches. The fourth year classification has its starting point represented by Approach F identified in the pilot study centered on process-focused, perceptual-cum-conceptual, schema-based approaches (A. Iyer & Roberts, 2014). The fourth year UTA *strategic-to-deeper* range signifies a wider spectrum in comparison to the range identified in the earlier pilot study and depicted in Figure 26.

Approach UTA4A: Architectural Design as Program & Process-Focused Approach (Process-Focused, Holistic & Idealistic, Independent Schema-Based Category)

The dominant and the most discussed theme in the fourth year is centered on the design program offered in the advanced design studio as holistic and idealistic with a continued

focus on the process of design. Student-(UTA-004-AR037) has discussed this continued focus stating that *"so whether that's… the design about or a drawing, you know visually something can talk about the architecture, and be more academic exercise and explanation and theoretical thing, or it could be something that is purely to visualize something in space, an almost sell to the lay-people, it's about something that we have been discussing in the studios, what do our renderings look like, what do we use to draw them, what is the atmosphere, does the atmosphere talk about this simple image or does it go deeper than that, because they want these drawings to raise money, and so what does the normal public understand."*

The continued focus on the design process through the design program offered varies from conceptual-to-perceptual-to-experiential approaches depending on the emphasis of the particular advance design studio opted by that specific student. Student-(UTA-004-AR036) dwells into this specific nature of the design program stating that *"my studio consists about thirteen students, we are fourth, fifth year and graduate students and we are designing a school in India, we are doing a master plan for the entire school from kindergarten to twelfth grade and housing as well, and we are also in detail, designing the tenth, eleventh and twelfth grade school, so six buildings, that we are going to design in detail, so the exciting part of the studio is we are going to travel to India for two weeks, so that's exciting to get to a, we are going to a new culture, and going to design for that culture, and realize how much we don't know about these other cultures."*

The nature of the advanced design studios with renewed focus on the design process is reflected by Student-(UTA-004-AR029) who has extrapolated stating that *"so were doing a<u>n</u> edible materials lab. So we're trying to create new materials from food by-products like bioplastics and salt and eco-waste. So it's very much theoretical as in there's no sort of building or project or scheme, it's kind of exploratory"* as independent and schema-based approaches is reflected in this identified category. The realm of the design programs offered in the various advance design studios and the consecutive focus on the process of design is dominant in this identified category. The range of the programs offered in the various design studios and the consecutive focus on the process of design are the dominant sub-themes.

Approach UTA4B: Architectural Design as Stages of Program & Process-Focused Approach (Process-Focused, Multidirectional & Intellectual, Independent Schema-Based Category)

The first of the three lesser dominant but much discussed themes, Approach UTA4B is a continued reflection on the various stages undertaken by the students' cohort as

multidirectional, intellectual, independent and schema-based approaches in the design program offered within the advanced design studio centered on the process of design. Student-(UTA-004-AR034) has reflected on this program-centric approach stating *"…and so we were tasked with coming up with something that the community needed to help bring in more tourism so that they could get more money and things like that and also something to give back to the community. And so I was with a partner. My partner and I, we decided to design an art gallery and like art workshop space so that local artists could display their work and also teach classes so that more people could also learn. Or it could be either from the community or a tourist coming in, they can learn how to watercolor or to do ceramics or something like that."*

The focus has continued on the various stages of the design process centered on the design program with Student-(UTA-004-AR029) stating that *"so for last semester I did a studio in Paris that was entirely, since we weren't…we were travelling, a lot of it was very much by hand and the drawings were by hand. And a good deal of it was sketching and kind-of drafting, not formal drafting, but just they were straight out done in sketchbooks. And that was nice because I didn't, like I said I had done it this much and I was kind-of thrown back into it. And it made me think of, because I'm very fast to jump in the computer when I have design and kind-of forget about how does sketching with your hand can inform a little bit freer and designs aren't as maybe rigid or thought out."* This focus has continued based on the various stages through the range of programs offered.

Approach UTA4C: Viscom in Architectural Design as Process-Focused Analogue-to-Digital Approach (Process-Focused, Analytic & Independent Strategic Category)

This second of the lesser dominant themes has focused on the role played by viscom in the architectural design studio with a continued emphasis on the process of design as independent and strategic approaches. Student-(UTA-004-AR035) has reflected on this process stating that *"maybe it's helped out a lot in a group setting when you try to express ideas, visually and would take with, I guess; different types of views or perspectives or drawing typologies that they have taught us through visual communication, like axonometric drawings, or perspectives or, plans or sections, those are allowed, group discussions and sort-of , tends to be more productive because then it's much easier to express if everyone has a same level of understanding."*

The learning experiences in this identified category also focused on the transition from the analogue-to-digital domain and the role played by the coursework of viscom with

Student-(UTA-004-AR038) extrapolating on this transition stating *"but more often now in project and thinking of perhaps use a hybrid, hybridized version where you'd start perhaps a hand drawn thing which you learn from the curriculum of the first, visual communication sequence and then apply digital tools to it, to that hand drawing."*

Approach UTA4D: Architectural Design Studio as Collaborative Learning Approach (Process-Focused, Independent & Analytic Schema-Based Category)

The third of the lesser dominant themes in the fourth year has focused on the importance of the collaborative learning process as independent and analytic, schema-based learning approaches in the architectural design studio. This identified category has focused on the process of design within the design program being offered in the advanced design studio.

Student-(UTA-004-AR034) has reflected on this collaboration stating that *"but here we have to work in a group and bounce ideas off of each other. And you know, sometimes a lot of times in a studio, we sit there for hours discussing like the pros and cons of one idea and the pros and cons of another. And I know it's a lot. Sometimes it's frustrating because you think you're right and someone else thinks they're right but…. so I'd say that's the big difference, working in a group. And also, now we're with…it's mixed because it's advanced design. So it's fourth years, fifth years, and all the grad students as well. And so it's interesting working with older students because I'm a fourth year. I just think they have very different perspectives. And we have a landscape architecture student. And so it's interesting seeing what she thinks about and what her, not priorities, but like I don't know. We focus a lot in the…"*

Approach UTA4E: Architectural Design as Process-Focused Experiential & Conceptual Approach (Process-Focused, Holistic & Independent, Experiential Schema-Based Category)

One of the three minor themes, this identified category is a continuing connection of a few students from the fourth year transitioning the process of design as holistic and independent approaches within the design program offered in advanced design through conceptual and experiential, schema-based approaches towards understanding architecture.

Student-(UTA-004-AR038) has extrapolated on this process-focused approach stating that *"Understanding, there's a lot of different ways. Perhaps finding that in the very beginning, it's probably understanding experience, being able to learn to place yourself in the project you're creating. And as I've developed more and now I'm, there's still, there*

is still understanding in the design sequence. It's still understanding experience and understanding how a person occupies it and how it would be used and so forth. But there is more aspects of it understanding of how we will react in the culture that it sits and understanding how the environment will act. Understanding where it sits within the larger architectural narrative of today. Like my studio being very digitally based as in a particular place in the architectural history that is different, that is moving forward and understanding how my work is affecting really where architecture is going in a small portion in the wider time scale and understanding how I'm also connected with precedents, with modern day precedents and historical precedents as well or perhaps understanding how disconnected from it in different ways as well and understanding how through the whole sequence, understanding how me as a person has impacted my work. Even more so I understand that and continuing to understand it more as I create more, understanding how my experiences in my past and who I am has a huge reflection on my work. And that understanding that what I am creating is a reflection of me. But then professionally as well that what I'm creating will then also help create myself as well in my professional career so it's cyclical in the creation process." This categorized approach represents the introspective nature of the learning experiences of a few students in the advanced design studio through their conceptual and experiential journey towards understanding architecture.

Approach UTA4F: Integral Role of Design Faculty's Studio in Architectural Design as Process-Focused Approach (Process-Focused, Holistic & Independent, Perceptual Schema-Based Category)

The second minor theme is a continued reflection on the role played by the design faculty in the evolving holistic and independent, perceptual and schema-based approaches through their centrality as the nucleus of each advanced design studio and being the interface for the student.

Student-(UTA-004-AR034) has reflected on this role stating that *"I think it's very different. For this studio, because it's a design-build studio, we are all working in the same project. Whereas before in the first three years, a lot of it was individual work. So you have your own design and you keep refining that like with the professor's feedback and so. But here we have to work in a group and bounce ideas off of each other. And you know, sometimes a lot of times in a studio, we sit there for hours discussing like the pros and cons of one idea and the pros and cons of another."* This identified category presents their centrality as the nucleus for each advance design studio and being the interface for the students' cohort.

Approach UTA4G: Identifying with Design Process of Architectural Design Studio at UTA (Process-Focused, Independent & Analytic Strategic Category)

The third minor theme of Approach UTA4G has described the nature of specific advance design studios with the focus on the process of design. This identified category represents independent and analytic, strategic approaches incorporated within the design process based on the program offered.

Student-(UTA-004-AR029) has extrapolated on the studio stating that *"I'm doing advance design right now. So the way the program works is it's that you go through four…five design studios, then you have what's called a sound building studio where it's very technical and it's very much about construction, documentation and budgets. And then you have advanced design which is what I'm in now, and it's very, it's more theoretical I think.*

Architectural Design Coursework in Fifth Year B. Arch. Program at UTA

Advance design studio for 10 credit hours, with professional practice and history coursework for 6 credit hours is offered in the fifth year covering 47% of the overall 34 credits. Additional coursework from the core curriculum and electives for 18 credits is also offered as per Figure 24. 'Advance Design' as the vertical studio offered across the fourth and fifth year of the undergraduate architecture program is the key feature of School of Architecture, UTA.

Summarized Discussion: Fifth Year Students' Learning Approaches at UTA

The data collected from the fifth year students suggests the continued importance given to the process of design through *schema-based* approaches in the advance design studio. Approaches UTA5A, UTA5B and UTA5C represent the *deeper range* of learning in the advance design studio. There is a continued focus on the program as well as the process of design through the continuing themes including the role of first and second year viscom. The strategic-to-deeper range including UTA5D, UTA5E and UTA5F have focused on the integral role played by the faculty in the advance design studio, *collaborative learning strategies* and importance of *experiential learning* approaches in architectural design at UTA.

Table 38 depicts the six identified categories from the experiences of fifth year students at UTA, mapped onto meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13). These identified categories represent the continued focus on the design program offered in the advance design studio from the fourth to the fifth year as a transformation within the students' learning experiences through *process-focused,*

independent and *holistic, intellectual* and *perceptual, idealistic* and *multidirectional schema-based* approaches and strategies. The fifth year classification has identified dimensions of approaches to learning in architectural design going beyond the classification range in the earlier pilot study including holistic, idealistic and intellectual approaches through the continuation of the advance design studio from the fourth year at UTA.

Categories identified in the 5th Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Advanced Design Studio-Based Process-Focused Approach	Approach UTA5A	Process-Focused Holistic & Idealistic Intellectual Schema	Deep
Architectural Design as Stages of Program & Process-Focused Approach	Approach UTA5B	Process-Focused Multidirectional & Intellectual Independent-Schema	Deep
Viscom in Architectural Design as Process-Focused Analogue-to-Digital Approach	Approach UTA5C	Process-Focused Holistic & Independent - Schema	Deep
Integral Role of Design Faculty's Studio Philosophy in Architectural Design as Process-Focused Approach	Approach UTA5D	Process-Focused Holistic & Independent Perceptual Schema	Strategic-to-Deep
Architectural Design Studio as Collaborative Learning Approach	Approach UTA5E	Process-Focused Independent & Holistic Schema	Strategic-to-Deep
Architectural Design as Perceptual, Experiential & Abstract-Based Process-Focused Approach	Approach UTA5F	Process-Focused Holistic & Perceptual Intellectual Schema	Strategic-to-Deep

Table 38: Categorized Approaches to Learning in 5th Year B. Arch – UTA

Approach UTA5A: Architectural Design as Advanced Design Studio-Based Process-Focused Approach (Process-Focused, Holistic & Idealistic, Intellectual Schema-Based Category)

The first of the two dominant themes in the fifth year, Approach UTA5A has represented the learning experiences of the students based holistic, idealistic-cum-intellectual and schema-based approaches in the design program offered within the advanced design studio and its continued focus on the design process. Student-(UTA-005-AR041) has elaborated on the focus towards the design program with advanced design stating that "*so I am taking K…. B….'s advanced design studio and what that focuses on is, what he is calling 'wrinkles,' so we are studying, like how different, really different organic forms like; you know Zaha Hadid does, Frank O Ghery does, so like really organic shape, we are following parametric design essentially, not your traditional architecture studio, this is a heavy digital fabrication and we are using primarily, 3D-S-Max to make weird forms using cloth geometry to create architecture and interject architecture with, within these weird forms that we make.*"

The advance design studio has provided a wide range design programs for the fifth year students' cohort to traverse based on the varied specializations offered and is reflected

in the permeating process-focused learning experiences. Student-(UTA-005-AR040) has extrapolated on this process stating that *"it doesn't differ that much other than technology and the way I deal with design problem differs. Like there's an evolution from simple hand drawings and very, very simple project-to-computer drawings and very detailed graphic designs too. But as far as the design process is concerned, it's still first of all, find out the site and then it's about recording the site and then recognize what it is and then propose a suitable intervention."* The learning experiences traversed based on the offered range of programs is centered on the process of design.

Approach UTA5B: Architectural Design as Stages of Program & Process-Focused Approach (Process-Focused, Multidirectional & Intellectual, Independent Schema-Based Category)

The other dominant theme, Approach UTA5B has reflected on the various stages through multidirectional and intellectual-cum-independent, schema-based approaches of undertaking the design program offered in the advanced design studio by focusing on the process of design. Student-(UTA-005-AR045) has reflected on this program-centric approach stating *"from the Sound Building project, ok, well one investigation I had was looking in section, the building was this row section , the attempt was to lay on the landscape on one level, but also carve out of it on the other level, and so with the conception of the idea was taking sort-of, a very, I guess; general stroke of the landscape and you know, drawing inward the experience of the building, I wanted it to be, and then after I sort-of; nailed down the, sort-of, the right feel, the right shape, how the right proportions and relationship, and take that into the digital realm, and actually lay that in with the contour information of the topography, and actually figure out whether this, this doesn't intersect the points on the ground as I thought, it would, and I did this more, general drawing, and using that to push and pull the lines in such a way that, it would actually work but still communicate the idea that I drew initially."*

The students' learning experiences amalgamated all the stages of the design process reflected through advanced design extrapolated by Student-(UTA-005-AR039) who has stated that *"we were able to …how we do drawings for that specific model in terms of section, in terms of elevation and in terms of all that stuff that we do in architecture. And then after that is how we put that in a sheet, how do we lay it out in terms of composition. And so… that really informs how we think about construction in terms of our models or design later on in the years on how we lay out a sheet."*

Approach UTA5C: Viscom in Architectural Design as Process-Focused Analogue-to-Digital Approach (Process-Focused, Holistic & Independent, Schema-Based Category)

One of the two lesser dominant themes, Approach UTA5C has elaborated on the continuing role played by viscom in the advanced design studio emphasizing on the design process as holistic and independent, schema-based approaches. Student-(UTA-005-AR041) has emphasized on the process-centric approach in the design program stating that *"with any introductory coursework in architectural design, it's good to understand your basics, so you know, in our basic visual communication courses, we are learning basic drawing, techniques, understanding how the details work, in line weights and understanding what it means, when you draw a line on a piece of paper, and how that translates to any design studio, now in the current one is understanding how, you know understanding the basic forms and shapes, no matter how complicated they are, you still must communicate them in its basic form to someone, providing sections and drawing, like you know, all of these basics that we have learnt, translates with us throughout, so no matter how complicated things are, you always have to go back to your basics and communicate visually and have people understand that."*

Student-(UTA-005-AR045) has elaborated on the role played by viscom including the transition from the analogue-to-digital domain in the advanced design studio stating that *"so right, the visual communications work that we do for the first three terms; its shifted over my time in UT but when I went through the viscom courses, the first two were predominantly analogue, i.e. hand drawing and all that, and the third one started getting into digital technologies, rendering and 3D Modelling in the computer. And the 3D Modelling is fairly, directly relevant; to this year, it would be recommended today, different program but similar bits, similar ways of thinking and I think, similar ways of working, but I think the analogue is very important for the way that you actually construct something in your mind, getting that actual relationship between your hand and guess, what you are thinking, connecting the mental world to the physical world in a very tangible way."* The focus on process-centric approaches in the design program is further elaborated based on the role played by the coursework of viscom including the transition from the analogue-to-digital domain.

Approach UTA5D: Integral Role of Design Faculty's Studio Philosophy in Architectural Design as Process-Focused Approach (Process-Focused, Holistic & Independent, Perceptual Schema-Based Category)

The second lesser dominant theme continues to reflect on the centrality of the design faculty as the nucleus of each advanced design studio.

Student-(UTA-005-AR045) has reflected on this integral role played stating that *"…and the 3D Modelling is fairly, directly relevant; to this year, it would be recommended today, different program but similar bits, similar ways of thinking and I think, similar ways of working, but I think the analogue is very important for the way that you actually construct something in your mind, getting that actual relationship between your hand and guess, what you are thinking, connecting the mental world to the physical world in a very tangible way, it's something we still do in studio today, for instance today, K… B… is having us plot out the Ventura drawings that we have created, images of 3D models, then taking those and going over in trace paper and pencil to reconstruct our, develop our, develop the ideas separate from the digital realm. As far as the really technical skills, I think there is little bit less of the direct application, for instance, I really don't hand-draft as much, any more, sometimes I quickly sketch ideas, but rarely do I breakup my parallel bar and work like I did in Viscom – I."*

Though the experiences are centered on the process of design as holistic and independent, perceptual and schema-based approaches, the integral role play by the design faculty is reflective within the design program.

Approach UTA5E: Architectural Design Studio as Collaborative Learning Approach (Process-Focused, Independent & Holistic, Schema-Based Category)

One of the two minor themes in the fifth year, Approach UTA5E reflects on the continuing importance of the collaborative learning process in the development of independent and holistic, schema-based approaches in the advanced design studio.

Student-(UTA-005-AR043) has reflected on this collaboration as peer-based learning stating that *"we are doing a Design & Build Project, and we are working in India, in Thiruvannnamalai, it's a great working environment, Its one of the studio, working as a whole studio for one working project, instead of each working on their own designs, so it helps out there, we have to work with each other to come along together, based on a lot of conflicts, but it's based on a lot of the project."*

Approach UTA5F: Architectural Design as Perceptual, Experiential & Abstract-Based Process-Focused Approach (Process-Focused, Holistic & Perceptual, Intellectual Schema-Based Category)

The second minor theme identified amongst a few fifth year students' learning experiences, Approach UTA5F reflects on the continuing connection of the transition in the design process of the design program within advanced design through holistic, perceptual, intellectual and schema-based approaches.

Student-(UTA-005-AR044) has elaborated stating that *"so understanding a project is, it's very holistic; I think, that's one of the roles of architects, is to understand the bigger picture, engineers understand structural systems, you have acoustic engineers who understand acoustics and what not, but architects have a hand-in on every aspects of the project, so they understand; how people and things move across the site, they understand, how a person might experience a particular room in the building; but they also understand how the building comes together in the construction process, and what materials are used and why, and the better architects understand how, all of that effects the greater environment around the site and the city."*

The Outcome Space for the Classification of Approaches to Learning for the B. Arch Program at School of Architecture, University of Texas at Austin is explained in Chapter-9

International Perspective: Four – Welsh School of Architecture, Cardiff University, UK

International Perspective: Four – Welsh School of Architecture, Cardiff University, UK

Welsh School of Architecture (WSA) – Cardiff University located in Cardiff, Wales; United Kingdom is one of the four institutions covered in the current study. Table 40 presents an overall picture of the bachelor of architecture programs offered at the four institutions with WSA offering a total of six hundred credits with twenty core modules in the five year program. This program includes the first-three years as a BSc program in architecture and two years as a M. Arch program. The fourth year is termed as a *'sandwich'* year or the year of *'education in practice.'* This BSc-plus-M. Arch program offered at WSA meets the requirements and is accredited by the Royal Institute of British Architects (RIBA) and the Architects Registration Board (ARB)-Part 1 & 2 (C. University, 2016).

Name of Institution	Total Credits Hours	Equivalent Coursework / Core Modules	Accreditation Body
Sir Jamshetjee Jeejeebhoy College of Architecture (Sir JJ) University of Mumbai - Mumbai, India	340	85 Courses offered in the 5 Year Program	Council of Architecture (CoA), New Delhi, India https://www.coa.gov.in/
School of Architecture, Oklahoma State University (OSU) - Stillwater, Oklahoma, USA	154	43 Courses offered in the 5 Year Program	National Architectural Accreditation Board (NAAB), United States http://www.naab.org/
School of Architecture, University of Texas at Austin (UTA) – Austin, Texas	161	47 Courses offered in the 5 Year Program	
Welsh School of Architecture (WSA) - Cardiff, UK	600	20 Core modules offered in the 5 Year Program	Royal Institute of British Architects (RIBA) and the Architects Registration Board (ARB)

Table 40: Data Collection at Four Institutions with Highlights of the Architecture Program offered at Welsh School of Architecture

Welsh School of Architecture, Cardiff University: A United Kingdom Perspective

Welsh School of Architecture was established as a school of architecture, one of the many departments in Cardiff Technical College on the 20th of March 1920. RIBA recognized Part-1 of the program offered at the School in 1923 and Part-2 in 1928 (Powell & Welsh School of Architecture., 2009). The 1929 fourteenth edition of the Encyclopedia Britannica has recognized the architecture program offered at Technical College, Cardiff as being exempted from the RIBA intermediate examination (AARUK, 2007). The school began to offer a four year degree program (BSc plus B. Arch) in 1962. Welsh School of Architecture became a part of Cardiff University which became independent from the University of Wales in 2004. The four year B. Arch degree was

replaced with the five year degree program (BSc plus M. Arch) in 2006 (Powell & Welsh School of Architecture., 2009).

5 YEARS BSc+M.Arch Program - WSA

■ Design ■ Technology ■ Design Modules ■ Research ■ Practice-Based training ■ Modules

YEAR 5	80 Credits Design Thesis	30Credits Dissertation	10Credits Pr.Mg.Ec.
YEAR 4	40 Credits Reflective Practice / 20Credits Research Preparation	60Credits. Design in Practice	
YEAR 3	70 Credits Archiitectural Design 3	20Credits Arch. Tech. 3 / 10Credits DPM 3	10Credits Pr.Mg.Ec. / 10Credits Is.Co.Arch.
YEAR 2	70 Credits Archiitectural Design 2	20Credits Arch. Tech. 2 / 10Credits DPM 2	20Credits Arch. in Context
YEAR 1	70 Credits Archiitectural Design 1	20 Credits Arch. Tech. 1A-1B / 10Credits DPM 1	20Credits Building th. Time

Figure 27: 5 Years BSc-plus-M. Arch Program Curriculum at Welsh School of Architecture, Cardiff University, UK

The five-year professional degree program includes the three-year BSc in Architectural Studies degree program that satisfies Part-1 and the two-year Master of Architecture (M. Arch) degree program that satisfies Part-2 of the UK qualification for architects, and is approved by RIBA and ARB. The BSc program emphasizes on "the practical 'making' of architecture and with its broader physical, social and intellectual contexts," whereas the M. Arch program is a combination of "experience in practice with challenges in advanced architectural design" (Welsh School of Architecture., 2015). The five year program has a total of 600 credits that includes 330 credits of architectural design coursework, 50 credits of research coursework, 60 credits of technology coursework, 30 credits of design principles and methods (DPM) coursework, 80 credits of practice-based training cum coursework and 50 credits of additional coursework as per the core curriculum depicted in Figure 27.

Architectural Curriculum at WSA

The design studio is core to the architectural curriculum at Welsh School of Architecture. The central focus of the design coursework is on the teaching and learning of design through workshops and tutorials complemented by model-making and architectural debate. This happens in the studio environment through the display of students' work

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with "critical discussion and assessment by staff, peers and visiting critics" (Welsh School of Architecture., 2015). The studio atmosphere is highlighted as an important asset of the school encouraging this twenty-four hours, all-day creative and collaborative spatial experience that nurtures peer-based learning experiences within this supportive academic environment. The learning experiences in the five year program is highlighted by the WSA student association as being consistently high, based on the superior quality of focus given to teaching in the design studio environment by lecturers, tutors and visiting staff from practice and academia (SAWSA & Architecture, 2012).

Architectural Design Learning Context at WSA

Architectural education at the Welsh School of Architecture has revolved around the production of graduates who will play an important role towards the rich diversity in practice within the United Kingdom and the international context. This is being achieved through the three-year BSc program equivalent to Part-1 of RIBA where the focus in on "how buildings are made" followed by the unique two-year M. Arch program equivalent to Part-2 of RIBA where the architecture students learn in the first year through "education in practice" and the second year through the advancement in the pedagogy of the architectural design coursework (Welsh School of Architecture., 2015).

Architectural Design Coursework in First Year BSc Program at WSA

Architectural design and design principles & methods (DPM) coursework with an equivalent of eighty credits are offered across the three terms of the first year program covering 67% of the overall 120 credits. Other required coursework including architectural technology and building through time for a total of 40 credits are offered as per Figure 27. The design coursework in the first term has focused on the 'making' of architecture by generating ideas and responding to various contextual references. These skill-based developments are channelized through a small scale design project in the second term reflecting the rural and urban contextual references within architecture. The third term gives students the opportunity to participate in the 'Vertical Studio' and get involved in peer-based interaction with senior-students and fostering collaborative learning amongst their first year cohort through a week-long international study visit or field trip (Welsh School of Architecture., 2015).

Summarized Discussion: First Year BSc Program Students' Learning Approaches at WSA

The data collected from first year WSA students suggests *product-focused, dependent-cum-unidirectional, strategies* evolving towards *process-focused, independent-cum-multidirectional, analytic* and *experiential, schema-based* approaches to learning in

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architectural design. The dominant Approach WSA1A represents *product-focused, strategic* approaches adopted through the *unidirectional* process of design based on the completion of the final solution. Approaches WSA1B. WSA-1F and WSA1C fall in the range of *surface-to-strategic* learning approaches with the dominant Approach WSA1A. Both WSA1B and WSA1F have focused on the design product as *multidirectional* and *process-based* learning strategies through collaboration, group-work and inculcating studio culture through architectural design. The *process-focused, dependent strategy* of Approach WSA1C represents the faculty's role in developing the final product.

Approaches WSA1D and WSA1E are centered on *product-cum-process focused, schema-based* categories. The importance of the parallel coursework of design principles and methods (DPM) conducted with architectural design as well as the development of the design process through *analytic* approaches of conceiving design is discussed. WSA-1B, WSA1D and WSA1E represent the *strategic* range in the first year classification.

Categories identified in the 1st Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Evolving Perceptions of Architectural Design Studio as Skills & Craft-Based Process & Product-Focused Approach	Approach WSA1A	Product-Focused & Process-Based Unidirectional Strategy	Surface-to-Strategic
Learning, Working & Exploring the Architectural Design Studio as a Collaborative Group of architecture students	Approach WSA1B	Product-Focused & Process-Based Multidirectional Strategy	Strategic
Faculty as Scaffold in Understanding Architectural Design as Process-Focused & Product-Based Approach	Approach WSA1C	Process-Focused & Product-Based Dependent-Strategy	Surface-to-Strategic
Exploration of DPM & Architectural Design as Process-Based Approach	Approach WSA1D	Process- Based Analytic & Independent Schema	Strategic
Experience of Conceiving Design through Architectural Design Process	Approach WSA1E	Process-Focused Independent & Experiential Schema	Strategic
Inculcating a Studio Culture and evolving a sense of experience within Architectural Design	Approach WSA1F	Process-Based Multidirectional Strategy	Surface-to-Strategic

Table 41: Categorized Approaches to Learning in 1st Year BSc – WSA

Table 41 depicted the six identified categories of learning approaches from the experiences of the first year students at WSA, mapped onto meta-categories identified in the earlier pilot study (Chapter 5, Section 5.5; Table 13).

These categorized approaches have transitioned from *product-focused* approaches that are *process-based, unidirectional* and *dependent strategies* towards *process-focused, multidirectional* and *independent, analytic* and *experiential schema-based* approaches. The first year classification represents the understanding into the centrality of the design process. Approaches WSA1A, WSA1B, WSA1C AND WSA1F are in parallel Approaches A, B, C and D from the pilot study representing the *unidirectional-cum-*

dependent, product-focused strategies evolving towards *independent, process-focused* and *schema-based* approaches identified in the pilot study (Chapter 5, Section 5.5; Table 13) (A. Iyer & Roberts, 2014). This is in contrast with Approaches WSA1D and WSA1E focusing on *experiential-cum-multidirectional*, *process-focused*, schema-based approaches connected to Approach E, the *experiential, practical* and *process-focused, schema-based* category from the pilot study (A. Iyer & Roberts, 2014). The WSA classification (Table 41) in parallel to UTA in Chapter 9 (Table 34) presents the further evolution in the first year learning approaches in comparison to Sir JJ and OSU in the earlier Chapters 7 and 8.

Approach WSA1A: Evolving Perceptions of Architectural Design Studio as Skills & Craft-Based Process & Product-Focused Approach (Product-Focused & Process-Based, Unidirectional Schema-Based Category)

This identified category has been the dominant theme of discussion in the first year WSA students' learning experiences. The evolution of the design process in the architectural design studio focusing on the final solution has been the most discussed subtheme in this identified category. Student-(WSA-001-AR03) has elaborated on this product-focused approach stating that *"we've had to do a museum for the Burton-ship's graveyard, which was to build a museum that would commemorate the site and the boats that are there, and the atmosphere that is there, etc. But instead of starting from the museum itself, we started designing from an object that would be found in the museum, so was kind-of moving from the inside to the outside, from the small to the big, and yeah, so we started designing a sculpture. Then from this sculpture we moved on to designing, a more real, formal sculpture, so it was for a smaller scale museum something like that will come out of curiosity that will contain sculpture itself, and from that I think we moved to designing a collage of a specific moment that would be found inside the museum, to finally develop the museum on the declared brief."*

Two of the three other equally discussed subthemes within this categorized approach have focused on the craft of making architecture and learning the drafting skills necessary for the process of design. Student-(WSA-001-AR12) has elaborated on the process of 'making' stating that *"well I think all the projects that we have done is sort-of practiced the drawing skills and stuff. That's… and we did a bit of the structure, stuff like that. Which started and we just need to follow the suit for modeling and things. It's quite a lot of the culture exactly. We used to plaster, these hand-made things also before the final work."* Student-(WSA-001-AR07) has focused on drafting skills reflecting on *"how to do a pretty drawing, to draw the human figure as well, to be more… architectural skills."*

The identified category culminates with a focus on the design solution or the final product which has been the third equally discussed subtheme with Student-(WSA-001-AR09) stating its importance within the process, *"the first thing we did was we went for a walk through Cardiff, set a trail; within a group; then I had to do a montage, you know through sketches, drawing it together, bringing it together, we had to feel a lot of those things."*

Through expressions in the learning experiences focusing on 'the process of making,' 'architectural skills & crafts,' 'the technical aspects of visually communicating architecture in two-dimensional and three-dimensional format' and 'extrapolating the design process' reflects the transitionary phase of learning experiences as unidirectional schema-based approaches amongst the first year students.

Approach WSA1B: Learning, Working & Exploring the Architectural Design Studio as Collaborative Group of Architecture Students (Product-Focused & Process-Based, Multidirectional Strategic Category)

One of the two less-dominant but much discussed themes in the first year learning experiences at WSA has been the transition towards working and exploring the potential of the design studio and collaboration amongst groups of students. Student-(WSA-001-AR07) has elaborated on working as a group stating that *"we basically…, how to draw and how to make models, and like how to design some stuff… and then you… from each other when you do something like, if you work in a studio."* This identified category can also be considered as the starting point for the decision-making process amongst groups of students as well as a comparative analysis amongst the group members.

Student-(WSA-001-AR04) has reflected on this former sub-theme stating that *"there is always a collaboration between the students and its kind-of, we… mostly from each other than the tutors or in class, that's all"* whereas Student-(WSA-001-AR02) has expressed the latter subtheme that *"…we were looking at each other's boats…"* This categorized approach has identified the basis for peer-based learning within the design studio for the first year students' cohort with Student-(WSA-001-AR16) stating that *"I guess I just take the brief more as I interpret it than I just could have, I do use other people's help and comments and criticism and I sort of observe the people working and it all kind-of amalgamates to my idea process and work on going."*

This identified category is considered as the starting point for the decision-making process amongst students' in groups as well as a comparative analysis amongst the group members. Identified as the basis for peer-based learning, Approach WSA1B represents the importance of working in groups as well as the collaborative environment

of the design studio. This category is connected to the development of reflective learning approaches as multidirectional strategies.

Approach WSA1C: Faculty as Scaffold in Understanding Architectural Design as Process-Focused & Product-Based Approach (Process-Focused & Product-Based, Dependent Strategic Category)

The second lesser dominant but much discussed theme in the students' learning experiences was the role played by the design tutor and faculty in the development of the process of design within the students' learning experiences. This identified category reflected a product-focused, dependent and strategic approach with the tutor being seen as a guide in the craft of making and acquiring the drafting skills required in the design process. Student-(WSA-001-AR03) has extrapolated on this process of guidance stating that *"they try to make you understand your design process in a much free-way and it's, very much, like up-to you, they give you the minimum guidance and, yeah it's up-to you to explore it and even though it's your first year, you can make mistakes and… from them, and, yeah, so this freedom of research for yourself, within yourself, I think these are the themes that we deal with in the first year."*

There is further articulation and communication on the process of design gained from the design faculty. Student-(WSA-001-AR08) has reflected on this subtheme stating that *"I was just trying to take the points that the tutors were giving across, trying to understand what professors, they have, obviously been practicing architecture teaching for many of the years…just trying to think through their eyes … think through their, and never the same and once you… that, you should find out, you can start with them, their design principles, maybe, their expectations, and their preferences… and ...you just start and become more confident in yourself."* This identified category represents the students' effort to gain a footing of the architectural language which is key towards reinforcing their understanding towards the process of design.

Approach WSA1D: Exploration of DPM & Architectural Design as Process-Based Approach (Process- Based, Analytic & Independent, Schema-Based Category)

A minor but much discussed theme was the role played by the coursework of Design Principles and Methods (DPM) that has been running parallel to the architectural design studio. The students learning experiences have reflected that DPM is considered as a medium of exploration, experimentation and foundation to architectural design, playing an important role in the development of the design process as independent and schema-based approaches in the studio. Student-(WSA-001-AR03) has extrapolated on DPM's exploratory nature stating that *"it's up-to you to explore it and even though it's your first*

year, you can make mistakes and… from them, and, yeah, so this freedom of research for yourself, within yourself, I think these are the themes that we deal with in the first year."

The students' learning experiences explain DPM's exploratory nature as well as the experimentation on projects offered in this coursework and its impact on the process of design. Student-(WSA-001-AR10) has discussed the aspect of experimentation based on a small project from DPM and its impact on the design process stating that *"what I recently found out, from my precedent studies is that how to look at things, look at things, a bit more out of character…. a bit more different, so I can, try, use those ideas to help me break off my comfort zone."* Student-(WSA-001-AR05) has extrapolated on the importance of DPM in developing the process of design stating that *"I expected to…, how to represent stuff when I was making plans of a building and sections of a building and I think, we did sort-of accomplish in a way, because of the two DPM's…"*

Approach WSA1E: Experience of Conceiving Design through Architectural Design Process in the Studio (Process-Focused, Independent & Experiential, Schema-Based Category)

The other minor theme, Approach WSA1E has focused on the evolution in the students' learning experiences from an experiential and independent perspective within the process of design in the architectural design studio. Student-(WSA-001-AR03) has extrapolated on this evolution stating that *"I was thinking of the correlation of the different parts, when they were done mechanically like one-by-one, week – one sculpture, week – two; do that, etc. it was just, trying to put them together, like, ok I was looking at how the site gave me a feeling of alienation and I saw how this feeling of alienation was brought throughout the different steps from the sculpture to the collage to the development of the architecture itself.. so probably the main theme that laid behind all these steps, which in my case was a feeling of alienation towards the site."*

This evolution with the continued focus of developing around the process of design is reflected in multiple architectural contexts with Student-(WSA-001-AR09) stating that *"I suppose many things in different ways, we didn't just kind-of draw the piece of architecture; but then we think about the materiality, how it is constructed, so it like looking at a multitude of layers."*

Approach WSA1F: Inculcating a Studio Culture and evolving a sense of experience within Architectural Design (Process-Based, Multidirectional Strategic Category)

This identified category was seldom discussed as a distinctive learning experience and has also emerged in the subthemes of Approach WSA1B and Approach WSA1E. This category reflects the importance of the architectural design studio as an experience towards the evolution of multidirectional approaches and the development of studio culture in the first year of the program. Student-(WSA-001-AR01) has stated that *"it's very different anywhere else I imagined where it would work, because its open, being collaborated, it's about more creative, I guess, it's definitely a good way of working, especially for this course."*

Student-(WSA-001-AR09) has further reflected on the development of the studio culture stating that *"it's a very relaxed place you are with a group of students with a common goal and yeah."* This categorized approach has represented the role of the studio in reinforcing the skills and craft-based nature of the design process and its reinforcement through the design studio experience.

Architectural Design Coursework in Second Year BSc Program at WSA

Architectural design and design principles & methods (DPM) coursework with an equivalent of 80 credits are offered in the second year covering 67% of the overall 120 credits. Other required coursework including architectural technology and architecture in context for 40 credits are offered as per Figure 27. The second year design coursework in the first term has focused on "the concepts of 'making place' and sustainable living through a housing project in an urban context" (Welsh School of Architecture., 2015). The second term extends the design context through architectural technology focusing on the performance of the building and working out technical aspects of the design. Term-3 includes the 'Vertical Studio' with first year students, week-long international study visit, digital domain-based second year DPM coursework as well as contextual study of historical and theoretical facets of architecture (Welsh School of Architecture., 2015).

Summarized Discussion: Second Year BSc Program Students' Learning Approaches at WSA

The collected data suggests that the second year students have focused both on the *product* as well as the *process of design* through *analytic* and *experiential*, *practical* and *independent, multidirectional* and *schema-based* learning approaches. The second year classification has focused on the design process through the transition from the analogue-to-digital domains as well as macro-to-micro level contextual studies of architectural design from the *strategic-to-deeper* range of learning approaches.

The *strategic* range of learning Approaches WSA2B, WSA2C and WSA2D have focused on the academic and aesthetic, craft-based and technical, functional and technological as well as the utility and sociological domains of architectural design. This has included the transition from the analogue-to-digital domain through collaborative learning and the first year DPM coursework as well as the faculty's role as the checkpoint through crit in the design coursework. Approach WSA2A has encompassed the *strategic-to-deeper* range by looking into the technological, sociological as well as utilitarian domains of architectural design through the development of *schema* and understanding the *analytic*, *practical* as well as *experiential* approaches of learning.

Categories identified in the 2nd Year	Nomenclature	Meta-categories	Position within Referential Facet in the Outcome Space
Architectural Design as Experience-Based & Evolving Perceptions of Architecture through Exploration of Materials, Technology & Precedent Studies with Macro & Micro Scale Master Planning Studies as Process-Focused Approach	Approach WSA2A	Process-Focused Analytic & Practical Independent & Experiential Schema	Strategic-to-Deep
Architectural Design as Process-Based Analogue & Digital, Multi-Layered & Collaborative Process in Design Studio as Product-Focused Approach	Approach WSA2B	Product-Focused & Process-Based Multidirectional & Independent Schema	Strategic
DPM & Architectural Design as Process & Product-Focused Approach	Approach WSA2C	Process & Product-Focused Analytic & Multidirectional Independent Schema	Strategic
Faculty & Crit as Scaffold, Checkpoint & Evolution of Architectural Design Process	Approach WSA2D	Process-Focused & Product-Based Independent -Strategy	Strategic

Table 42: Categorized Approaches to Learning in 2nd Year BSc – WSA

Table 42 depicts the four identified categories from the second year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13) (A. Iyer & Roberts, 2014). These categories represent the macro-to-micro level contextualization of architecture from *product-focused* and *process-based*, *analytic strategies* towards the evolution of *multidirectional, practical* and *independent, experiential* and *schema-based* and *process-focused* approaches. The second year classification represents the transformation of the learning approaches with marked similarity to Approaches D, E and F from the pilot study representing *process-focused, independent* strategies developing into *experiential* and *perceptual, as well as conceptual* and *schema-based* approaches (Chapter 5, Section 5.5; Table 13) (A. Iyer & Roberts, 2014). The second year WSA classification is further differentiated from the strategic-to-deeper range of learning approaches within the pilot study as Approaches D, E and F are predominantly adopted amongst a small cohort of fourth year students, further depicted in Figure 29.

Approach WSA2A: Architectural Design as Experience-Based & Evolving Perceptions of Architecture through Exploration of Materials, Technology &

Precedent Studies with Macro & Micro Scale Master Planning Studies as Process-Focused Approach (Process-Focused, Analytic & Practical, Independent & Experiential, Schema-Based Category)

One of the two dominant themes discussed in the second year, Approach WSA2A represents the evolution of the design process from a macro-to-micro level analytic and practical approaches in the architectural design studio. The major subtheme discussed by the students' cohort was the evolving perceptions of architecture in the process of design being undertaken as experiential and schema-based approaches in the architectural design studio. Student-(WSA-001-AR28) reflected on this evolution stating that *"I guess just go through the process of design and just refining; at the moment it's been, a lot of site analysis; so it's about looking at different ways of analyzing the site and its quite fortunate because our site is at M… airport, so we spent so much more time, analyzing in different areas of our site; but it's still really key to our site, So we… is just not at the site, working but also around the site, working in the design studio as well."*

Three equally well-discussed subthemes included the importance of precedent studies and its emphasis as independent approaches in this process-focused category with Student-(WSA-001-AR25) stating that *"we did lots of precedent studies to see how the breweries work and how the, what is interesting in and what kind of space, I want to make and one, I kind-of did three or four precedent studies, and they are all about how they use the space, old space as redecorate.. and make kind-of, how they fit into the new program as well, so it's quite, I am just, following… my personal interest to incorporate with the design."*

The second well-discussed subtheme included the importance given to macro and micro scale master planning studies that was considered as an important part of the design process with Student-(WSA-001-AR17) extrapolating *"…like that's the kind of project that they are working on, at the moment it's pitched in the way; now it's structured for like four phases, at the moment we have just finished phase one and we have just come back from Stuttgart and basically, phase-one is more like a site-analysis and so we go to the site and get a feel of the place and we also start building a strategy to focus on and the way we've been doing."*

The third subtheme focused micro-level pointers to be considered in the design process including the exploration of materials and architectural technology as an important focal point in the design process with Student-(WSA-001-AR27) expressing that *"understanding the climatic, like, because we had spaces for elderly and for young*

children, understanding, their sort-of, acoustics, insulation properties needed, and properties like that before getting into the design work, so we know what was needed and then a lot of precedent studies was encouraged."

Approach WSA2B: Architectural Design as Process-Based Analogue & Digital, Multi-Layered & Collaborative Process in Design Studio as Product-Focused Approach (Product-Focused & Process-Based, Multidirectional & Independent Schema-Based Category)

The second dominant theme discussed in the second year was focused on the production of the final solution based on the evolving process of design. Student-(WSA-001-AR19) has described the importance given to the design process stating that *"taking elements from the building regulations and understanding what people on wheel chairs; turning spaces, they need, and what's the minimum width of a corridor, all that has a major influence on your design and we didn't really think about that last year."*

The development of the process of design as independent approaches has been described from both the analogue as well as the digital domain. Student-(WSA-001-AR29) has focused on this analogous facet of the design process stating that *"ok so for example that one, we had to create, a tactile piece of plaster that could kind-of ask, how, a long time ago, I said, kind-of like show what we were thinking in a very abstract way, and then we had to transfer that into a type of installment, at Barry Castle, yeah I don't know, but it's kind-of difficult to say, how exactly it helped by just thinking about the role, of starting something, abstract and going back into the design is quite interesting to see, what you can come up with."*

Student-(WSA-001-AR18*)* has extrapolated on the analogue-to-digital evolution embedded within the design process extrapolating that *"the ideas of atmosphere and the sections and plans, drawn by hand, well I think those are mixture across the year of people drawing by hand and on the computer."*

The development of studio culture and collaborative cum peer-based learning was another subtheme that emerged in the identified category. Student-(WSA-001-AR17) reflected on this developing culture stating that *"you always tend to have the same kind of people, always there; and some people coming in and out and looking at what you are doing and asking questions and there is always a comparison on what you're doing. Comparing, comparing, comparing whereas last year it was more about you did compare yourself, but everyone was kind-of; like in the same level and it was like, now people know each other. It's different and people know, how each of them work; so in*

terms of learning, I am always, personally you hit me; in a spot where I am not really sure of myself on what I want because; last time, I had a very stressful term and I worked in studio the whole time but, I felt, that perhaps if I would, I don't know, because there was no change in time."

This category as schema-based approaches has focused on the final design solution but also presenting the continued importance given to the multidirectional process of design. Approach WSA2B also represents the transformation developing within the students' cohort towards independent learning strategies in architectural design.

Approach WSA2C: DPM & Architectural Design as Process-Based & Product-Focused Approach in Design Studio (Process & Product-Focused, Analytic & Multidirectional, Independent Schema-Based Category)

One of the two lesser dominant but much discussed themes, this identified category represents the continuing focus placed on design principles and methods (DPM) coursework offered from the first year of the program in the architectural design studio. The role of DPM from the perspective of precedent studies and developing the focus on abstract concepts has been extrapolated by Student-(WSA-001-AR17) who has stated that *"let's just say the first project that I did last year the first architectural design-1 project which was after DPM after Christmas, the skills I learnt in DPM applied directly, So the project we were doing was building… a 'Glitter hut kind-of thing' in Barry and so it made us think about designing in plan, in section, which we had been taught to do in DPM by studying or doing a precedent study so we; I used precedent studies of previous, so the concept of a precedent that we have been taught in DPM, I applied directly to that design project, also we have been drawing plans and sections of these precedent studies in DPM, this in architectural design made me able to draw my own plans and sections of the design, of my installation and what kind-of, surprised me in a good way was…"* This role has been further extrapolated within the design process from the perspective of development of the skills and craft-based approaches required for the 'making of architecture.'

Student-(WSA-001-AR21) has focused on these approaches stating that *"being first year, it was more kind of structured for us, And if I remember correctly, the first thing that we did, was a collage of the space and I believe the idea, was to get you to try and create an atmosphere, because we're doing something very, very similar this week, yeah and try to design an atmosphere, At that time, I completely missed the point, and I actually did awfully at that particular method and I've never done it since, and probably never will. But we started off with the collage and then. I believe, the rest of it was more,*

there was a structure to it, I mean the rest of it was then just trying to design the space and it was informed by other things, I can't quite remember. Yeah, lots of, little sketches and stuff and hand drawings as well, did a lot of hand drawings towards the end of it. I suppose one thing that I did then that I have realized is wrong and don't need to do is, I almost did everything to scale at every stage whereas now, you only need to do it' almost at the last minute. You can go design, you know, and obviously trace and stuff, just to be; very quick drawings and just go through a lot of ideas rather than doing it all to scale every time, and just waste so much time."

The focus on the final solution or the product and the visual and aesthetic values embedded within the design process was also part of the learning experiences in this identified category. Student-(WSA-001-AR27) has extrapolated on this product-focused approach stating that *"where is, because I was trying to get down, the rhythm, sort-of route, so I was just thinking, where is the rhythm in this, how is this rhythmic, is there anything in it that I can use or draw inspiration or design from, aesthetically."*

Approach WSA2D: Faculty & Crit as Scaffold, Checkpoint & Evolution of Architectural Design Process in Design Studio (Process-Focused & Product-Based Independent –Strategic Category)

The other lesser dominant but well-discussed theme was the role of the design tutor and faculty as well as the crit received by students at regular intervals. As a checkpoint in the design process, the crit is balanced by the faculty's role as providers of knowledge towards these independent and strategic learning approaches. Student-(WSA-001-AR29) has extrapolated on this role as a checkpoint in the design process stating that *"in designing if I have understood something I can take what, say lecturers have given me and I can incorporate that knowledge into design if they say you shouldn't do this, a window next to something for example, then I know not to do that and I've understood it, so I wouldn't do that type thing."* This categorized approach also reflected on their role as providers of knowledge towards the development of the design process with Student-(WSA-001-AR28) reflecting that *"I'm…, that's patience and its more of a attrition, you have to put the hours in and you slowly get the rewards and I know that's like the same in most subjects but this is, it's you learn things as you start designing; so a tutor wouldn't say much, so you can do this and then so we are just with our own devices and just like, we understand through trial and error I think that's what it is."*

The role of the design tutor and faculty as well as crit at regular intervals were considered as an important part of the framework towards the development of the design process. Student-(WSA-001-AR17) has extrapolated on this framework stating that *"it's been very*

interesting, because we're having regular every week, been having tutorials, common tutorials so we all share our experiences, so it has really been one-to-one basis in the last four weeks, it's been a common thing and it's been really good because you… from everyone and it's really; productive the way that the tutors are making us think about the site really; in depth and come out with this strategy and we have to make this strategy models, that literally just show; what is important in the site for us and not just a random model but an actual model that shows an idea."

Architectural Design Coursework in Third Year B. Arch. Program at WSA

Architectural design and design principles & methods (DPM) coursework with an equivalent of 80 credits are offered in the third year program covering 67% of the overall 120 credits. Other required coursework including architectural technology, issues in contemporary architecture, and practice management & economics for a total of 40 credits are offered as per Figure 27. The third year design coursework is transformed by the range of thematic units that are offered in all the three terms through a continued investigative structured exploration of the selected unit. This exploration of a neighborhood or an urban block is done "at various scales; it will incorporate low environmental impact strategies; and use an architectonic language, brought to a good level of technical resolution." The design studio units are based on an international context and are complemented by coursework including DPM for digital methods and media, contemporary architecture, technology and practice-based coursework for the fourth year of 'education in practice.' (Welsh School of Architecture., 2015).

Summarized Discussion: Third Year BSc Program Students' Learning Approaches at WSA

The data collected from the third year students suggests the continued focus on the process of design through the range of *thematic units* offered in architectural design. Approaches WSA3B and UTA3D represent the *strategic* learning approaches exploring the role played by the first year DPM coursework of the transition from analogue-to-digital domain as well as the pedagogy of architectural design coursework at Welsh School of Architecture. These *process-focused*, *holistic* and *multidirectional, independent* and *schema-based* as well as *product-based, theoretical* and *practical, strategic* categories represent the continuation from the second-to-third year classification.

Approaches WSA3A, WSA3C and WSA3E represent the *strategic-to-deeper* range of learning approaches by focusing on the *schema-based* process of design developed for the specific thematic units offered through *multidirectional* and *independent* learning approaches. The faculty's role in inculcating *pragmatic* as well as *practical* approaches and the continuing evolution in the design process towards understanding the *experiential and perceptual* facets of architectural design define the *strategic-to-deeper* range in the third year classification.

Categories identified in the 3rd Year	Nomenclature	Meta-categories	Position within Referential facet in Outcome Space
Architectural Design as Group Collaboration, Site, Technology & Society-Based Process-Focused Approach	Approach WSA3A	Process-Focused Multidirectional & Independent Schema	Strategic-to-Deep
DPM & Architectural Design as Process-Focused & Product-Based Approach	Approach WSA3B	Process-Focused Holistic & Multidirectional Independent Schema	Strategic
Faculty & Crit as Guide & Facilitator in Architectural Design Process	Approach WSA3C	Process-Focused Pragmatic & Practical Independent –Schema	Strategic-to-Deep
Approaching Architectural Design Process at Welsh School of Architecture	Approach WSA3D	Process-Focused & Product-Based Theoretical & Practical Independent –Strategy	Strategic
Architectural Design as Integrated, Experiential & Perceptual Process-Focused Approach	Approach WSA3E	Process-Focused Experiential & Holistic Independent Schema	Strategic-to-Deep

Table 43: Categorized Approaches to Learning in 3rd Year BSc – WSA

Table 43 depicts the five identified categories of learning approaches from the third year students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13) (A. Iyer & Roberts, 2014). These identified categories represent the *product-based, theoretical* and *practical, multidirectional strategies* towards *process-focused, holistic* and *multidirectional, pragmatic* and *experiential, independent* and *schema-based* approaches. The classification further enhances the process-focused nature of the learning experiences with collaborative group-based learning structured within the thematic units offered in the third year architectural design.

The third year classification is in parallel to Approaches D, E and F from the pilot study representing *independent* and *pragmatic, process-focused* as well as *multidirectional, schema-based* approaches (Chapter 5, Section 5.5; Table 13) (A. Iyer & Roberts, 2014) going further beyond this identified spectrum. The identified approaches to learning predominantly being adopted in the third year classification is represented amongst a minimum cohort of fourth year students from the pilot study. Approaches WSA3A, WSA3C and WSA3E represent identified approaches going beyond the spectrum of the classification of the pilot study depicted in Figure 29.

Approach WSA3A: Architectural Design as Group Collaboration, Site, Technology & Society Based Process-Focused Approach (Process-Focused, Multidirectional & Independent, Schema-Based Category)

Approach WSA3A, one of the two dominant and much-discussed theme has focused on the process of design as multidirectional thematic units offered in the design studio. A major sub-theme in this categorized approach has focused on site analysis extending further to master-planning and urban analysis. Student-(WSA-001-AR47) has extrapolated on this subtheme stating that *"so we are learning about in Rome, how the Pope at the time placed obelisks around the city in order to have actual routes, sort-of things like that, but yeah, just learning about I guess learning urban planning, but through architecture from the point of view of the architect and the responsibility, he has; and sort of creating an environment around his building and not just creating objects."*

The other major subtheme of discussion was correlating architecture, history and society with the process of design. Student-(WSA-001-AR33) has extrapolated on this subtheme stating that *"so far we've been doing mostly conceptual work, within the group since the beginning of the year. So we have made tiles which are meant to be representations of ideologies on the square. Since I'm looking at Tiananmen Square in Beijing and comparing it to and taking some ideas and leaving some ideas and other people have been looking into the politics of the parliament and democracy and the media, and digital world and how all of these things might enable or in some way relate to protest. So we've just moved on to kind-of making sense of our concepts and trying to interpret a form or a structure on the square. We did that yesterday. And, and so that's going into, by the end of the year we will have designs for the square, but the year has mainly been split into two, so we've had the concept phase and now, we're having the designing phase."*

Approach WSA3A also represents the learning experiences that are centered around the design process as independent, schema-based approaches through with Student-(WSA-001-AR40) extrapolating on the nature of this process stating that *"…well have more skills now, more set of skills and different ways of approaching and I am trying to work with different scales and different methods at the same time which I didn't do before, Like before I just did like, I am going to do a plan, I am going to do a section, I am going to make a model, I am going to do that, now it's like all at the same time, you do a little bit of the plan, then you say, oh I need to make a model and you see, how's that's going to work and then you quickly move to the section and it's harder but working, but everything at the same time is faster in progressing to your design and stuff like that."*

Two minor subthemes that have also been reflected in the learning experiences has been the focus on materiality and incorporation of technology in the process of design as well-as the importance of collaborative group-based learning in the design studio. Student-(WSA-001-AR37) has reflected on the former minor subtheme stating that *"I mean in the first-year, if you were to ask me about, certain buildings; maybe the Barbican Centre in London; I would say how I enjoyed the garden spaces there, like how they used it as a creative space, but now it's more, okay; I understand through the materials and the tectonic of how the guidance and the focus through the building and the architects' understanding of not just materials; but structure and tectonics; everything through, it's a more wholesome idea to architecture now."*

Whereas Student-(WSA-001-AR35) has reflected on group-based learning stating that *"year 1 , the end-of-the-term semester, we had to design a pier-head, like I remember the site model which was a group work, it took us, like two weeks which is like a, because it was like no, there was no actual collaboration or exposure of collaboration before that, and it was in a group, group members and right now we can make, a site model in like 3-4 days, tops if we guess, we sit down to discuss like, you can do that, you can do that, till everything is finished."*

Approach WSA3B: DPM & Architectural Design as Process & Product-Focused Approach (Process-Focused, Holistic & Multidirectional, Independent Schema-Based Category)

The continued role played by design principles and methods (DPM) coursework offered from the first year of the program in the architectural design studio which is another dominant theme of discussion amongst the third year students. The students have focused on both the analogue-to-digital transition as well as the process of design as holistic and multidimensional, independent and schema-based approaches through the role played by DPM in arriving at the final design solution in architectural design.

Student-(WSA-001-AR37) has reflected on the analogue-to-digital facet of the design process stating that *"it introduced me to the software's that I wasn't used to, I had experience like a lot of people in Photoshop, Illustrator, these sort-of programs, we used them in our schooling things, but we don't often have experience with modelling software, I mean basic modeling like Sketch-up, most people can use it but like 3DS Max is much more complicated and so pushing us into that, it really helped I think for me now, because now I am able to do renderings very quickly and very; like CAD models are easy to make, so there are small models that are easy to make, and small renderings easy to make as well and you can use them at ..crucial stage, I haven't seen*

that stage like at the end of the year, you have to do big renderings and considering how much it benefited there, but at the moment with the tutorials, I render something quickly and show the tutor and that's because I have pushed in and given the given block courses and they, kind-of, have pushed you into the, put you in the deep end."

Student-(WSA-001-AR47) has further extrapolated on the process of design stating that *"the design process wasn't forced on us and I guess it's probably, the model-making process which I prefer to design probably, it might stem from first year, when we were forced to make models, in order to be able to design and, its difficult today, how much is someone's own way of working and how much is that they have been told that this is how it should be done."*

Another key point of discussion in the design process was the importance of analysis from the macro-to-the micro level extrapolated by Student-(WSA-001-AR43) who has stated that *"whereas, in first and second year it was kind of, it was a very shallow, looking into that probably for a week, we spent on site analysis , history, things like that, and then we move straight to the design but this one, spent a lot more time on looking at the concept."*

Approach WSA3C: Faculty & Crit as Guide & Facilitator in Architectural Design Process (Process-Focused, Pragmatic & Practical, Independent Schema-Based Category)

One of the three lesser dominant themes, this much discussed identified category reflects on the role played by the design tutor as well as crit in the framework of thematic design units in developing independent schema-based approaches in the architectural design coursework. Student-(WSA-001-AR33) has extrapolated on the tutor's role as a facilitator stating that *"in this year, I've been lucky to be with P.. S.. (tutor) because we've very much been researching more, yeah. We've been researching our topics more. So, we're basically being asked to look at ideas which are quite politically engaging, and good points for discussion. So we haven't just looked at the site and decided, ok this building will be good; because of the site. We, we're really researching into what makes a good reason to build and what to build. So yeah, I feel like we've spent much of the year looking at conceptual research, similar to fifth year maybe, I think in fifth year; we're doing the same thing."*

The role of the tutor and crit is further exemplified from the perspective of the guidance and critical analysis through pragmatic and practical approaches gained in the process of design. Student-(WSA-001-AR39) has extrapolated on the guidance provided by the

tutor stating that *"in first year, we had a project called Pier Assemblage, which we were given, a base sort-of, it was a project where we designed through modelling, and we were given a base, to mention of a Pier to build, and, we were given certain amount of work to build, to begin with."*

Student-(WSA-001-AR47) has extrapolated on their role as a critique in the process of design stating that *"my opinion of it is, I think in third year it's quite interesting and exciting because what you have …in your first and second year has prepared you, the relationship we have with our tutor becomes more, one-to-one, on a level basis, which is quite nice and the third year tutors are always questioning and questioning our ideas in relation to contemporary architecture, but I like the way, it's being run as an unit and unit basis."*

Approach WSA3D: Approaching Architectural Design Process at Welsh School of Architecture (Process-Focused & Product-Based, Theoretical & Practical, Independent Strategic Category)

The second of the three lesser dominant themes, Approach WSA3D reflects on the underlying notions behind the students' learning experiences pertaining to the process of design independent strategies propagated in the design studio at Welsh School of Architecture. The focus of these learning experiences are on the relevance of the design process translating to current architectural practice theoretically, and through the practicality of the design solution. Student-(WSA-001-AR43) has stated that *"I think it's what, well here at least quite relevant, what you do outside the practice compared to what they do in other schools, so it's just like, Bartlett and others, where it's very balanced between technology and design, free design and yeah, I think the system is quiet good here, in terms of preparing students for the work place, the projects that we do here are realistic enough that they , at least some of them would be translatable to the real world."*

Student-(WSA-001-AR35) has extrapolated on the practice-based pedagogy of the design process stating that *"I can have some kind of point of view because I have been to architecture schools and I have friends over there and that I think here we are more; some architectural schools are more conceptual here; we are more practical… of course we look into the concept, but here we are more practical, like how can we make this system, part of our concepts, and how can we make the façade, some kind of medium between the concept and the power, between the concept and the structure of the building, I mean, how we can use tectonics and all those kind of stuff and I think that's quite good."*

Approach WSA3E: Architectural Design as Integrated, Experiential & Perceptual Process-Focused Approach (Process-Focused, Experiential & Holistic, Independent Schema-Based Category)

Approach WSA3E as a minor but much-discussed theme has explained the experiential and holistic transformation in the process of design. This identified category represents the integration of bridging the macro-to-the micro level contextual facets of architectural design by connecting the experiential and perceptual aspects within the thematic design units. These independent, schema-based approaches have developed based on specific thematic units offered in third year architectural designs.

Student-(WSA-001-AR43) has reflected on this identified category stating that *"understanding is a relative term in the sense that you can understand; you think you can understand a building, and you can think that you understand a lot of design; but it's not; in first-year, you are there and you are very superficial, you can like something, you can-not like something; whether you understand it or not, but now we have come to a stage where, we have got the raw knowledge of what architecture is attempting to do, and what you want to do with architecture; so when we design, we know some.. of the problems one faces, and with that, we can criticize and understand others; I mean in the first-year, if you were to ask me about, certain buildings; maybe the Barbican Centre in London; I would say how I enjoyed the garden spaces there, like how they used it as a creative space, but now it's more, okay; I understand through the materials and the tectonic of how the guidance and the focus through the building and the architects' understanding of not just materials; but structure and tectonics; everything through, it's a more wholesome idea to architecture now; I wouldn't say that I understand architecture at all, That, I mean, that will be terrible to say for me, I suppose that's something we all want to do; it is the end goal, but it's not about the end goal now, it's about the process and the process that we get; we start with here and it opens our mind to lot of things than I thought, what architecture was about when I started, so."*

Architectural Design Coursework in First Year M. Arch Program at WSA

Popularly termed as the 'sandwich year,' the first year of the M. Arch program at WSA (fourth year of the five-year B. Arch program) represents the "good balance between learning in practice and in the university" (Welsh School of Architecture., 2015). Design in practice with 60 credits is offered in first year M. Arch covering 50% of the overall 120 credits. Other required coursework including research preparation with 20 credits and reflective practice for 40 credits are also offered as per Figure 27. The students' are required to take up full-time employment at architectural firms in the international context and are expected to visit WSA for short periods during the year. These visits coincide

with the assessment on the course-development offered in the first year of M. Arch including "architectural design, technology, research, professional practice and building economics" through a design project developed in practice as well as report-writing for the final dissertation (Welsh School of Architecture., 2015).

Summarized Discussion: First Year M. Arch Program Students' Learning Approaches at WSA

The collected data from the fourth year students suggests the importance given to the design process representing the *strategic-to-deeper* range through *schema-based* approaches in the 'year of architectural education in practice.' Approaches WSA4B, WSA4C, WSA4D, WSA4E and WSA4F have represented the strategic-to-deeper range with the focus on *process-focused, theoretical* and *practical, experiential* and *holistic, pragmatic* and *multidirectional, independent* and *schema-based* approaches through design in practice. The role of the craft of making architecture through the *experiential* and *perceptual* approaches with the importance of design faculty and crit in developing the process of design as well as *collaborative* learning represent the *strategic-to-deeper* range. The *strategic* range is represented by Approach WSA4A focusing on the process of design based on the first year coursework of DPM.

Categories identified in the 1st Year M. Arch	Nomenclature	Meta-categories	Position within Referential Facet in Outcome Space
DPM & Architectural Design as Process-Focused Practical Approach	Approach WSA4A	Process-Focused Holistic & Multidirectional Independent Schema	Strategic
Architectural Design Process as Craft of Making, Practice-Based & Grounded-in-Reality at Welsh School of Architecture	Approach WSA4B	Process-Focused Theoretical & Practical Independent –Schema	Strategic-to-Deep
Architectural Design as Process-Focused Experiential & Perceptual Approach	Approach WSA4C	Process-Focused Experiential & Holistic Independent Schema	Strategic-to-Deep
Tutor & Crit as Mold, Facilitator & Positive Experience in Architectural Design Process	Approach WSA4D	Process-Focused Pragmatic & Practical Independent –Schema	Strategic-to-Deep
Architectural Design as Product-based & Process-Focused Approach	Approach WSA4E	Process-Focused Multidirectional & Independent Schema	Strategic-to-Deep
Architectural Design Studio Culture as Enriching & Process-Focused Practical Approach	Approach WSA4F	Process-Focused Multidirectional & Independent Schema	Strategic-to-Deep
Table 44: Categorized Approaches to Learning in 1st Year M. Arch – WSA			

Table 44 depicts the six identified categories from the first year M. Arch students' learning experiences as the meta-categories based on the pilot study (Chapter 5, Section 5.5; Table 13) (A. Iyer & Roberts, 2014). These identified categories represent the design process centered on *multidirectional* and *practical, theoretical* and *holistic, pragmatic* and *experiential, independent* and *schema-based* approaches in architectural practice as well as 'research in practice.' The first year M. Arch classification has its starting point represented by Approach F from the pilot study (A. Iyer & Roberts, 2014)

focusing on *process-focused, theoretical* and *practical, schema-based* approaches through their 'education in practice. Approaches WSA4A and WSA4C as well as WSA4D, WSA4E and WSA4F represent identified approaches going beyond the spectrum of the classification of the pilot study depicted in Figure 29.

Approach WSA4A: DPM & Architectural Design as Process-Focused Practical Approach (Process-Focused, Holistic & Multidirectional, Independent Schema-Based Category)

One of the two-dominant themes discussed in the fourth year students' learning experiences is the role played by DPM in the development of skills and crafts-based, multidimensional and holistic approaches within the process of design in the architectural design studio. This role was further extrapolated in reference to the transition from the analogue-to digital domain which has an added relevance in current architectural practice.

Student-(WSA-001-AR54) extrapolated on the skills and craft-based focus in the design process stating that *"I am thinking of this because it was recently commented on in the interview that I went to for job, and they pointed out that it was nice, in this, I designed a housing project and for one of the perspective, I did a water color sketch which gave a lot of atmosphere to the whole design, and, I see that has been very valuable, because, it was something I don't think I could've achieved through digital methods, so what I learn is definitely still being useful for me as I go on and also leave Cardiff, and become a professional."*

Student-(WSA-001-AR50) has described the transition from analogue to the digital domain stating that *"well, as supposed to first-year when everything was hand drawn, this year most of it is done in CAD, so it's computer-generated. And that's the first time I had really done that properly, and so it's a case of; where I'm trying to be able to convey the same level of information and thought; you can, when you can hand-draw through the use of CAD and its learning the techniques of how to do where."* This identified category reflects the interconnection within varied architectural contexts as well as the macro-to-micro level connections developed in the process of design through the DPM coursework. Student-(WSA-001-AR56) has elaborated on the contextual aspects stating that *"I remember going into, architecture and my perceptions had certainly changed a lot, just by the Seven week project, what I expected to…, I suppose was like what the architecture school entails, because having just had the experience of art at school, it was very kind-of, a loose creative process and architecture is, kind of the combination*

of the Sciences and the Arts, so I guess I just wanted, it was just, more like getting a background idea of what architecture would entail."

Student-(WSA-001-AR53) has further elaborated on the macro-to-micro level connections stating that *"I expected to…, I think for this project, it was very much; designing not only the building but it was more designing the buildings in context with other buildings. So it was kind-of infrastructure - and it was kind-of, It was not only about the appreciation of what those buildings were; but it was, how they are going to be used in conjunction with the tower; how is this going to work with the wider town because you don't to create something which is, you know a school; when there are five schools, in sort-of all away. I don't know; I generally don't do projects wondering what I'm going to… from it, I never thought of it like that before, But yeah, I would say, designing in context, sorry that, you know designing the whole system in context"* relevant through independent and schema-based approaches in the process of design.

Approach WSA4B: Architectural Design Process as Craft of Making, Practice-Based & Grounded-in-Reality at Welsh School of Architecture (Process-Focused, Theoretical & Practical, Independent Schema-Based Category)

The other dominant theme reflects on the importance given to learning experiences from the theoretical and practical perspective in the preceding three years of the architecture program at WSA focusing on the process of design of 'making Architecture' within the design studio.

Student-(WSA-001-AR56) has extrapolated on the craft of 'making' as independent schema-based approaches and reflected within the practice-based pedagogy of WSA in promoting architecture for the real world stating that *"so my creative output prior to university had been solely in art, I was interested in very visual, kind-of art work, at that level, I didn't really go into that much depth for my inspiration, in terms of, you know, that wasn't that much of deeper meaning in my work, when you come to architecture school, there is quite an emphasis on finding, you know, what you really want to explore through your building and it's not visual, in fact like, it's usually the way I have experienced it here, usually the form follows the function of the building, so you are developing a kind of an understanding of a function, needs and, maybe technology and all of these different, there is an array of different things that can inform the way you practice so I suppose, just the way your creative output is shaped by all of the different factors, the contributing factors."*

Student-(WSA-001-AR51) has extrapolated on the WSA pedagogical approach inculcated in the design process stating that *"why did they like give it the importance, I*

think on that, I would tend think that WSA Cardiff is quite into their design research program, before the materials and also they are into sustainability of things, and the use of materials, there is a great potential in materials and sustainability of things, I think they are really trying to do, like kind-of; because this is a whole spirit in the school or isn't it; so I think these are the one of the things that have come out, What I'm not sure is what the other universities are giving importance it's just something that, maybe something that occurs everywhere, rather than painting this as the only school, I went running into."

Approach WSA4C: Architectural Design as Process-Focused Experiential & Perceptual Approach (Process-Focused, Experiential & Holistic, Independent Schema-Based Category)

One of the two lesser dominant but well-discussed theme, Approach WSA4C is a continued reflection of the transformational nature of the design process reflecting the experiential and holistic contextualization of architectural design as independent and schema-based approaches in the first year M. Arch program.

Student-(WSA-001-AR56) has extrapolated on this context stating that *"so my creative output prior to university had been solely in art, I was interested in very visual, kind-of art work, at that level, I didn't really go into that much depth for my inspiration, in terms of, you know, that wasn't that much of deeper meaning in my work, when you come to architecture school, there is quite an emphasis on finding, you know, what you really want to explore through your building and it's not visual, in fact like, it's usually the way I have experienced it here, usually the form follows the function of the building, so you are developing a kind of an understanding of a function, needs and, maybe technology and all of these different, there is an array of different things that can inform the way you practice so I suppose, just the way your creative output is shaped by all of the different factors, the contributing factors."*

Approach WSA4D: Tutor & Crit as Mold, Facilitator & Positive Experience in Architectural Design Process (Process-Focused, Pragmatic & Practical, Independent Schema-Based Category)

Approach WSA4D, the other lesser dominant theme is a continuation of the role played by the design tutor as well as crit within in architectural design from pragmatic and practical purview in the preceding three years of the program. Student-(WSA-001-AR59) has extrapolated on this role stating that *"the ability to express my ideas to gain feedback from tutors and from peers and then develop onto using my technical understanding and then I developed to propose a building that would; that worked as a design and also*

worked, technically speaking." Student-(WSA-001-AR56) has reflected on the tutor's role as a facilitator stating that *"there is a real kind of camaraderie, so you get, you bounce your ideas of your friends much more openly than you do, of design tutors, because you are less, they don't know as much as your design teachers perhaps, so you are less, kind-of wary if, coming out with bad ideas."*

Student-(WSA-001-AR51) has further reflected on the role of critics stating that *"I think it's quite important, even though I think, when you visit the site, you already know some stuff; I found like all of the critics, they are always, kind-of, they want to see ugly, something; that we've done on the site and the analysis, any time; remember, even though you don't even a look at it; also, all the time, it always comes up like, who do you think is going to come here, It's like, just asking the questions means that you need to know, who it is really."* This identified category has represented independent and schema-based approaches.

Approach WSA4E: Architectural Design as Product-based & Process-Focused Approach (Process-Focused, Multidirectional, Independent Schema-Based Category)

One of the two minor themes discussed by a few students in their fourth year learning experiences reflected this consistent balance between the process of design through multidimensional and multidirectional as well as independent, schema-based approaches and its basis on the final design solution in question.

Student-(WSA-001-AR51) has extrapolated on this balance stating that *"we had 1:50 model and then, we had neighbors and we also had to build, like a street scene, basically like a row of buildings on the street and then, we had to integrate, First we had to talk to neighbors and, come and make a bit of exchange and see; how it's going and stuff like that, And secondly, as a group, we had to construct the whole streetscape which I think, really kinds-of; tells you about, like the fact that you need to concentrate on the surroundings, and some people, obviously their style is different; and have more different buildings, can be bit more geometric, or other things like that, or a bit more organic, in a way so; even though, in first-year, you kind-of, first come and you haven't, you know you have no idea of, how to create spaces and whatsoever; and you kind-of do what you like instead of doing what you think it would, in the context of the streetscape, you still have at the very first stage, there's always a first restriction where they always tell you; don't forget, you have neighbors, you need to talk to them and think about think about the streetscape, and how; think about a story of all the people that are coming to your shop, things like that, so there's always this element of like, thinking*

about the surroundings and in our project also, you always start with site analysis; isn't it, so site-analysis; I think it's quite important, even though I think, when you visit the site, you already know some stuff."

Approach WSA4F: Architectural Design Studio Culture as Enriching & Process-Focused Practical Approach (Process-Focused, Multidirectional, Independent Schema-Based Category)

Approach WSA4F as the parallel minor theme has discussed the nostalgic connection towards studio culture developed in the preceding years of the architecture program and connecting it to their current year of 'education in practice.' This identified category further reconnects the design process and the final solution through multidirectional and independent, schema-based approaches.

Student-(WSA-001-AR56) has reflected on this facet of studio culture as a learning curve stating that *"I think the studio culture and how design, how something as vague and ambiguous as design can be actually applied is like a structured and professional, way of doing work, and the studio culture, working late nights, and I mean, all of these things, It was, at that time, that was really fun, it was kind of exciting, and pumped in, into the deep end, kind-of, working late nights, but it works, but you worked with people whose company you really enjoyed and it was kind of intense …experience, so I guess, yeah, you just sort of thinking about, it was a very steep… curve in many aspects"*

Architectural Design Coursework in Second Year M. Arch Program at WSA

The second year of the M. Arch program is based at Welsh School of Architecture with the focus on the design thesis for 80 credits covering 66% of the overall 120 credits. Other required coursework including dissertation with 30 credits and practice management and economics for 10 credits are also offered as per Figure 27. The students' are required to develop a design thesis based on the "units representing different themes and issues for contemporary architecture and urbanism" (Welsh School of Architecture., 2015). The second year M. Arch design coursework includes dissertation, advanced design incorporating technology through consultancy and design economics theory that are incorporated in the thesis.

Summarized Discussion: Second Year M. Arch Program Students' Learning Approaches at WSA

The data collected from the second year M. Arch students suggests the continued importance given to the design process through *schema-based* approaches in design thesis through the units offered. Approaches WSA5B and WSA5D represent the

strategic-to-deeper range of approaches. There is a continued focus on the role played by first year DPM and reinforcing the pedagogical identity of architectural design at WSA through *process-focused, holistic* and *intellectual, multidirectional* and *intellectual schema-based* approaches. The *deeper* range including WSA5A, WSA5C and WSA5E have focused *process-focused, experiential* and *perceptual, idealistic* and *intellectual, independent* and *schema-based* learning approaches. The importance given to the design process through the *perceptual* and *experiential* approaches of understanding architecture, the integral role of the faculty and crit and the importance of the research domain in the design coursework at WSA have defined the *deeper range* of approaches to learning.

Categories identified in the 2nd Year M. Arch	Nomenclature	Meta-categories	Position within Referential Facet in Outcome Space
Architectural Design as Integrated Development of Perceptual & Experiential Process-Focused Approach	Approach WSA5A	Process-Focused Experiential & Perceptual Independent Schema	Deep
DPM & Architectural Design as Analytical& Aesthetic, Conceptual & Abstract, Grounded & Context-Based, Process-Focused Practical Approach	Approach WSA5B	Process-Focused Holistic & Intellectual Independent Schema	Strategic-to-Deep
Faculty & Crit as Sounding Board in Architectural Design Process	Approach WSA5C	Process-Focused Idealistic & Intellectual Independent –Schema	Deep
Architectural Design Process in Design Studio as Reinforcing the Identity & Practice-Based Approach at Welsh School of Architecture	Approach WSA5D	Process-Focused Multidirectional & Intellectual Schema	Strategic-to-Deep
Architectural Design as Developing, Intellectual & Research Oriented Process-Focused Approach	Approach WSA5E	Process-Focused Intellectual Schema	Deep
Table 45: Categorized Approaches to Learning in 2nd Year M. Arch. – WSA			

Table 45 depicts the five identified categories from the second year M. Arch students' learning experiences at WSA, mapped onto meta-categories based on the pilot study (Chapter 5, Section 5.5: Table 13) (A. Iyer & Roberts, 2014). These identified categories represent the *process-focused, intellectual* and *holistic* and *multidirectional, perceptual* and *experiential, idealistic* and *independent, schema-based* approaches through research-oriented domains incorporated in the design process. Similar to the first Year M. Arch, the second year classification has its starting point represented by Approach F from the pilot study (A. Iyer & Roberts, 2014) with the emphasis on *process-focused, theoretical* and *practical, schema-based* approaches through design research and thesis. Approaches WSA5A, WSA5B, WSA5C, WSA5D and WSA5E represent identified approaches going beyond the spectrum of the pilot study representing dimensions including holistic, idealistic and intellectual approaches reflected within the design thesis depicted in Figure 29.

Approach WSA5A: Architectural Design as Integrated Development of Perceptual & Experiential Process-Focused Approach (Process-Focused, Experiential & Perceptual, Independent Schema-Based Category)

The dominant theme in the fifth year, Approach WSA5A represents the continuation of the transformation in the students' learning experiences within the process of design reflected by their experiential and perceptual contextualization of architecture in their design thesis leading to independent, schema-based categorized approaches. Student-(WSA-001-AR64) has reflected on the experiential facet stating that *"it was fairly linear, really I mean, as I said, it was taking this side of the research of this aging population and then I was looking in, and I ended up looking at kind-of, sets and sort-of design of cemeteries in the UK and it became about socio-attitudes, to funerary architecture in the UK, the fact that there is an architectural response, is often quite lacking, because it's a bit of a taboo and we sort-of hesitate to really engage with it, as a design topic because, think it's a bit, sort-of touchy for people, it's a bit difficult to deal with, whereas in other cultures, sort-of much more active in getting, in getting a big name architect, involved in producing these cemeteries or things that are a bit more visionary and a bit, have a potential to be much more exciting spaces and so it was kind of taking the idea of the architecture engagement and still trying to be aware of Brecon, as a kind-of, architectural context."*

The identified category is a balance between the experiential and perceptual nature of the design process with Student-(WSA-001-AR74) reflecting on the latter stating that *"I think the process has been, for me; very much led by, site-analysis, so it was a case of going to the site, and seeing, what spoke to me from the site, and then building up on that and that's not always the way we get to do things, but that process, has been about sort of identifying, specific phenomenon and, building from them, thinking of them, as a concept about, which to go about a building, and so from that, I would build a whole language of, ideas on how the building grows up, and what the program that goes into it, is; and coming beside the building, a language based upon, a concept from site and that has kind-of been the process, this time around and the representational process, has come from the idea of layering and processes, it's all the sort of basic concepts from site that became ways about, drawing and building something."*

Approach WSA5B: DPM & Architectural Design as Analytical& Aesthetic, Conceptual & Abstract, Grounded & Context-Based Process-Focused Practical Approach (Process-Focused, Holistic & Intellectual, Independent Schema-Based Category)

One of the two lesser dominant themes, Approach WSA5B is the continued representation of the role played by DPM coursework in enhancing the holistic and

intellectual as well as aesthetic, skills and crafts-based approaches within the process of design in the architectural design studio. Student-(WSA-001-AR69) has elaborated on the analytic and aesthetic facet of the design process stating that *"well I guess I do a lot of hand sketching, and then, once I have hand sketched, I digitize it; maybe, I take a lot of photographs, photo collages and sketch like; sketches like that and then scan it and Photoshop it, and then, yeah; some modeling usually comes afterwards; I don't really use modeling as a tool to design as much I should, actually my last project I did all that compared to... what I do now, I think we learn by researching different things, I mean, like you start reading various books, about various aesthetic things, that might interest you which is personal to what your project is, whereas and you could then, I think, go into quite a lot of detail, and know, quite a lot, about, a specific topic, I mean, no one else in the entire year knows about, whereas obviously in first year, we were kind of learning the same thing."*

This identified category has been further reflected based on the conceptual and abstract-based as well as the contextualization of architecture based on the DPM coursework offered from the first year at WSA. Student-(WSA-001-AR74) has elaborated on this contextualization stating that *"there is a huge thing about how there will be about how to detail materials, and, I am working, with a lot of timber, this time around, but how am I going to connect that to materials, how is timber going to react to this, I do de-positioning in the ground and the water, and that's kind of got, introduced to us from a very early stage, with building a scale model, of an actual scale, joists and beams and everything structure wise for that, so you can go with that, continue your style or how the structure goes together, but then, some of these ideas, of time and how the building is going to change, and react with the site and become a part of time, and change with time and that is what will certainly come in my current project, and, I think, yeah, those were all things, that are, introduced at one point or the other, we learn from the fundamentals stage."* Student-(WSA-001-AR66) has elaborated further on the process of design stating that *"you kind of couldn't really do one without the other, the design was very overwhelming because it was introducing so many fundamentals to the point where it was actually hard to look back and remember all the stuff that we got taught, because we don't realize that at one point always, we don't use it, we haven't understood it, I would say the best explanation to what we did… in design studio, its summed up in a book by Simon Unwin, who was teaching Analyzing Architecture which is absolutely all the fundamentals of spatial design, in that, all the considerations, then it just taught us a whole new mode of thinking, really which has taken over"*

Approach WSA5C: Faculty & Crit as Sounding Board in Architectural Design Process (Process-Focused, Idealistic & Intellectual, Independent Schema-Based Category)

Approach WSA5C, the other lesser dominant theme is the reflection of the role played by the design tutor as well as crit in the architectural design studio in the preceding four years of the program that included their year of 'education in practice' towards the enhancement of idealistic and intellectual, independent schema-based approaches. This identified category represents the tutors, both external and within WSA as well as the crit at regular intervals as sounding boards in their eventual journey through the design thesis.

Student-(WSA-001-AR66) has elaborated on this role stating that *"the tutor said that, architecture; by the end of the first year should've become like a parasite in our veins that we don't really get rid-of and I do believe that was so intense that this way of thinking is quite rooted into us, I believe.., what, is the role it played in understanding, how to design, to a core idea, to a concept, I think that was really important for me because I originally designed."*

Student-(WSA-001-AR75) has reflected on crit and its impact on the design process stating that *"then there was like penultimate review before Easter and with sort-of final one after Easter and during the Crit, I got specific feedback from this critique who said this change maybe; you should develop on these issues, the design was about; I think there was a school project and it was something through circulation of the way I organize it basically that, he said that I should refine this and I think the way that I thought at the time was kind-of, this person has said your project should be like this and it was a very clear instruction of something to do, that was my assumption and so I did what I thought and then the next review was actually the same critique and he said that you haven't understood what I got you do, so I think going through that process of getting something a bit wrong and misinterpreting somebody, it underlines the importance of always being self-critical of your work and develop something and also trying to still understand what people actually say, actually mean; as supposed to what I say which is maybe, a skill that you are applying wider than just architecture; I think and also I realized in my next project in second year, the importance of how you communicate something being as important as what's being communicated, if not all, it's part of the task."*

Approach WSA5D: Architectural Design Process in Design Studio as Reinforcing the Identity & Practice-Based Approach at Welsh School of Architecture (Process-Focused, Multidirectional & Intellectual, Schema-Based Category)

One of the minor but well-discussed theme in the fifth year was the reinforcement of identity towards practice-based, multidirectional and multidimensional approaches in the process of design at WSA. Approach WSA4B and Approach WSA3D from the fourth and third year can be considered as the starting point for this continued discussion on the underlying design pedagogy adopted at the school. Student-(WSA-001-AR65) has elaborated on the practice-based approach and its reinforcement in the design studio stating that *"I think in first year, it was about… a method of working, maybe more than and by the time we get to fifth year, we've had a whole experience of and year out in the industry, and you know, working in a real practice and I think; it's kind-of more easy opportunity to… what you want, more self-directed way, to apply the things we… in the first, second and third year, into finding our own corner, you know our own area of specialization or interest in architecture and so I think… now is become more about integrating things from outside-to-architecture, into architecture, than simply… the basic, you know that its more about the wider approach than narrow joining the establishment; sort-of; you know joining the profession, kind of approaches, yeah, it has become, I don't know, it's become more wider, Ranging more, integrated back into real life."*

Student-(WSA-001-AR74) has further elaborated on reinforcing this design identity within the WSA studio culture stating that *"I guess, it feels so much, more natural now, but WSA, as it is, that it's kind-of got its own structure, that I have a clearer goal of what I am trying to achieve for the week, rather than coming, plumbing in on Fridays; randomly and I know exactly sort-of what I am aiming for and , I come in for a normal working day rather than just staying on, until whatever I have done is finished, sometimes I go according to, I am here from 9 until 6 and, within that time I am looking to achieve a diagram, which says this, or a model that says, such and such, and gives, much a clearer idea from what you are trying to achieve within that working day, It's coming more like, it feels more like work, after having a year, in practice last year, so we sort-of, have a clear idea, of what to achievable within one day."*

Approach WSA5E: Architectural Design as Developing, Intellectual & Research Oriented Process-Focused Approach (Process-Focused, Intellectual Schema-Based Category)

Approach WSA5E as the other minor but forcefully discussed theme represents the transformational nature of the design process with the focus on research-oriented domains and intellectual development in architectural design. This identified category is centered on the design thesis as independent, schema-based approaches.

Student-(WSA-001-AR66) has reflected on this transformation stating that *"from then on, it's sort-of, there are a series of themes or assumptions which weren't necessarily explicitly stated but it kind-of revolves around, for instance, a kind of greater structures or frame works, so for instance, I am looking at national infrastructure or some might look at the specific local manufacturing over a region, say weaving or pottery or something and then we kind-of try and grasp something like that holistically as a system and then understand perhaps what we can juxtapose with that or how that area could grow and naturally has to be an architectural proposal, so for example, I've got a really odd one, I am looking at the internet for infrastructure although, the internet is something which is non-architectural, it's quite in the air and it's very non-physical and so, I guess the challenge is to take on board, you know, within the context to Hs2 and urbanism, manufacturing, to holistically understand several overlapping or conflicting systems and come up with not only an architectural solution but also, quite a logistical solution, that takes into account, be considerations or whatever you are looking at, if its newspaper, if its weaving, it's the internet, whatever, so my projects branched out I mean, so for instance mine has taken me down the route of high street shopping, it has come out as a result of my research and so I am taking my understanding of the internet infrastructure… of how it operates specifically in this country as well for all national conditions and I am trying to, if you like bolster that to support it, to really enhance its growth, to solve a set of issues that result from our national infrastructure structure being the way it is, but also to tie that in with high-street shopping and that the death of the high- street in the UK and that, being quite a big national theme which you hear about all these days, so like I said, looking at a huge, over-arching series of structures, Understanding them, and then, really taking an architect's ability to think holistically and to orchestrate solutions together and come up with an architectural proposal by the end of the day, it's more to do with the grasping and the over-arching structures, I mean, someone I know is doing, what was originally, something in space and of course like you can't be, have space, NASA scientist's level of understanding, but it's getting to grips with the system as best, as you can understand it from an amateur point of view, and I think, that's really the skill, that's what's being grasped, You don't have to be a 100% perfect with so much as, you're working within the limitation of the foreign system."*

The Outcome Space for the Classification of Approaches to Learning for the B. Arch Program at Welsh School of Architecture, Cardiff University, UK is explained in Chapter 10

<u>Charting the learning Approaches of students in the five year Architecture Program through primary data collection from an eminent American School of Architecture and presenting the ongoing research findings at Beginning Design, the National Conference on the beginning design student in 2015("Beginning Design,")</u>

Research Grant – Research and Development Program – Manipal University – Dubai Campus

No: R&DP/MUD/RL-07/2014 dated March 26, 2014

&

<u>Approaches to Learning in Architectural Education</u>

Research Grant – Research and Development Program – Manipal University – Dubai Campus

No: R&DP/MUD/RL-03/2017 dated July 20, 2017

No: R&DP/MUD/RL-07/2014
Date: March 26, 2014

Prof. Ashok Iyer
School of Interior Design & Architecture
Manipal University Dubai

Subject: Your research proposal entitled" **Impact of Fundamentals of Design and Visual Theory on the Design Curricula of the Architecture Program**" for funding.

Dear Prof Ashok,

This is to thank you for submitting your research proposal. The research proposal was examined by two external subject concerned experts and also by members of Research & Development Program (R&DP). Based on the recommendations of experts and R&DP committee members, we recommend the funding of **AED 10,000** (AED Ten Thousand) for your research proposal. The research funding is for a period 12 months, from April 2014 to March 2015.

We anticipate that you would conduct the research work as per the MUD Research Policy and would generate meaningful data for knowledge enhancement.

We wish you success in your research.

Dr Firdos Alam Khan
Chairman
Research & Development Program
Manipal University Dubai

Dr. S.V. Kota Reddy
Academic President
Manipal University Dubai

CC: Mr. Avik Dutta, *Account Department, MUD*
         Mr. Krishna Kumar, *Facilities Department, MUD*

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RESEARCH PROPOSAL

Ashok Iyer, Professor – Chairperson,

School of Design & Architecture, Manipal University – Dubai Campus

1. **FIELD OF RESEARCH:** Architecture & Design Education

2. **THURST AREA:** Charting the learning Approaches of students in the five year Architecture Program through primary data collection from an eminent American School of Architecture and presenting the ongoing research findings at Beginning Design, the National Conference on the beginning design student in 2015("Beginning Design,")

3. **TITLE OF RESEARCH PROPOSAL:** Data Collection and Presentation of current findings with reference to the study titled "Impact of Fundamentals of Design and Visual Theory on the Design Curricula of the Architecture Program" (Iyer, 2012)

4. **PROPOSAL ABSTRACT:** The focus of the research proposal is to explore the approaches to learning adopted by the architecture student through primary data collection at an eminent American School of Architecture. The approaches are being explored from the students' experiences' of the coursework of architectural design and putting it in reference to the fundamentals of design and visual theory, termed as the coursework of Basic Design within the learning and teaching context of the architecture program; and to understand its impact on the advanced level architectural design coursework (Bax, 1991). These approaches shall be charted using the research methodology of Phenomenography and based on the framework of surface and deep approaches which are considered as fundamental pillars of research into higher education (Marton, 1981).

5. **INTRODUCTION:** The research proposal is a part of the primary data collection for the ongoing PhD studies at Welsh School of Architecture (WSA), Cardiff University, UK since 2011. This includes the first phase of the data collection of conducting semi-structured interviews of an entire cross-section of students from the first to the fifth year of the architecture program (75 Nos. Students / 15 students from each year) and the second phase of a Focus-Group Discussion with a group of six to eight students from each year. Both phases of the data collection have been completed at WSA and Sir JJ College of Architecture,

Mumbai, India and the research proposal specifically aims at conducting a similar primary data collection at an eminent American School of Architecture ("America's Top Architecture Schools," 2014). The proposal envisages a formal application process to Rice University or University of Texas at Austin to conduct the primary data collection at the School of Architecture and map the entire cross-section of students within the five year architecture program.

The ongoing research work included a pilot study in two colleges of architecture in India where the variation in the learning approaches of students of architecture in the first and fourth year was mapped. The findings from this study pointed towards a difference between text – based learning context where the students seemed to dwell from surface to deep approaches to learning; whereas the range seems to be wider in practice – based learning context such as architecture from a product – to – process – concept focused approaches to learning. The final study has currently looked at the British and Indian context with the emerging analysis of the entire cross-section of five year of architectural education revealing further layers within the emerging approaches to learning that will be presented in the 'Beginning Design Conference' to be held at the University of Houston in 2015.

6. **OBJECTIVES AND SPECIFIC AIMS:** The research proposal aims map the experiences of the students with reference to the fundamentals of design and visual theory conducted as a part of the architectural design coursework in the first year on the advanced level architectural design coursework conducted in the second year to the fifth year of the design curricula for the architecture program in the identified American School of architecture. The study is currently looking at this impact based on the architectural design project work using the learning approaches adopted by the students for the coursework of architectural design with specific reference to the fundamentals of design and visual theory, and its effectiveness on the architectural design project work of the advanced level design studios in the senior years of the architecture program within the British and Indian context. This is being done from an international perspective and the research proposal endeavors to broaden this effort by looking at the American context. The primary data collection would be essential in building a third layer towards mapping the learning approaches of the architecture student and presenting the three layers within the overall framework of the learning outcome for the student of successfully completing the five year undergraduate program in architecture.

7. **RESEARCH PLANS:**

- The proposed study is approved by the WSA- Research Ethics Committee (EC1212.140) the nature of data collection for the proposed phenomenographic study.

- Conduct Semi-structured Interviews: on a sample of fifteen (15) design students for each year from the first year to the final year, chosen randomly from the year's population from the proposed school - University of Texas at Austin or Rice University – Feb / March 2015

- Interviews with Design Chairs and Faculty of Architecture – Feb / March 2015

- Focus-Group Discussion with the Student cross-section in five Groups of 6 to 8 students from each year will be randomly selected and asked 5 questions in four broad areas – Feb / March 2015

- Present findings of earlier Primary Data Collection from WSA and Sir JJ College at Beginning Design Conference – 2015 at University of Houston – Feb / March 2015

8. **SIGNIFICANCE OF PROPOSED RESEARCH:** Currently the research into architectural education has been broadly approached from the perspective of reflective practice (Schon, 1996), a process – based theoretical perspective (Broadbent, 1988), a sociological perspective (Stevens, 1998); and practically going through the design process through architectural design exercises (Unwin, 2012). This ongoing work and the proposed research proposal will add to the interesting spectrum of research that has and is being conducted with reference to the learning approaches that students of architecture chart in their undergraduate education and documenting the underlying academic pedagogy within an international context. This research proposal takes the ongoing work by weaving three layers of learning contexts; American, British & Indian perspective, thus looking at the architectural curriculum from an international perspective. The three layers of learning contexts would their-by map the overall framework of the learning outcome envisaged for the five year undergraduate program in architecture.

Sr.No	Items required	Timeline	Justification
1	Leximancer – Software for Phenomenographic Analysis - https://www.leximancer.com/req/buy/?pid=8 (Penn-Edwards, 2010)	April 2014 – 15 on an Academic Edition Annual License	This software is useful for Survey Analysis, Market Research, Social Media Monitoring, Customer Loyalty & Forensic Analytics and can be used for research work being conducted by various Schools in MUDC
2	Presenting Paper and attending Beginning Design Conference	Feb / March 2015	Required for visiting the university and attending the conference
3	Accommodation & other expenses at UTA / Rice University & Houston	Feb / March 2015	Required for the stay in University Accommodation
4	Transcription of primary data collection audio interviews	April to July 2015	Required as transcription is an arduous and time-consuming task and requires a minimum of three iterations
5	Special Leave in Feb / March 2015	Feb / March 2015	Required to carry out the Research as conference is scheduled in the specific timeframe & the University Spring Semester
6	Presenting Paper and attending Beginning Design Conference	Feb / March 2015	Required for primary data analysis with researchers on a common platform looking at academia

9. RESEARCH BUDGET:

Sr.No	Description	Approximate Cost (AED)	Remarks
1	Leximancer – Software for Phenomenographic Analysis - https://www.leximancer.com/req/buy/?pid=8 (Penn-Edwards, 2010)	750 AUD / 2550 AED	Leximancer Desktop: Academic Edition Annual License
2	Primary Data Collection at Houston / Austin	8000 AED	Travel & Visa
3	Presenting Paper and attending Beginning Design Conference	1150 AED	Registration
4	Accommodation & other expenses at UTA / Rice University & Houston	2750 AED	University Accommodation

5	Transcription of primary data collection audio interviews	2000 AED	Research Assistant payment
6	Special Leave in Feb / March 2015	15 working days	MUDC

10. BUDGET JUSTIFICATION:

11. LIST PREVIOUS RESEARCH GRANT RECEIVED AND AMOUNT:

➢ Paper Presentation at International Conference titled ' Economy' by the Welsh School of Architecture, Cardiff, Wales, UK in July 2011 – AED 1500/- MUDC

➢ Paper Presentation at 2nd International Conference on Engineering Systems Management and its Applications (ICESMA'10), American University of Sharjah, March 2010 – AED 2000/- MUDC

➢ Paper Presentation at *4th International Quality Congress hosted by HBM e-University*, Dubai, UAE, March 2010 – AED 1500/- MUDC

12. RESEARCH PUBLICATION:

➢ Research Paper titled 'A Phenomenographic Study in Understanding Architecture Students' Approaches to Learning the Coursework of Architectural Design' is under the final review process for Publication in an International Journal – 2012 to 2014 ongoing

➢ Ashok Iyer "House, Home and the Concept of a Familial Economy" Abstract of Proceedings of the International Conference titled ' Economy' by the Welsh School of Architecture (http://www.cardiff.ac.uk/archi/economy/) in Cardiff, Wales, UK in July 2011

➢ Ashok Iyer "Relevance of Construction Project Management in the Interior Design Curriculums" Abstract of Proceedings of 2nd International Conference on Engineering Systems Management and its Applications (ICESMA'10) hosted by

American   University   of   Sharjah
(http://www.aus.edu/conferences/icesma2010/)(ISBN#:978-9948-427-14-8)
Sharjah, UAE in March 2010 & online access of paper on IEEE Xplore -
http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=5700033&url=http%3A%2F
%2Fieeexplore.ieee.org%2Fstamp%2Fstamp.jsp%3Ftp%3D%26arnumber%3D57
00033   E-ISBN :   978-9948-427-14-8 Print ISBN: 978-1-4244-6520-0 INSPEC
Accession Number: 11846368 Date of Current Version :   24 January 2011 Issue
Date :   March 30 2010-April 1 2010

➢ Ashok Iyer "Quality Management in Design Education: Parameters on Relating
Quality and Creativity" *Proceedings of 4th International Quality Congress hosted by
HBM   e-University   (Congress   Proceeding   -   ISBN   978-9948-15-397-9
http://qc.hbmeu.ae/)* Dubai, UAE in March 2010

No: R&DP/MUD/RL-03/2017

Date: July 20, 2017

Ashok Iyer

School of Design and Architecture

Manipal University Dubai

Subject: Your research proposal entitled" Approaches to Learning in Architectural Education" for funding.

Dear Prof. Ashok Iyer,

This is to thank you for submitting your research proposal. The research proposal was examined by two external subject concerned experts and also by members of Research & Development Program (R&DP). Based on the recommendations of experts and R&DP committee members, we recommend the funding of AED 13650 (AED Thirteen Thousand six hundred fifty) for your research proposal. The research funding is for a period 12 months, from April 2017 to March 2018.

We anticipate that you would conduct the research work as per the MUD Research Policy and would generate meaningful data for knowledge enhancement.

We wish you success in your research.

Dr. Jason Fitzsimmons   Dr. S.V. Kota Reddy

Coordinator   Academic President

Research Development Program   Manipal University Dubai

Manipal University Dubai

CC: Mr. Ganapati Hegde, Account Department, MUD

　　 MUDC, Facilities Department,MUD

　　 Dr. Ravishankar Dudhe, Co-coordinator, R&D P, MUDC

　　Prof. Ashok Iyer, Chairperson, School of Design and Architecture

Title of Research Project: *Approaches to Learning in Architectural Education*

Name (Principal Investigator): *Ashok Ganapathy Iyer*

Department/Institution: *School of Design and Architecture, Manipal University Dubai*

Email ID: *ashok_iyer@manipaldubai.com*

Signature: Ashok Iyer,

Name (Co-Principal Investigator):

Department/Institution:

Email ID:

Signature:

Name (Co-Principal Investigator):

Department/Institution:

Email ID:

Signature:

Research Proposal is directed towards: ■ Journal Publication   or   ☐ Patent

- **Total Budget: AED :** *Twenty One Thousand Dihrams (AED 21,000/-)*

- **Ethical Approval***: Attached*

- **Is your Research Proposal checked by anti-plagiarism software?** *This proposal is part of my ongoing PhD Studies at Welsh School of Architecture, Cardiff University, UK*

RESEARCH PROPOSAL

1. **FIELD OF RESEARCH:** *Architectural Education*

2. **THURST AREA:** *Outcome-Based Education (OBE), Learning Pedagogy, Approaches to Learning, Phenomenography, Architectural Design Education*

3. **TITLE OF RESEARCH PROPOSAL:** *Approaches to Learning in Architectural Education*

4. **PROPOSAL ABSTRACT** *The range of approaches to learning adopted by students is often categorized into Deep, Surface and Strategic learning (Biggs, 1987; Marton & Säljö, 1976;*

Moon, 2004). This paper looks into the classification of approaches to learning in Architectural Design Education, using as its data an earlier study looking at the change in approaches to learning between 1st and 4th year (A. Iyer & Roberts, 2014). This classification of approaches to learning points towards a more complex set of approaches than just the deep, strategic and surface division. It also raises a further question on whether the categorized approaches to learning in architectural education should be represented on the continuum of deep, achieving and surface facets (A. G. Iyer, 2015), or is this classification in requirement of a different dimension when related to architecture. In this paper, the classification of students' approaches to learning in architectural education is presented using a phenomenographic methodology that has been instrumental in deciphering Deep, Surface and Strategic dimensions in the other fields of education (Biggs, 1987; Drew, Bailey, & Shreeve, 2001; A. Iyer & Roberts, 2014; Marton & Säljö, 1976).

The earlier study on students' learning in 1st and 4th year has derived six categories of learning approaches (A. Iyer & Roberts, 2014). These categories represent a broader spectrum to Deep, Surface and Strategic learning approaches (Marton & Säljö, 1976) with reference to the research question and the literature review in architectural education (A. G. Iyer, 2015).

Approach A	*Series of steps taken from introduction of the design problem to completion of the final solution with emphasis on presenting a consistent output and preparing a good portfolio*
Approach B	*Trying to understand architecture using experiences of faculty as a scaffold or using their instructions to present the learning outcome*
Approach C	*Evolving perceptions of architecture by adopting series of steps in the design process based on a product-focused outcome*
Approach D	*An approach focused on evolving the perceptions of architecture through the process of design which is based on a process-focused outcome*
Approach E	*Conceptualizing thought process in evolution of architecture based on in-depth experiences correlative to perceptual psychology within the student's experience*
Approach F	*Conceptual and abstract focus towards design based on innately creative and experiential level of understanding architecture*
Categorized approaches to learning adopted by 1st & 4th Year Architecture Students (A. Iyer & Roberts, 2014)	

5. **INTRODUCTION :** *Approaches to learning with reference to students in higher education have been expressed in terms of surface and deep approaches (Marton & Säljö, 1976). Students' approaches to learning are directly correlative to their prior experiences of studying and understanding the key concepts of the subject matter, which is vital to the subsequent approaches to studying and learning outcomes (Prosser & Trigwell, 1999). The focus of the research is to explore the approaches to learning of architecture students using the qualitative research methodology of Phenomenography. Phenomenography has been defined by Marton (1992) as "the empirical study of the limited number of qualitatively different ways in which we could experience, conceptualize, understand, etc. various phenomena in and aspects of the world around us. These differing experiences, understanding, etc. are characterized in terms of categories of descriptions, logically related to each other, and forming hierarchies in relation to the given criteria. Such an ordered set of categories of description is called the outcome space of the phenomenon or concepts in question" (Drew et al., 2001). Using this research methodology, the researcher can put together a "range of different ways in which people understand and experience the same thing" and "is interested primarily in surfacing variation of experience and understanding" (Cousin, 2009). "Each phenomenon in our world can be seen and understood in only a limited number of distinctively different ways" and this understanding can be correlated by defining it "as the experiential relations between an individual and a phenomenon" (Marton, 1992).*

6. **OBJECTIVES AND SPECIFIC AIMS:** *To identify the approaches to learning adopted by students in their design project work and classify these learning approaches to understand how they actually manifest themselves in architecture education through Phenomenographic*

research methodology using the Qualitative Analysis Software – NVivo 10. The analysis will be further validated using NVivo 11.

RESEARCH PLANS: *The data analysis will include ten steps commencing from actual data collection to presenting the phenomenon in question through the final categories of description and outcome space of the phenomenographic research methodology.*

I. *The first step has included the collection of primary data through audio recordings of one-to-one semi-structured interviews with a random sample of students' cross-section from the identified four schools of architecture. This has already been completed as a part of an earlier research grant in 2014-15 (A. G. Iyer, 2014-15).*

II. *The phenomenographic analysis includes the precise transcription of the audio recordings verbatim.*

III. *These transcripts are loaded on the NVivo – 10 platform and physically read by the researcher, in both the digital medium as-well-as the printed medium as a part of the familiarization process of the collected data.*

IV. *The compilation and condensation of transcribed data includes bracketing parts of the transcription by extrapolating directly on the phenomenon in question i.e. approaches to learning. The transcriptions for specific questions are grouped together and filtered to show the emphasis on the important facets of the phenomenon in question.*

V. *This step involves the process where fragments of the transcription are compared and classified both, manually through the process of labelling and creating the initial codes on NVivo which is fundamental to this qualitative research method.*

VI. *In the next step, clusters of the fragments of experiences emerge in the form of preliminary groups of categorized experiences of the pre-classified approaches to learning.*

VII. *The seventh step involves a repetitive process of iteration of these initial codification with preliminary nomenclatures being given to the identified categories.*

VIII. *The pre-final nodes that emerge through to the codification on the NVivo platform are labelled using the corresponding metaphors with reference to the phenomenon in question, learning approaches and the categorized experiences emerging out of the phenomenographic analysis.*

IX. *Labeling includes the cross-referencing with literature review of previous research into the approaches to learning. This step includes a comparison and contrast of the emerging categories of learning approaches through a penultimate stage of iterations.*

X. *The final step includes the categories of description that emerge from the phenomenographic analysis representing the outcome space of the emerging classification of the phenomenon in question, approaches to learning.*

7. **SIGNIFICANCE OF PROPOSED RESEARCH:** *Classification of Approaches to Learning will fill the gap within the existing research on learning and teaching pedagogy in Architectural Education. This research is focusing on continuing the phenomenographic analysis using the the qualitative analysis software platform of NVivo 10 and using the upgraded application features of NVivo 11. This classification will provide further pointers for studies into Outcome-Based Education within Architectural Education.*

S. No.	School of Architecture	Year of Program	Total No. of Semi-structured interviews Conducted to be transcribed for NVivo 10 - 11

1	Welsh School of Architecture, Cardiff University, United Kingdom *Feb.2013 to Feb. 2014*	1st Year B.Sc. Arch.	04 Nos.
		2nd Year B.Sc. Arch.	07 Nos.
		3rd Year B.Sc. Arch.	07 Nos.
		1st Year M. Arch.	04 Nos.
		2nd Year M. Arch.	07 Nos.
2	Sir JJ College of Architecture, University of Mumbai, India *Aug. 2013 to March 2014*	1st Year B. Arch.	05 Nos.
		2nd Year B. Arch.	06 Nos.
		3rd Year B. Arch.	07 Nos.
		4th Year B. Arch.	07 Nos.
		5th Year B. Arch.	07 Nos.
3	School of Architecture, the University of Texas at Austin, Texas, USA *Feb. 2015*	1st Year B. Arch.	01 Nos.
		2nd Year B. Arch.	01 Nos.
		3rd Year B. Arch.	01 Nos.
		4th Year B. Arch.	02 Nos.
4	School of Architecture, Oklahoma State University, Stillwater, Oklahoma, USA *March 2015*	1st Year B. Arch.	04 Nos.
		2nd Year B. Arch.	02 Nos.
		3rd Year B. Arch.	02 Nos.
		4th Year B. Arch.	04 nos.
		5th Year B. Arch.	01 Nos.

8. RESEARCH BUDGET WITH JUSTIFICATION:

Intel Xeon Processer, 24 Inch Monitor, 8GB Quadro Graphic Card, 4 TB Hard-Disc, 64 GB RAM, 6 USB Ports – AED 7350/-
NVivo 11 Software 36 Months Subscription – AED 5250/- (US$1,380.00 http://www.qsrinternational.com/products/nvivo/pro/standard/new/nvivo11profulllic)
Transcription through dictate2us LTD www.dictate2us.com @ AED 10 (1.75 GBP) per minute for approximately 800 Minutes: AED 8000/-
EndNote X7 Upgrade to X8: AED 400/ - (Referencing Software to be used with NVivo 11)

9. TIME-LINE FOR RESEARCH WORK:

S. No.	Description	Timeline
1	Software upgradation	June 2017
2	Transcription of 800 Min. Two speaker interviews	June 2017
3	NVivo Analysis	July – December 2017
4	Publication / Conference Peer-reviewed Paper Publication	June 2018

10. LIST PREVIOUS RESEARCH GRANT RECEIVED AND AMOUNT IN AED:

S. No.	Title	Amount in AED & Funding Agency
1	Conservation Management Plan for Al Mahatta Museum – Research Project Being conducted with Sharjah Museums Department, Government of Sharjah" 2016-17	AED 14,000/- Research & Development Program, Manipal University Dubai
2	"Archiving an Impression – Travel, Entrepreneurship and the Cosmos" 2015-16	AED 10,000/- Sharjah Museums Department, Government of Sharjah
3	"Impact of Fundamentals of Design and Visual Theory on the Design Curricula of the Architecture Program" 2013-14	AED 10,000/- Research & Development Program, Manipal University Dubai

11. RESEARCH PUBLICATION

Ashok Ganapathy Iyer, "Review of approaches to learning adopted by architecture students in the coursework of architectural design," archi DOCT, The e-Journal for the Dissemination of Doctoral Research in Architecture. Volume 3, Issue1, pp. 21-30 (2015) (http://www.enhsa.net/archidoct/Issues/ArchiDoct_vol3_iss1.pdf) & Cardiff University's institutional repository ORCA http://orca.cf.ac.uk/id/eprint/74414

 Ashok Iyer & Andrew Roberts, "A Phenomenographic Study in Understanding Architecture Students' Approaches to Learning the Coursework of Architectural Design," Journal for Education in the Built Environment, Volume 9, Issue 1 (2014), pp. 89-109 (JEBE) http://dx.doi.org/10.11120/jebe.2014.00010 & Cardiff University's institutional repository ORCA http://orca.cf.ac.uk/63758/

 Ashok Iyer "Approaches to Learning Adopted by Students of Architecture – A Classification," Research Paper presented at the 2nd BUiD (British University in Dubai, UAE) Doctoral Conference Proceedings, ISBN: 978-9948-02-481-1 (Page 366 – 377) http://buid.ac.ae/BDRC-2016-Proceedings / http://orca.cf.ac.uk/id/eprint/97158 in May 2016

12. DOCUMENTS TO BE ATTACHED WITH THE APPLICATION:
CV – Principal Investigator (Soft Copy-PDF format)
Ethical Approval - WSA, if it's applicable (Soft Copy-PDF format)

13. PROVIDE AT LEAST 3 NAME WITH CONTACT DETAILS OF THE SUBJECT EXPERTS:

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