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ENHANCING ARCHITECTURE EDUCATION WITH THE USE OF TECHNOLOGY

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Abstract

This paper presents effective ideas for using technology in design studio courses. These courses are based on some small well defined projects during the semester, in each of these projects students will pass through design process contain some clear steps. The attempt of this paper is to integrate technological methods in each stage of the design process. The paper first will outlines (agree on) five main stages in design process starting from research stage until the final jury presentation and then comes the faculties' summative assessment. In each step technological modern methods are introduced. E-learning-podcasting, social media, smart boards, virtual client meeting, 3D cinema shows, coogle brainstorming, design games and finally using smart rubric for grading student's projects will be involved in design steps to enhance students learning. Nowadays faculties have become increasingly committed to making teaching and assessments more effective in promoting student learning. This paper will presents HOW technology CAN enhance student learning in Design Studio courses especially in this era, where the technology not only yielded new tools and techniques, but have shaped a generation of students who seamlessly engage in the online and real world environments in many facets of their lives. Two types of data are considered for analysis: student's level of satisfaction and expectation through surveys, Faculty Personal experience involvement. The paper will suggest a model for the design studio incorporating all the technological interventions in different stages of the design process.

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ABSTRACT

This paper presents effective ideas for using technology in design studio courses. These courses are based on some small well defined projects during the semester, in each of these projects students will pass through design process contain some clear steps. The attempt of this paper is to integrate technological methods in each stage of the design process. The paper first will outlines (agree on) five main stages in design process starting from research stage until the final jury presentation and then comes the faculties' summative assessment. In each step technological modern methods are introduced. E-learning-podcasting, social media, smart boards, virtual client meeting, 3D cinema shows, coogle brainstorming, design games and finally using smart rubric for grading student's projects will be involved in design steps to enhance students learning. Nowadays faculties have become increasingly committed to making teaching and assessments more effective in promoting student learning. This paper will presents HOW technology CAN enhance student learning in Design Studio courses especially in this era, where the technology not only yielded new tools and techniques, but have shaped a generation of students who seamlessly engage in the online and real world environments in many facets of their lives. Two types of data are considered for analysis: student's level of satisfaction and expectation through surveys, Faculty Personal experience involvement. The paper will suggest a model for the design studio incorporating all the technological interventions in different stages of the design process.

KEYWORDS

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1. INTRODUCTION

The design studio has been the centerpiece of architectural education for more than a century and a half. The studio – as a place and as a form of pedagogy – is so central to architectural education that most ... don't even begin to question its authority. (Crosbie, 2007) the practice of teaching design studio changed rapidly as it has following the advent of technologies. This study focused on an architectural design studio course for integration with technological teaching methods and for using technology in evaluating and grading students projects, the paper will suggest a model design studio using suggested technological methods, and will examine the experience of using some of these suggested methods for teaching in design studio course taught in the third year of the Design Bachelor degree program at Jubail University College in the kingdom of Saudi Arabia. In addition to the suggested model of teaching design studio courses, this paper presents an effective method of using technology in design studio courses, it is called the SMART RUBRIC. Most frequently technology is used for electronic exams marking in some disciplines but

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until now no electronic marking for design studio projects. The thrust of this paper is not about software's, and hardware's but rather on addressing the model used in a practical implementation of these methods.

2. OBJECTIVES

The paper aims to find out HOW technology CAN enhance student learning in Design Studio courses and a suggest model for design studio courses incorporating all the technological interventions in different stages of design process are given. The comprehensive suggested model for design studio starting from introducing the project brief until grading the student's projects will be given. The model will be simple model in matrix form. The technological suggested methods are mapped with each design process stage.

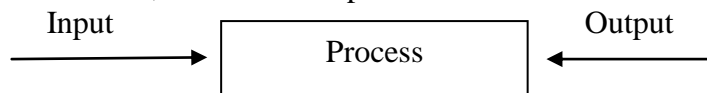
3. METHODOLOGY

This paper presents an effective method of using technology in design studio courses, in teaching and grading student's projects, it examines the experience in design studio courses taught in the third year of the interior design Bachelor degree program at Jubail University College in the kingdom of Saudi Arabia. The paper reports the experience of one academic years, 2014 - 2015. In which two types of data were considered for analysis: student's level of satisfaction and expectation, Faculty Personal experiences. First student's aspiration about how to improving learning and communication in the design studio by the use of technology and various software's was tabulated through survey. Secondly, a survey was conducted to record the faculty's personal experience and suggestions of how to enhance the teaching, learning as well as evaluation in the design studio by using technology in different design stages.

4. DESIGN PROCESS: (background about theories ...)

What is a Design Process?

Design process consists of categorization of different and classifiable activities, which occur, in some anticipated and identifiable consistent order.



A. Established Design processes ...(Through History)

It can be seen that Design process in Architecture as well other related fields have been devised in past. Therefore further in this paper we will try to elaborate on the effectiveness of the already set design processes.

1. By RIBA

Assimilation → General Study → Development → Communication

2. Design Process by Popperian

Program → Analysis → Synthesis → Evaluation → Implementation

3. Creative Process By Bryan Lawson (1980)

Insight → Preparation → Incubation → illumination → Verification

B. Design Process through Live studies

In this paper an attempt is made to analyze the various design stages through selected sample of students work.

i. Student I



Programing
Analysis
Sketch
design
Design
Development
Final
Presentation

Fig.1: Sample of Student work showing design stages

ii. Student II



Research
Concept
Sketch
design
Design
Development
Final
Presentation

Fig.2: Sample of Student work showing design stages

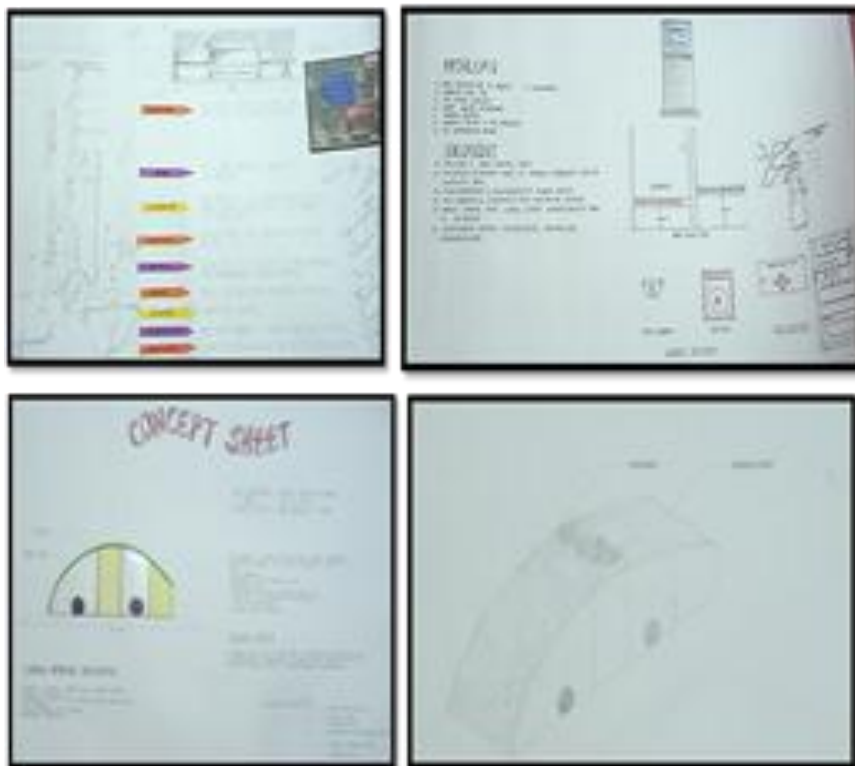
iii. **Student III**



Programming
Research
Sketch
Analysis
Design
Synthesis
Presentation

Fig.3: Sample of Student work showing design stages

iv. **Student IV**



Mind -Mapping
Analysis
Sketch Design
Final
Presentation

Fig.4: Sample of Student work showing design stages

C. Integrating technology in architecture design studio (case studies)

a. Literature Study

i. University of Sydney:

In the paper “learning about collaborative design for learning in a multi surface design studio” a case of university of Sydney was presented in which the presenter had talked about “Multi surface design studio “which is a space featuring a multi touch tabletop placed on regular large table ,an interactive white board (IWB) a wall painted in white paint a aprir of tablet devices each connected to mounted projectors mirroring the tablet interface to each wall. (Maldonado ,2015)

ii. Coogle:

It is a new, collaborative mind-mapping service that is very easy to use. To create a Coggle mind map just sign-in with your Google account and click the "+" icon to start your mind map. After entering the main idea of your mind map you can add branches and you can re-arrange elements just click on them and drag them around your screen. You can invite others to view and edit your mind maps. Mind maps can be downloaded as PDFs or PNG image files. **Features:** Some of Coggle's notable features are real-time collaboration, sharing with Organisations, individuals, or by private link. Using Coggle in Design studio as a tool in Curriculum Mapping, In concept evolving, Productive Classroom environment, Breaking Down Vocabulary/Concepts, Further Explaining Studies, Explaining large amount of content, Easier to share information.

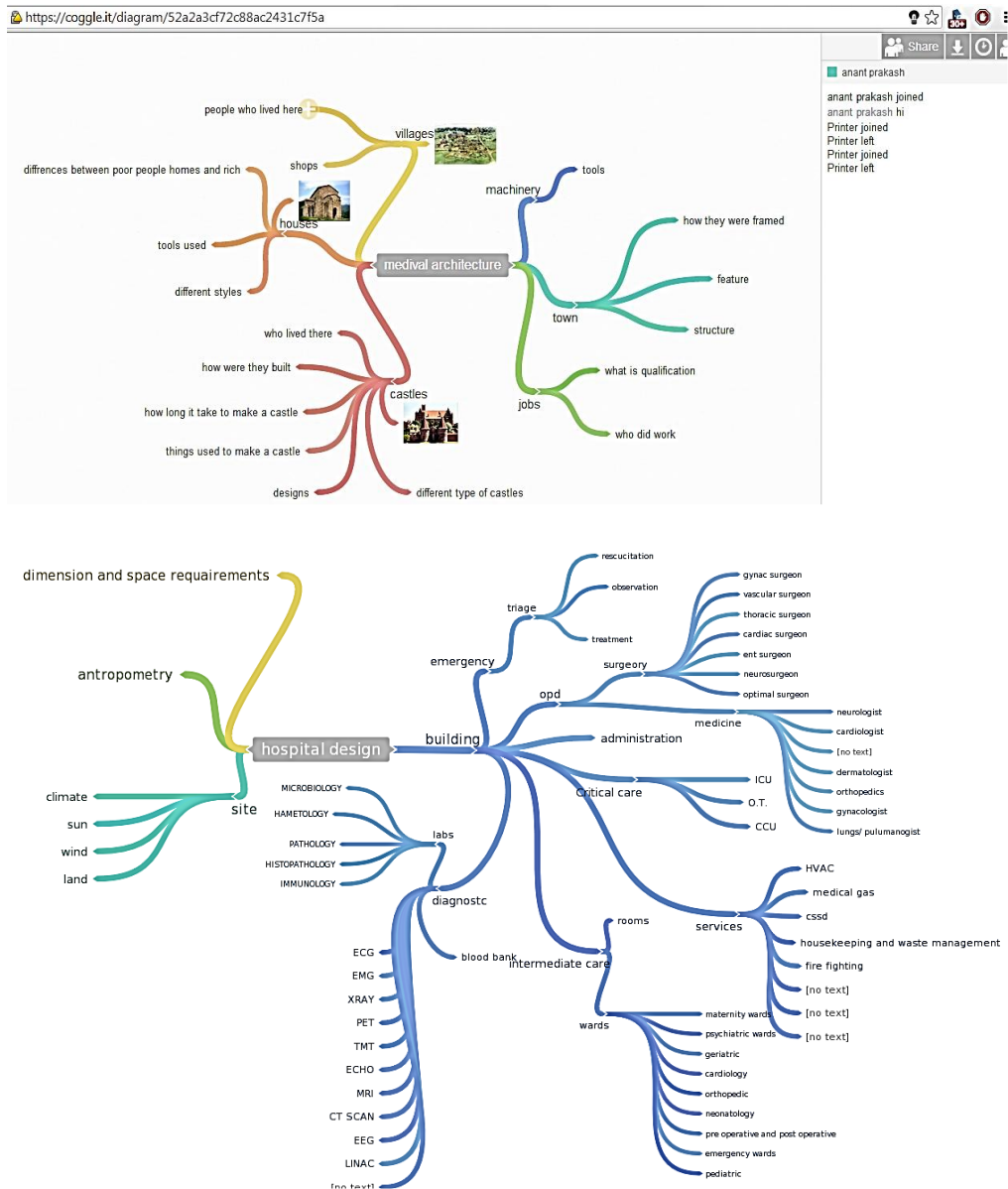


Fig.5: coogle interface showing Hospital Design Project

iii. Northeastern University, College of Art and Design:

The Digital Media Design Studio is a collaborative and interdisciplinary learning environment for creating course-related multimedia presentations, projects, and portfolios. The Studio provides services, technologies, and instructional support for digitizing and remixing various resources, enabling users to create new digital content. The facility has extensive data-analysis capabilities and GIS/mapping and CAD tools that provide users with the ability to work across disciplinary boundaries to build complex simulation models and explore innovative solutions to real-world problems.

iv. KTH Royal Institute of Technology Expands Scope of Architecture Education with 3D Printing:

Sometimes a tool is much more than a tool. A 3D printer, for example, can do more than create tangible versions of digital designs. It can unlock the vast talent of people who will shape 21st century architecture. That's the vision lecturer Daniel Norell has for his students at the acclaimed KTH Royal Institute of Technology in Sweden. He believes that to fully immerse oneself in the practice of architecture, a student must become intimate with the tools that can expand the limits of form and space. "3D printing," says Norell, "is a way to generate knowledge that wasn't available before."

v. University of Ulster, BSc (Hons) Architectural Technology and Management:

It has a project which used screen casting to produce online videos. In many institutions, recorded videos have been used, and continue to be used, to illustrate theories in practice, highlight real examples of graphical representations, and provide access to guest experts, and show experiments, scenarios and situations which would not be possible to show in the classroom (Whatley and Ahmad, 2007). The birth of user-generated video sharing, through sites such as YouTube and Vimeo, has led to an explosion of interest in ad hoc, user-generated content which can be placed online and watched by students on-campus, off-campus, or anywhere worldwide.

vi. University of Cambridge:

The Department of Architecture has a Digital Studio for Research in Design, Visualization and Communication. The digital studio brings together theoretical and practical study focusing on the narrative organization of space and the expressive use of digital media as an aid to design and communications in architectural and city related issues. (Digital Studio for Research in Design, Visualization and Communication, Department of Architecture) was founded in 1998 to stimulate teaching, research and creative practice.

vii. Strathclyde School of architecture, Scotland:

The second year studio has been involved in a project that has involved the use of Virtual Learning as part of the design process. In the project for both of the years, 2003/4 and 2004/5, the main learning objective of the studio was the encouragement of students to work, in teams on a "live" scale 1:1 project, from development through to the production stage. Through the vehicle of a small-scale design project this demanded that students conceive, design and produce part of a pavilion as a joint design project over a short period. The virtual architectural studio is a tool of promotion of collective inductive learning. The internet enable learning outside the institution, classrooms or architectural studios. The face-to-face traditional studio and a modern approach which enriches the architectural education and does not replace it,

the virtual architectural studio based on the Internet as a means of communication and transmission of information. It is a parallel between a real action method, of active participation, of formal learning by practical works and studio projects applied in a real context and a real physical space and a rationing method, of the e—Learning computer—assisted instruction type, which can be called the virtual architectural studio, occurring in a virtual medium, in a parallel reality.

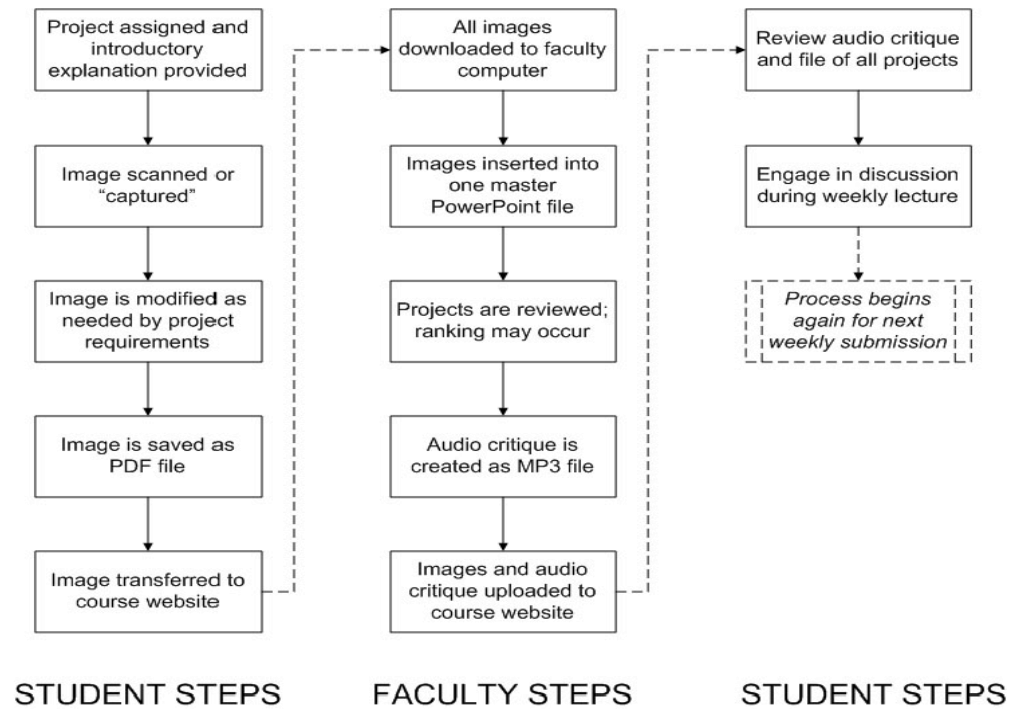


Fig. 6 Steps of Virtual Design Studio

viii. Jubail University College, Department of Interior Design:

Using Smart Rubric for grading students individual performance in design studio course. Students receive a score of 1 – 5 in each of the five categories. The scores are then multiplied by the weight and added to give a score out of the total mark of that phase for each student. The rubric has 2 tables, the first table has the explanation of performance categories, as shown in table 1. And the second table is the performance marking template. Student will upload there submission (E-Submission) and the rubric will finish all the quantitative assessment. (Osman ,2016)

Table 1: Explanation of performance categories marking Template
Reference: The Author

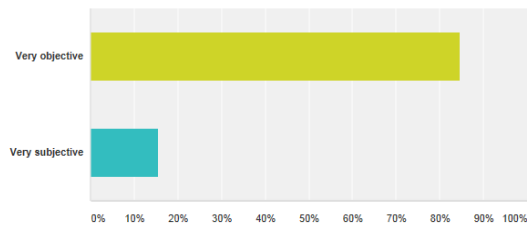
Area of Evaluation \ Ranking and score	Poor and Unacceptable	Marginal	Satisfactory	Very Good	Excellent
	1	2	3	4	5
Layout	The layout must be redone.	In the layout some requirements are missing and grids are missing	All the requirements and grids are present but the layout is partly functional but sizes are missing.	The layout is correct and has all requirement & grids but sizes have to be redefined.	All the Requirements present and layout is functional and sizes are also correct
Furniture Layout	Furniture Layout is missing	Furniture is partly missing and it's out of scale ,clearances missing	Furniture of all the zones present but have to be resized and circulation spaces but clearances not correct	Furniture present ,sizes correct but clearances partly correct	Furniture layout on scale and justified with proper clearances
Flooring Plan	Flooring pattern to be redone	Flooring pattern correct but wrong choice of material ,sizes and levels missing	Flooring pattern correct ,good choice of material but sizes to be redefined ,levels missing	Flooring pattern correct, good choice of material but sizes to be redefined. And levels incorrect	Flooring pattern correct with good choice of material and color and correct sizes and levels present
Ceiling Plan	RCP pattern to be redone	RCP correct but wrong choice of material ,sizes and levels missing	RCP correct ,good choice of material but sizes to be redefined ,levels missing	RCP correct, good choice of material but sizes to be redefined. And levels incorrect.	RCP correct with good choice of material and color and correct sizes and levels present.

Area of Evaluation \ Ranking and score	Poor and Unacceptable	Marginal	Satisfactory	Very Good	Excellent	Weight	Total (multiply weight by score)	Total mark
	1	2	3	4	5			
Layout						0.1		0.5
Furniture Layout						0.5		2.5
Flooring Plan						0.2		1
Ceiling Plan						0.2		1
						Final Mark		5

D. Analysis and discussion:

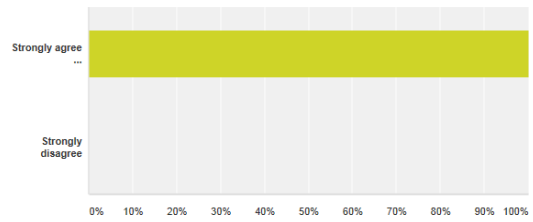
First students level of satisfaction and expectation are measured, a survey was conducted as shown in figure 1 below, for a class of 15 students, 13 responses were received, 61.5% of the students agreed that the grading procedures for the course (using smart rubric) was very fair, 92.3% agreed that it has a realistic definition of excellent performance, 84.6% agreed that it is very objective, 92.3% stated that it evaluated students work in a meaningful and conscientious manner. Also students were able to self-evaluate their work.

How would you characterize using digital Library for research Phase?



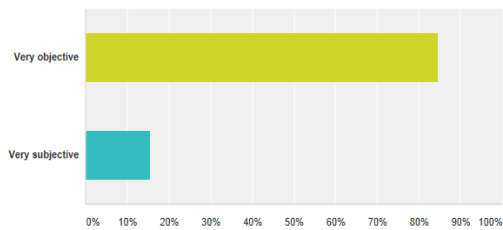
Answer Choices	Responses
Very objective	84.62% 11
Very subjective	15.38% 2
Total	13

Very good feedback was given to me via social Media and podcasting?



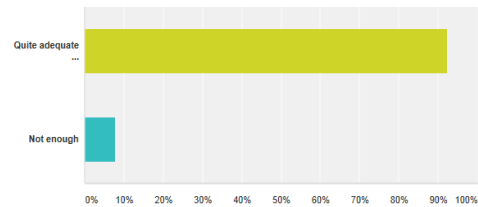
Answer Choices	Responses
Strongly agree	100.00% 13
Strongly disagree	0.00% 0
Total	13

Very sufficient instructions was given through recorded videos?



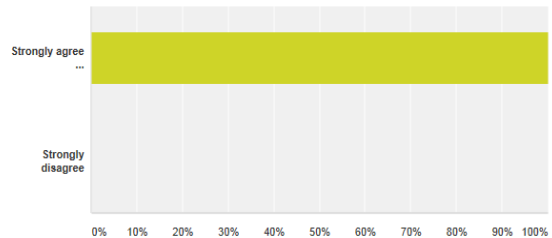
Answer Choices	Responses
Very objective	84.62% 11
Very subjective	15.38% 2
Total	13

How would you characterize using BIM for preliminary Design Phase?



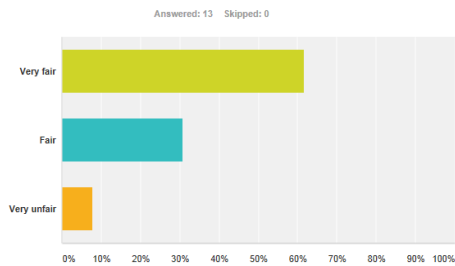
Answer Choices	Responses
Quite adequate	92.31% 12
Not enough	7.69% 1
Total	13

3D printer can enhance students' performance in Designing and imagination of 3D complex.



Answer Choices	Responses
Strongly agree	100.00% 13
Strongly disagree	0.00% 0
Total	13

The grading procedures for the course (using Rubric) were:



Answer Choices	Responses
Very fair	61.54% 8
Fair	30.77% 4
Very unfair	7.69% 1
Total	13

Figure 7: Student satisfaction Survey.
Reference: Authors



Figure 8: Faculties Survey (Design Process).
Reference: Authors

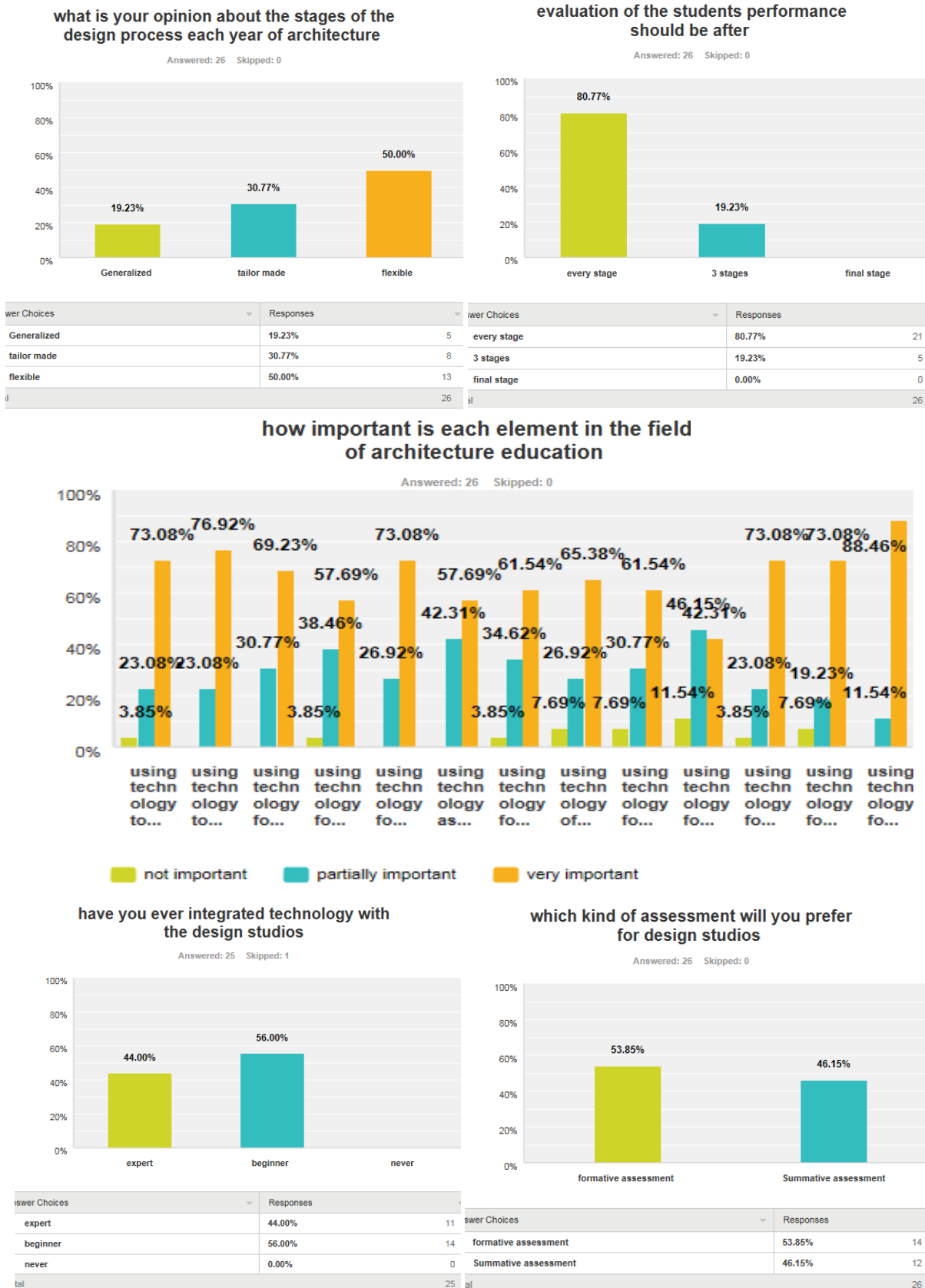


Figure 9: Faculties Survey (using technology in studio).
Reference: Authors

E. Synthesis

a. Model for Design Process:

Based on our analysis of the various established design processes and the examination of some of the design projects along with the opinion of the faculties involved the design studios we have established and limited our design process into following five stages.

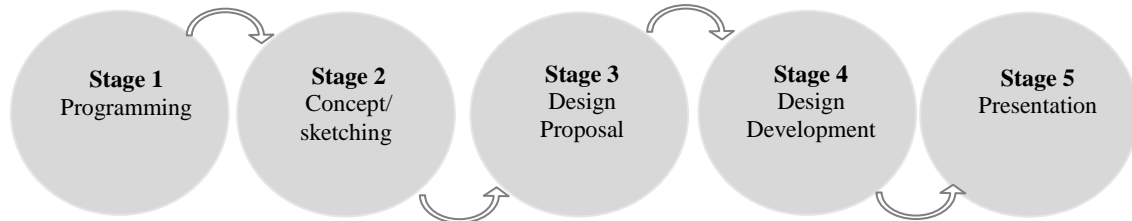


Figure 9: Design stages

b. Mapping Thecnological Methods and Design Process Stages, (Suggested Model)

Table 2: Suggested Model for Design Studio Course, Reference: The author

Detailed steps	Digital research studio	Tabletop	Google	BLM	Social media	Podcast	3D printer	Paperless Studio	3D Cinema	Sketchup	CAD	MAX	Smart Rubric
Stage 1	Data collection	●											
	Programing	●											
	Client meeting				●	●							
	Case study	●			●								
	Site Analysis				●								
Feedback						●						●	
Stage 2	Brain storming	●	●		●				●				
	Geometrical Analysis				●						●		
	Zoning										●		
	Circulation										●		
Feedback		●			●	●						●	
Stage 3	sketches							●		●			
	Preliminary design				●		●	●		●			
	Evaluation of alternatives											●	●
	Feedback		●				●	●					●
Stage 4	Feedback		●		●	●							●
	Presentation				●					●	●	●	
Stage 5	Drawings Presentation				●					●	●	●	
	Model making						●					●	
	Feedback		●			●	●						●
Final assessment												●	

5. CONCLUSION

- a. By analyzing, the design process established through history, personal experience in the design studios as well as faculty survey we devised the five major architecture design stages for studio.
- b. By referring to the methodology around the globe, which integrated technological methods in design, studios the paper lists certain technologies that were successfully use to have effective teaching learning and transparent evaluation.
- c. The above listed technologies were discussed with the students and faculties through the survey .Their Suggestions were evaluated and used to formulate the suggested model.
- d. The proposed model presents the technologies which can be integrated in each stage

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- Maldonado Roberto, Goodyear Peter (2015), Learning about Collaborative Design for Learning in a Multi-Surface Design Studio.
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