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8

THE FORMATION OF A SPACE: A REVIEW OF THE TEACHING OF FRESHMAN-YEAR DESIGN STUDIO

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INTRODUCTION

The pedagogical delivery method conducted in a design studio is different than that in a conventional classroom. Despite these differences, both aim at achieving similar educational objectives, such as introducing new knowledge, stimulating innovative ideas, exchanging various ways of thinking, formulating problem-solving strategies, etc. A design studio differs in placing emphasis on the creation of new objects by means of experimenting various alternatives based on designer's creativity, functional consideration, and aesthetic principles.

More specifically, interior design is a discipline that deals with creating physical interior environments, based on criteria such as fulfilling the programmatic requirements, satisfying users' needs, complying with building codes, and possessing a sense of spatial order to house the intended activities. Therefore, the central educational mission of an accredited interior design program by CIDA, Council for Interior Design Accreditation, is to train professional designers who are competent to practice effectively in order to ensure the user's health, safety, and well-being. However, it is not uncommon for interior design educators to notice the influence of the popular TV network, HGTV, on some students, who are misled by the show on the TV screen to equate decoration with design. The misconception leads to a belief that interior design is comprised merely of cosmetic effects of beautiful colors, stylish furniture, and attractive accessories. Hence, it is imperative for interior design programs to provide students with a clear understanding of the profession and a sufficient set of skills to create interior spaces that are in concert with Vitruvius' triad: *venustas* (beauty), *firmitas* (structural soundness), and *utilitas* (functionality).

Acknowledging the importance of space design skill, NCIDQ, National Council for Interior Design Qualification, specifies the following criteria as an essential part of the statement to define the profession of interior design: "Formulation of preliminary space plans and two and three dimensional design concept studies and sketches that integrate the client's program needs and are based on knowledge of the principles of interior design and theories of human behavior" (Jones & Allen, 2009, p. 3).

Therefore, as a CIDA-certified program, the interior design program at EMU considers it our essential task to educate our students in compliance with NCIDQ's criteria to be future designers, who are able to practice professionally. Through design studios, students are to work with the instructor to sharpen their cognitive skill to conceive conceptual framework so as to derive possible schemes. During the process of

design, students are required to first analyze the problem, then understand the requirements to incubate the design concept, which is to serve as the driving engine for students to formulate strategies, and synthesize desirable factors to reach optimal design solutions. Ultimately, a designer has to be able to materialize his or her spatial ideas through a physical building form as the final outcome of the design process. Thus, form-making is an indispensable part of design activities. As Alexander (1994) pointed out: “The ultimate object of design is form” (p.15); it seems to be obvious that to prepare design students with a keen sense of space and its formation through systematic formal derivations has been recognized as one of the most crucial pedagogical objectives of design studio teaching.

As a faculty member of an interior design program, I have been teaching design studios of various levels and have observed how design students struggled to tackle the challenges; some broke through with success, while others stumbled with frustration. The teaching experience gained in design studios triggers my research interest in exploring the mode of learning and the role of design method. To proceed with the research idea, I was granted an opportunity to participate in a series of seminars on Scholarship of Teaching and Learning, SoTL 2009-2010, sponsored by the Faculty Development Center at Eastern Michigan University. My research attempts the following: (1) to understand how the first-year students behave when facing design problems with little or no previous experience, (2) to examine the functionality of design tools/methods based on historically significant design theories, and (3) to assess the pedagogical effect of teaching activities delivered in the design studio. It is intended to shed light on the following remarks made by novice design students:

1. How to start?
2. I have ideas, but cannot draw.
3. Does the design of a space solely rely on the designer’s imagination?
4. Is there some sort of design method we can rely on?
5. I know what I am doing (so please leave me alone).
6. Are there criteria to judge design quality?

This study was intended to reflect an important concept I learned from an SoTL seminar that teaching and learning are not two separate ends of a linear relationship but an integral entity that may grow organically to benefit each other. Students’ feedback on learning is imperative in providing insightful information for the betterment of teaching. In order to echo the questions on learning design from students’ perspectives, I formulated a set of questions from the instructor’s perspective in order to find answers to address the teaching effectiveness:

1. Is the teaching of design methods pedagogically desirable from the students’ perspectives?
2. Do students perform differently when designing with and without a rule-based design method?
3. What did they learn from reflecting upon their own learning experience in the studio?
4. Is the teaching effective in enhancing students’ design skills?

REVIEW OF THE RELEVANT ISSUES

1. IS DESIGN TEACHABLE?

There are many researchers and design educators who have endeavored to address the complexity of the design process and the associated question of how designers start to form new ideas. Jones (1970) regarded designers as “black boxes” and suggested the most valuable part of the design process remains “inside the designer’s head and partly out of reach of his conscious control” (p. 46). Goldschmidt (1999) noted, “Creative design is held in great esteem, but we still know little about design cognition and the cognitive ability and strategies that contribute to creative design thinking” (p. 526). Design has a seemingly logical nature characterized by a linear, analytical, data-oriented process; however, the actual cognitive process of design remains internal and largely implicit within the designer’s cognitive domain.

There are other researchers who consider design as a trial-and-error procedure in which the designer tests possible schemes against design criteria one after another until satisfactory solutions emerge (Jones, 1970; Rowe, 1994); during this process, the designer’s intelligent judgment in screening useable schemes needs to be incorporated in the selection of those with potential for further development. Due to our rather limited understanding of the complicated human cognition faculty, there is no uniform agreement with regard to the origin of design creativity. Shriffrin (1996) acknowledges the role of practice that may account for much of the expertise shown in a given domain but argues that the contributions of genetic factors to the superb level of expertise could be decisive; in other words, the creative design expertise is attributed to a genetic effect and considered it a form of inborn talent for generating ingenious design ideas. Taking a different position, Sternberg (1998) regards design ability as a learnable skill and adopts a “practice makes perfect” point of view. For Sternberg, design ability can be obtained as a result of learning and constant practice; therefore, a student’s learning attitude and an instructor’s teaching strategies must collaborate closely in order for the students to reach the creative level of design skill, which has been regarded as the culminating pedagogical goal of design studio teaching. Similarly, in assessing the influence of the knowledge accumulated from previous learning experiences on the act of creating new ideas, Simon (1988) noted:

No sharp line divides learning things that are already known to others from learning things that are new to the world. What constitutes novelty depends on what knowledge is already in the mind of the problem solver and what help is received from the environment in adding to this knowledge. We should expect, therefore, that processes very similar to those employed in learning system can be used to construct systems that discover new knowledge (p.123-124).

For most researchers, learning ability constitutes one of the most prominent biological attributes of species with higher level of intelligence. Given the fact that there are still unknown cognitive activities occurring inside human brain when attempting to formulate new ideas, it is important to recognize that previous learned knowledge serves as the foundation to discover new knowledge.

2. WHAT IS THE PROCESS OF DESIGN?

According to Alexander (1994), design is “the process of inventing things which display new physical order, organization, and form, in response to function” (p. 1). The definition was predated by Sullivan’s (1979) maxim dictum recognized in the field of building design: form ever follows function. To address the functional needs might represent the goal of designing. But, the question is how to start?

Often raised by students, this is probably a question that most design educators have encountered in the design studio, which has also been posited as an interesting research topic and led to many theoretical propositions. Many authors have agreed that a design process consists of three essential stages: analysis,

synthesis, and evaluation (Jones, 1970). Analysis enables designers to comprehend the contextual conditions in terms of positive and negative factors by analyzing what are given, in order of frame the problems to be solved. Synthesis is the stage that involves imagination and creativity to eliminate the negative and optimize the positive factors to form tentative design solutions. Lastly, the evaluation stage is to test, compare, and choose the most promising scheme as the design solution.

Aiming to expand the boundary of related factors in order for “fact-finding” to support design decision-making, Jones (1970) proposes a new model of design process composed of three stages: divergence, transformation, and convergence. Divergence refers to the act of expanding the design situation to have a larger “search space” to seek a solution. Transformation, involving creativity, fun, flashes of insight, inspired guesswork, etc. is the stage to detect a pattern based on the results of a divergent search. Convergence is the last stage, in which the designer is to eliminate uncertainties progressively until only one of many design alternatives is left as the final solution. In the realm of interior design, Jones and Allen (2009) specify the design process based on the practical scope of services commonly adopted by the interior design industry as a two-stage process: analysis and synthesis. The first consists of initial contact, programming, and conceptual/schematic design, while the second includes design development, contract documentation, contract administration, and post-occupancy evaluation.

3. ARE THERE METHODS FOR GENERATING DESIGN IDEAS?

A design method is a strategic procedure which functions to germinate design ideas and to ensure the development of a pre-conceived schema in order to solve problems or to carry out a design task. Despite its varieties, methodical approach to creating design works is by no means a new invention. Panofsky (1955, in Heath 1984) noted that geometrical grids were applied by ancient Egyptian sculptors to lay out their work; Heath suggested that the same method may have been used by their contemporary architects in executing their monumental works. Likewise, a similar building design method based on a modular system was invented and employed by the ancient Chinese architects in their works ranging from palaces, temples, to residences. The design system was used to derive the building dimension, the sizes of structural members, the layout the structural grid in order not only to comply with the imperial codes of order but also to achieve a harmonious building design (Liang, 1991).

According to Vitruvius’ description in his treatise, *The Ten Books of Architecture*, the modular principles in the western civilization were also fully developed during classical times and utilized to facilitate efficiency and systemization in building construction. Further, the ancient Greek designers integrated the modular system with the notion of harmony which is based on the mathematical relationship among design components to ensure aesthetic soundness. One of the prominent examples would be the ubiquitous golden section, which was defined by a ratio of 1:1.618.

Tzonis and Lefaivre (1992) trace the origin of order/regulating line back to the idea of *taxis* introduced by Aristotle in his *Poetics*. Ensuring an integrated formal organization without contradiction, *taxis* is “the orderly arrangement of parts,” which “constrains the placing of the architectural elements that populate a building by establishing successions of logically organized division of space” (p. 9). Tzonis and Lefaivre (1992, pp. 9-15) further categorize *taxis* into two schemata: the *grid schema* and *tri-partition schema*. The grid schema consists of two set of lines that meet at right angles to form an array of squares or rectangles; or a set of lines that converge at one end and radiate with regular increment at the other; while the tri-partition schema is composed of three parts, one central part and two equal border parts. Ensuring a sense order, consistency, integrity, and harmony, the schemata have been used widely in classical building designs throughout history of the western architecture.

The notion of underlying geometric structure in building design continues to dominate even in the era of modern design, as it has been recognized to be able to stimulate design thinking, enhance creativity, and promote new ideas. For example, Le Corbusier (1887-1965), one of the most ingenious designers of the twentieth century, adopted regulating line as the “generating machine” in his design in order to conduct the disposition of spatial components, and simultaneously maintain a sense of harmony. Describing his use of regulation lines as an underlying structure system to organize constituent elements in design, Le Corbusier (1986) notes:

The regulating line is a satisfaction of a spiritual order which leads to the pursuit of ingenious and harmonious relations. It confers on the work the quality of rhythm. The regulating line brings in this tangible form of mathematics which gives the reassuring perception of order. The choice of a regulating line fixes the fundamental geometry of the work; it fixes therefore the “fundamental characters” (of a design) (p. 75).

Similarly, a Le Corbusier’s contemporary, Mies van der Rohe (1886-1969), has also been recognized as a giant figure in the modern design history. He created a long list of building landmarks representing a rationalist approach to derive design solutions. Mies was a design educator at the renowned German design institute, Bauhaus (1914-1933), whose teaching philosophy plays an influential role in shaping the contemporary design education. Mies’ design method, characterized by an underlying grid schema to achieve order and integrity, was conspicuously evidenced by his constant employment of the schema in his building design, on which Mies comments:

We shall emphasize the organic principle of order as a means of achieving the successful relationship of the parts to each other and to the whole.... We must have order, allocating to each thing its proper place and giving to each thing its due according to its nature (Blake, 1996, p. 232).

4. THE REPRESENTATION OF ABSTRACT SPATIAL IDEAS

Since design is an intellectual activity, the ideas generated as a result of cognitive process have to be translated into a pictorial system, such as drawings, diagrams, matrix, symbols, etc. for the purpose of communication among related parties. Thus, it is crucial for design educators to prepare the students with creative thinking to visualize the formation of spaces but also sufficient skill to conduct graphic communication via abstract notation systems.

Studying the effectiveness of teaching diagrammatic approach to schematic design phase, Wang (2007) noted: “The appeal of diagrams rests in the fact that they give abstract ideas graphic clarity, translating complex conceptions into visual configurations of nodes and relationships that are easy to grasp” (p. 33). Similarly, in their discussion on the teaching of design method, Jones and Allen (2009) point out “the designer may begin by developing a matrix indicating the relationship of particular individuals, departments, or spaces. Another tool is the bubble diagram to help the designer and client visualize the requirements of the space” (p. 15). It is indeed a common design method taught in design school and used by students to explore possible spatial relationships among constituent spaces of a project, such as adjacencies and approximate dimensions, in the early design stage. However, the bubble diagrams will not be able to address aesthetic principles involved in design thinking.

Reviewing the use of diagram in the field of architectural design, Peter Eisenman (1999) suggests that there are two different ways to understand the function of diagram in design field: diagram as an explanatory or analytical device and as a generative device. In an analytical role, the diagram is used to uncover “latent

structure” of an organization of spaces; while in a generative role, the diagram is used to mediate between an abstract idea and a physical space to facilitate the generation of new spatial ideas.

Asserting the learnable nature of symbol systems which define various domains, Csikszentmihalyi (1996) contends:

Knowledge mediated by symbols is extrasomatic; it is not transmitted through the chemical codes inscribed in our chromosomes but must be intentionally passed on and learned. It is this extrasomatic information that makes up what we call a culture. And the knowledge conveyed by symbols is bundled up in discrete domains- geometry, music, religion, legal systems, and so on. Each domain is made up of its own symbolic elements, its own rules, and generally has its own system of notation. In many ways, each domain describes an isolated little world in which a person can think and act with clarity and concentration (p. 37).

To most people, to draw what one can see is challenging enough of a task for an untrained hand, let alone to depict something graphically in one’s mind. However, it is one of the most important skills that a design student has to learn, in order to effectively create designs as well as to communicate with interested parties. In the field dealing with natural and artificial environments, it is particularly crucial to train students to think 3-dimensionally; for example, a line drawn on a piece of paper might not be simply a line in a space, instead, it might be a plane standing vertically, or a line tilting with one end on the ground. Hence, the ability to read and to speculate various possible conditions will be able to greatly enhance one’s design creativity by envisioning more alternatives.

METHODOLOGY

Based on my personal observation and actual experience in teaching freshman-year design studio/theory lab, I noticed that design students behave differently in the studio; while some students are confident in creating something unseen before, others are hesitant to draw a single line. Some are comfortable in visualizing spaces, while others struggle to conceive of ideas. The most commonly asked question was: “How to start?” which might indicate students need some sort of theoretical framework as catalyst for generating ideas. In response, the design project was thoughtfully designed to serve not only as a platform to practice design and enhance skills but also as a vehicle for teaching design theory.

Since the design studio in question was set for the freshman-year interior design students who have not yet gained any design experience in producing spatial solutions for interior design problem. The project is about the formation of a space. As a novice group of students, they were offered an opportunity to explore their creativity, to imagine the formation of a space, and further, to create space applying design theory.

THE PEDAGOGICAL OBJECTIVES

1. to facilitate imagination and creativity in design activities
2. to systemize design thinking in creating physical environments
3. to understand the human perception of spaces
4. to learn and apply historically significant design method: grid schema and regulating lines
5. to learn and apply aesthetic principles to design project, such as balance, axis, vista, symmetry/asymmetry, solid/void, progression, repetition, proportion, scale, etc.
6. to comprehend the formation of a space and to create spaces following Lynch's five components: nodes, edges, districts, paths, and landmarks
7. to be able evaluate and critique spatial quality for colleague students

PROJECT DESCRIPTION

To measure the effectiveness of different design methods, the studio consists of three projects. Each project was to prompt students to apply different design methods learned from the class. Students were asked to explore the formation of a space, and present design ideas via drawings and physical models. To simulate physical spaces, simple geometric wood pieces, such as linear and planar elements, were used to represent columns, walls, and roofs. A collection of wood pieces are to be assembled to represent actual building spaces on a physical model.

The first project is "Designing without Rule," which requires students to create spaces based on whatever they think would work. There are no rules to comply with, such that students have full freedom to work on the formation of a space without any restriction. This project was intended to detect the desirability of design methods/generative devices from students' perspectives.

The second project is "Designing with the Golden Section Grid System," which allows students to learn the grid system and use it as an idea-generating device. The project begins with introductory lectures on the grid schema based on the ancient Greek aesthetic notion of the Golden Section, a rectangular shape, whose ratio of two sides is 1:1.618. On the Grid, wood pieces are positioned, grouped in such a way that comply with aesthetic principles such as balance, axis, vista, symmetry/asymmetry, solid/void, progression, repetition, proportion, scale, etc.

The third project is "Designing with Lynch's Five Components," which requires students to base their designs on the five spatial components of a city introduced by Kevin Lynch. In his book, *The Image of a City*, Lynch (1960) notes:

The contents of the city images so far studied, which are referable to physical forms, can conveniently be classified into five types of elements: paths, edges, districts, nodes, and landmarks. Indeed, these elements may be of more general application, since they seem to reappear in many types of environmental images... (p. 46-48).

Lynch's five components are widely adopted by design professionals in creating spaces, ranging from urban design, architecture, interior design, and landscape. The five components enable designers to form spaces with profound experiential quality that enhance the interaction between the users and the space.

Additionally, some prominent design works created by Le Corbusier, Luis Baragan, Mies van der Rohe and other Bauhaus instructors were introduced to students as inspirations to stimulate design ideas. To design for the second part of the project, students were asked to use a grid schema as the underlying structural system to position elements. The arrangement of elements is to be conducted in compliance with previously introduced aesthetic principles of the students' own choices, as well as Lynch's five space components.

To provide opportunities for mutual-learning, students were required to present their projects to the entire class, explaining their design thinking, process, and spatial formation. During each project presentation, students are encouraged to raise questions and to provide critique on projects by others to facilitate discussions. Furthermore, two types of documentation were required: a reflective essay and a collection of notes, sketches, as a journal of the project, in which students are to comment on each project and to record their learning experience during the design process. It is noteworthy that students are required to compare and evaluate different design methods introduced in the studio, such that the instructor is able to learn from students' feedback and assess the usefulness of each design approach.

RESULTS

1. I used the students' reflective essays as the first-hand data to provide direct information I need to find out what students think about their learning experience in my studio and to try to answer the following questions: Is the teaching of design methods pedagogically desirable from students' perspectives?
2. Do students perform differently between designing with and without a rule-based design methods?
3. What did they reflect upon their own learning experience in the studio?
4. Is the teaching effective in enhancing students' design skills?

1. STUDENT REFLECTIONS ON DESIGNING WITHOUT RULE:

It was intuitive for me to think students would prefer design freedom to restriction, but, surprisingly, there were only four students out of thirty-one who thought designing without rule is very helpful in generating their design solutions. The majority of the class thought that they needed some rule-based guidelines to develop their design from inception to completion. The following table includes an interesting comment suggesting that design rule is comparable to traffic regulations which help drivers; similarly, design rule is actually helpful in making design.

There is another comment on the project which points out that we have to know the rules before we can break them. This reminds me of a chess player who must not only comply with but master the rules before winning the game. Meanwhile, there are students who thought designing without rule is a form of liberation, which sets them free to create designs. As an instructor, care must be taken when facing students with a high degree of self-confidence, because it is crucial for us to guide them without hurting their confidence. It is not uncommon to see self-confident student reluctant to accept advice, as a result, confidence might become a learning hindrance. As a result, it necessitates more time to infuse them with new ideas.

TABLE 1: STUDENT COMMENTS ON PROJECT 1 – DESIGNING WITHOUT RULE (SELECTIONS)

Student	Designing without Rule	usefulness
1	“Designing the project without rule requirement was a total liberation of my imagination from restriction.”	+ +
2	“Great! It was really fun to design whatever we like to do with the project.”	+ +
3	“I think I have got a mixed feeling about the project, on the one hand, I have all the freedom to design, but on the other hand, I am not so sure what to do. Well, it is life, always full of the positive and the negative.”	- -
4	“I think it is a good thing to have the freedom to design, we can try different ideas without violating any rule.”	+
5	“This is a very hard project for me, because I just don’t know where to start with the design.”	- -
6	“I am not so sure if I like to design without knowing the rules, because I think rules might be useful in guiding our design thinking towards creating new ideas.”	-
7	“It is a chaos without rules to follow.”	- -
8	“It is not bad at all; we can try to set our own rules.”	+
9	“It is my opinion that you must know the rules before you can break them.”	+
10	“To set up rules by ourselves is not a bad idea.”	+
11	“I don’t think I like to design without rules, I feel lost, it is like to drive a car in the street without traffic regulations. I think we need rules.”	- -
12	“I think it is challenging to design without rules, however, it provides us an opportunity to think harder.”	+

Note: -- negative; - somewhat negative; + positive; ++ very positive

2. STUDENT REFLECTIONS ON DESIGNING USING THE GOLDEN SELECTION GRID SYSTEM:

Despite the aesthetic significance of the Greek Golden Section in design history, some students thought that it restricted their creativity. Although I introduced the notion of generative capability of an underlying structure and examples of great success during my lecture, some students tend to think differently. It is only natural to see students with a variety of different ways of thinking in the same classroom. At least, viewing from the perspective of education, it is better to have variety than uniformity. After all, students gained exposure to something they have not learned before; the seed might germinate in the future. There are twenty-one students out of thirty-one who thought the Golden Section Grid system was generative in their design and helpful to achieve consistency and harmony.

TABLE 2: STUDENT COMMENTS ON PROJECT 2 – DESIGNING USING THE GOLDEN SECTION GRID SYSTEM (SELECTIONS)

Student	Designing Using the Golden Section Grid System	usefulness
1	“The underlying grid system made my model look orderly, precise, and professional. It has become my favorite project of the entire semester. I am proud to put it in my portfolio. Not to mention, the Golden Section helped to create a space that is rational and aesthetically pleasing.”	++
2	“The Golden Section grid limits our creativity, while designing our space.”	--
3	“The Golden Section grid is a very powerful tool for creating design; it helped me layout elements on my floor plan.”	++
4	“In my design, the grid system was helpful in determining where elements would agreeably work in conjunction with other elements. It helped to balance the different spaces of my design by laying the foundation for a consistent, orderly design scheme.	++
5	“I was shocked to see the Golden Section break down into smaller and smaller quadrants that were to scale with the design components. Those Greek were pretty smart.”	+
6	“I believe using the Golden Section did help create harmony within my space, objects seem much more proportionate to one another and there is similarity throughout the entire model as elements are sized at a relative scale.”	++
7	“It was a tedious assignment, but I think it enhanced my overall design.”	+
8	“Before using the Golden Section, I was placing objects onto a plane without much thought... Once I learned this new technique, I was able to develop a composition that was perfectly organized.”	++
9	“Using the grid was very helpful when it came to the placement of elements and how they relate to on another. Conversely, because of the grid and the ratio of the Golden Section, there are limitations ...”	+
10	“The underlying grid system, and no skew, it forces to think in a way that you haven’t before, to construct a space that you wouldn’t have necessarily created in the first place”	+
11	“I also found that the fact that could be no skew stifled my creativity.”	-
12	“I felt that using the Golden Section restricted our creativity. I found it time consuming and frustrating to use this grid for the entire design.”	--

Note: -- unhelpful; - somewhat unhelpful; + helpful; ++ very helpful

3. STUDENT REFLECTIONS ON DESIGNING USING LYNCH’S FIVE COMPONENTS:

I introduced Kevin Lynch’s five components in my lecture; it was a completely unheard-of idea for my interior design students. To my surprise, it was well received. Some students’ reflections indicate that it was generative to create a flow of movement within the space. It was wonderful to see freshman year students who are able to perceive spatial quality. Other comments suggest that Lynch’s components were so generative that they would apply it to their future design work. As an instructor, it was a truly rewarding experience to see students appreciate the knowledge you prepare for them to learn. Lynch’s five components were considered generative by thirty students out of thirty-one in the class, close to one hundred percent reception, which is also indicative of the powerfulness of Lynch’s design theory.

TABLE 3: STUDENT COMMENTS ON PROJECT 3 – DESIGNING USING LYNCH’S FIVE COMPONENTS (SELECTION)

Student	Designing Using Lynch’s Five Components	usefulness
1	“Kevin Lynch’s five components not only help to create a flow of movement within the space, but they also help to guide and focus the ideas of the designer in order for the creation of space to be cohesive and integrated as a whole.”	++
2	“Overall, I enjoy using Kevin Lynch’s five components while working on my projects because I like to have more structure to my work.”	+
3	“These guidelines marked out specific parts of the space, but at the same time, they allowed for creativity and diversity. I found that using Lynch’s components helped mapped out space very effectively and it challenged me to think about where I was placing pieces, and what their purpose was there...help you think in a move design oriented way, instead of randomly placing objects, it is important to consider their purpose in the space.”	++
4	“Kevin Lynch’s five components really helped me with my final projects. Knowing what they are and how to use them really helped me define my space.... It is something that I will use in the future when designing spaces.”	++
5	“I found that using these components was helpful in creating a space successfully. I feel that they help to bring a space together by using the set of elements.”	++
6	“I think that Kevin Lynch’s five components are genius! I liked having them as a guide for the final project.”	++
7	“It gives the design a jumping off point because you want to think about what to use for the node and then the edge. It helps the idea process a lot. The five components also help make the design consistent.”	++
8	“Lynch’s five components are very helpful when designing a space. It’s almost like it gives you a map of your space. By creating paths, nodes, districts, landmarks, and edges, it gives the space a better sense of unity and completion. This was very helpful when designing my space.”	++
9	“I would say that these components collectively are essential in the formation of a space. While building my own models I found as I layered and add these components individually the design grew in character. I would definitely utilize this concept in future endeavors.”	++
10	“I think it’s important to have most of the elements, but I don’t agree that you need to incorporate all five to make a space successful.”	+ -
11	“I enjoyed learning and designing around Kevin Lynch’s five design components. I felt that while it made setting up the project slightly more difficult, it makes sense.”	+
12	“Overall the studio helped me understand order and proportion of design. I have learned the composition of space has rhythm and order and I will carry these concepts along with future designs.”	++

Note: -- unhelpful; - somewhat unhelpful; + helpful; ++ very helpful

4. STUDENT REFLECTIONS ON THE TEACHING EFFECTIVENESS OF THE STUDIO:

As teaching and learning are inseparable in pedagogy, students' comments on the effectiveness of the studio were crucial for me to conduct self-evaluation. Their comments were able to serve as a sensor of the quality of the pedagogical delivery in the studio. It is encouraging to see the positive responses to my teaching, there were twenty-seven students out of thirty-one who thought that my studio was helpful in their learning design. However, there were some comments which suggest that there was too much work to do in my studio; I would reassess the requirements of the assignment in the future.

As an instructor teaching design, I realize that it is our advantage to have a longer studio time that a traditional class, which enables us to engage in direct interaction during "table critique" with each and every student in the studio. This provides us with an opportunity to get to know a student and their way of thinking; the understanding is indispensable to facilitate an effective communication in a pedagogical activity.

TABLE 4: STUDENT COMMENTS ON THE OVERALL TEACHING EFFECTIVENESS OF THE STUDIO (SELECTION)

Student	Teaching Effectiveness of the Studio	usefulness
1	"Overall, I found this design studio to be very useful in my conception of how and what elements should be placed as well as how to create a composition that is integrated and balanced."	+
2	"I feel that it was a great challenge and overwhelming, it has helped me to improve my design skill and will be helpful in the future."	+
3	"I think the effect of this studio was strong... I think it did help me develop my perception of space and how it is used."	++
4	"This studio really tied everything together for me. It showed me and helped me really understand the concept of space and how to utilize elements within the space. I plan on holding on to all of my notes from this project to use in the future."	++
5	"For the most part, I enjoyed having to follow a set of guidelines. Instead of being able to have a free-for-all on our design, we are forced to learn new concepts and put them to use in our designs."	+
6	"Once I learned this new technique, I was able to develop a composition that was perfectly organized. Each element had a spot and a purpose. I am a person who likes organization, cleanliness, and structure. I think that is part of the reason as to why the studio had such a profound effect on me and my work."	++
7	"The studio leads to a definite broadening of my horizons. It has helped me not only improve my ideation, but has also expanded my knowledge on the notion of elements and composition. Through practicing the application of order to arrange geometric elements I have learned how to successfully develop a unified and attractive space."	++
8	"We should just stick with Kevin Lynch's principles. The Golden section grid does achieve harmony but it's too complicated, design should be about fun and not restricted by a golden section grid."	+ -
9	"I felt this studio was a great learning experience. Like I said previously, you have to know the rules before you can break them... it forces to think in a way that you haven't before, to construct a space that you would have necessarily created in the first place. It helped me understand more greatly the power of placement, and how the relationship between elements affects your design composition."	++
10	"I learned some different things in this class that I didn't think that I would be learning. This class helped me learn how to develop things that are in my head and putting them on paper. This will help me through my career and life."	++
11	"I enjoyed this studio, I also feel that I am more knowledgeable when it comes to the notion of elements and composition now that I have studied and worked with creating space."	++
12	"The studio helped me better understand how a space should flow – and asymmetrical designs are more interesting and poetic, which is what I tried to translate through my design."	+

Note: -- unhelpful; - somewhat unhelpful; + helpful; ++ very helpful

5. THE DISTRIBUTION OF STUDENT ASSESSMENTS OF DIFFERENT DESIGN METHODS:

The distribution of student assessments for the three projects assigned in my studio are shown in the following table.

TABLE 5: STUDENT ASSESSMENTS OF GENERATIVE CAPABILITY OF DIFFERENT DESIGN METHODS (BASED ON INSTRUCTOR'S ANALYSIS OF STUDENTS' REFLECTION PAPER) (N=31)

Project	Not Generative	Somewhat Generative	Generative	Very Generative
1. Design without rule	10	8	9	4
2. Design using golden section grid	6	4	7	14
3. Design using Lynch's 5 components	0	1	9	21
4. Overall assessment of the studio	0	4	9	18

CONCLUSIONS

After attending the SoTL seminar sponsored by Bruce K. Nelson Faculty Development Center at Eastern Michigan University, it became clear that studying teaching and learning is a scholarly activity to be based on innovation, research, evidence, and testing. Teaching practice is no longer a one-way act, in which the instructor only prepares the materials for the students to learn through lectures, assignments, and exams. Rather, it is a bilateral relationship between the instructor and the students, both sides will benefit from a healthy input-output mode of interaction. A successful pedagogical delivery can be more likely to happen when there is a channel that facilitates two-way communications. The reflective essays indeed serve to provide insightful information regarding students' feedback toward my teaching, and their feelings about their learning. By analyzing what they have put down in their essays, I am able to assess the effectiveness of my teaching, and to fathom the degree to which they understand the content, more importantly, to make necessary adjustments to the way I practice teaching in my design studio.

There were 31 reflective essays submitted by the students. Among those, only one student thought Kevin Lynch's five components are somewhat unnecessary to define a space, while the rest consented that Lynch's five components, node, edge, district, path, and landmark, are helpful in designing a space with meaning and purpose. Eight students expressed negative feelings about the Golden Section system, thinking the grid restricted design freedom and creativity, whereas 28 students thought the grid system is useful in achieving harmony, coherence, and consistency in the space.

As to the teaching of space formation, the data indicated that students understood the role elements and composition play in the formation of a space. Students also learned Kevin Lynch's five components and the Golden Section grid system, despite the opinions that some thought the grid system is restrictive to creativity. All 31 students agreed that the project provided opportunities for them to learn new design methods, which were useful to enhance their design capabilities. Kevin Lynch's five components were previously unknown to them, nonetheless, students were able to appreciate and apply these components to their design projects.

It is particularly noteworthy that only a few students thought designing without rule is “generative”; design will not be easier when we are given all the freedom to design. On the contrary, students’ reflections clearly indicate that design methods, such as the ancient Greek’s Golden Section or Kevin Lynch’s five components, serve as idea-generating devices that are instrumental in creating design. Overall, the analysis of the reflective essays in conjunction with the quality of student’s projects provides positive evidence of the teaching and learning activities in the studio. As an educator, there seems nothing more valuable than the encouraging feedback that justifies the pedagogical purpose.

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