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Digital Studio vs Conventional Studio in Teaching Architectural Design Process

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Abstract

Design is a complex and open process. A designer starts the idea from an abstract form to a final idea in the form of a product to solve the design problem. At the early design stage discussion occurs regularly between students and lecturer to improve the design quality. The selection of a proper media for presentation is important in the design process to make sure the media selected has strong visual impact. CAD technology gives opportunity for students to use three dimensional digital models in the design process to develop good design concept. The digital model can decrease the aspect of abstraction on a design idea. The main objective of this study is to compare the development in the design activities between students that use digital studio and students that use conventional studio. The study had been done for four years on diploma architectural students at Port Dickson Polytechnic. All the semester six students had been selected as the sample for this study. The quasi experimental method was used to study the effect of integrating digital studio in the design process. The research outcome showed that significant difference between digital model product (M=80.2) compared to conventional product from the aspect of creativity, t(238) = 9.198 significant. This study shows that integration of digital studio in the learning process of design modules in polytechnic provides learning environment that ignites students to produce creative architectural design product.

Key-word: - design process, digital, conventional, architecture

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1. Introduction

Designers start from something that is abstract and has progressively developed a problem that can be produced in the form of product. According to Lawson (2006), the architectural design is a process in which architects create spaces, places and buildings that have a major impact on the quality of human life. For this study the design process is a systematic process that has several levels to produce new products that can be evaluated physically and give benefit to human life. According to Kalisperis et al. (2008), the main problems faced by students in the design process is the limited ability of conventional media to produce a good visual presentation of more complex space. The conventional media also does not have capability to evaluate the performance of any design space in a real situation. The past experiences of the researcher showed that the lack of sensitivity of the student to manipulate the elements such as light, scale, finish and proportion in the design process. Students gave high priority to the production of accurate drawing and to the selection of graphic techniques suitable for use in producing interesting drawings. More times and energy had been given in producing presentation drawing rather than producing creative design products. According to Kalisperis et al. (2008), another problem is in the conventional method the design activity relied heavily on a static graphic image without taking into account the effect of movement in a space, the effect of light in a space and the effect of finishing material in a space. The visual effects by moving image can facilitate designers to create the effective and creative interior design (Kalisperis et al. 2008). Computer animation can help the designer to study the interior space based on the effect of light, color, texture and scale. According to Kalisperis et al. (2008), one of the greatest advantages of AutoCAD is its capability to understand the weaknesses of the design of buildings and spaces before the building is constructed.

2. Computer Simulation

Computer simulation can be described as a method involving the use of a computer to replicate events, processes or situations into learning activities (Michael 2000). Integration of computer simulation in the architectural design process can help students to study the physical impact of building finishes and colors in the actual situation on the building designed using CAD software. Two methods based on CAD technology that can be used to help students in simulation activities. 3D digital models can help students to carry out static simulation to study the effects such as texture and finishes on the architectural design. The computer animation can be used in performing a dynamic computer simulation. Computer animation being integrated in the design process can also help students to assess the quality of space in terms of movement. The main advantage of using computer simulation in the design process is that it can help students to quickly assess the quality of the designed shape and space. If computer simulation is integrated into the design process in polytechnic, students are expected to produce a creative design product. Integration of CAD technology in the design process can improve the quality of polytechnic education in architecture, especially for learning architectural design process through design module. Integration of CAD technology can help students creating new ideas in architectural design process.

3. Research Strategy

For the last eight semesters part of the students who attended design module class in semester six were required to use CAD technology in the design process. This study session was held from January 2011 to June 2014. This study was made at Port Dickson Polytechnic involving 240 students. This study is a quantitative study to examine the effect of the digital studio in the design process for producing creative design product. For the digital studio the methods for digital design are digital sketching, digital rendering, digital drafting and digital presentation. Quasi-experimental methods used to study the effect of integrating CAD technology in the design process. For each module in a three week periods all students involved in the retrieval of designs' information and analysis in respect of the project given. For twelve weeks remaining students were asked to participate in design activities. To see the effect of integration of CAD technology in the design process the students were divided into two groups in each semester. 15 students received the highest grade in the AutoCAD class were asked to perform design process with

the integration of CAD technology and the remaining 15 students were asked to carry the design process in conventional method. To facilitate integrating CAD technology in the design process students were asked to use CAD laboratory for design module. The rest of the students who carry the design process in conventional method, the design module were implemented in the third year design studio. Throughout the research were carried out, the type of projects made by students is a public utility buildings with less than 4 levels such as child care centers, automotive centers, museums, craft centers, sports centers and recreational sea centers. The students' final design products for each semester were evaluated by two lecturers. To create the scenario of using digital studio in the design process CAD laboratory being used as design studio for those students that integrating CAD technology in the design process. CAD laboratory brought the feeling of digital design environment in the digital studio to the students. There are four activities in the design process for this research which are design information analysis, synthesis, simulation and determination of the final product. Analysis of design information is an activity to analyze the information derived from information search activities to provide design information to be used in the design process. Next activity is the synthesis activity. During this activity the ideas being triggered in the preparation of preliminary alternative ideas before decisions are made in the preparation of final design ideas. Simulation activities are activities to produce final design ideas from the selected alternatives. A simulated activity is to provide a real situation in the design process. For this study building simulation were made using 3D Studio Viz and Lumions.

4. Findings

In assessing students' skills on the synthesis stage in the design process with the integration of CAD, studies have also been made to determine whether students who use CAD technology in the synthesis activity make more changes from 2D to 3D when compared to conventional methods in the synthesis stage. The findings are shown in Table 1. Thus, the students involved in digital design methods have a higher mean to change from the initial idea of 2D to 3D compared to the conventional method.

Table 1 Mean for changing initial idea from 2D to 3D

Session	*No of Students*	*Mean for Treatment Group*	*Mean for Control Group*
Jan 2011	*30*	*1.95*	*4.10*
Jun 2011	*30*	*2.05*	*3.85*
Jan 2012	*30*	*2.15*	*4.05*
Jun 2012	*30*	*2.10*	*3.45*
Jan 2013	*30*	*1.95*	*3.65*
Jun 2013	*30*	*2.20*	*3.85*
Jan 2014	*30*	*2.10*	*4.05*
Jun 2014	*30*	*2.05*	*3.75*
Average		*2.07*	*3.84*

In assessing students' skills on the simulation activity during the design process with the integration of CAD, analysis had been made to determine whether students who use CAD technology do more simulations than students using conventional methods. The findings are shown in Table 2. Thus, the students involved in digital design methods have a higher mean in simulation activity as compared with conventional methods.

Table 2 Mean for simulation activity

Session	*No of Students*	*Mean for Treatment Group*	*Mean for Control Group*
Jan 2011	*30*	*2.00*	*3.95*
Jun 2011	*30*	*2.15*	*3.65*
Jan 2012	*30*	*1.95*	*4.15*
Jun 2012	*30*	*1.50*	*4.05*
Jan 2013	*30*	*1.65*	*3.90*
Jun 2013	*30*	*2.15*	*3.85*
Jan 2014	*30*	*1.95*	*3.75*
Jun 2014	*30*	*1.85*	*4.15*
Average		*1.90*	*3.93*

This finding shows that students who undergo a digital design process made more simulations than students who undergo conventional design process. In conclusion, the descriptive analysis showed that the integration of CAD technology in the design process helped students at the synthesis and simulation activities. Inferential data derived from assessment of student outputs in the synthesis, simulation and final products in the design process. This data is used to determine the impact of CAD technology integration on student products in the design process. In determining the effect of integrating CAD technology in the synthesis activity, studies had been made to determine whether there are differences between initial ideas generated during the synthesis stage integrated with CAD technology compared with the initial ideas generated in the conventional synthesis activity. Inferential data show a significant difference between the initial ideas generated at the synthesis activity integrated with CAD technology (M = 82.3) compared with the initial ideas generated during the synthesis stage in the conventional method (M = 71.2), t (238) = 13 410 significant. In determining the effect of CAD integration in simulation activity studies have been made to determine whether there are differences between the ideas generated at the end of simulation technology integrated with CAD compared with the ideas generated at the end of a conventional simulation. Inferential data shows a significant difference between the ideas generated at the end of the simulation with CAD technology integration (M = 81.8) compared with the ideas in the conventional simulation (M = 71.63), t (238) = 9992 significant. In looking at the impact on the integration of CAD technology into the design process in producing creative product researchers looked at the effect of this integration based on the CPAM model. The results showed significant differences between the final product produced by the integration of CAD (M = 80.3) compared with the final product produced by the conventional design process (M = 71.3) in terms of creativity, t (238) = 9198 significant. Inferential data also showed a significant difference between the design process integrated with CAD technology (M = 82.3) compared with a conventional design process (M = 74.1) in producing unique product, t (238) = 11,090 significant. The findings also showed significant differences between the design process integrated with CAD technology (M = 78.0) compared with a conventional design process (M = 71.3) in producing practical product, t (238) = 6901 significantly. The study also showed a significant difference between the design process integrated with CAD technology (M = 81.5) compared with a conventional design process (M = 72.0) in producing high details product, t (238) = 11 076 significant. Overall findings show that there is a positive effect in integrating CAD technology in the design process to produce creative product. The comprehensive study at the Port Dickson Polytechnic for eight semesters with design activities carried out by digital methods helps the students to produce more creative products compare to conventional design methods. Digital studio has the capability to help the students in producing creative during design process.

5. Product Review

The results showed significant differences between the products produced by digital method compared to the products produced by conventional methods. CAD technology helped the students to produce designs' products with higher creativity. Some of the final design products produced by the students as a result of this study are shown in Figure 1 and Figure 2.

Figure 1 Design by treatment group

Figure 2 Design by treatment group

Conclusion

This study shows the integration of CAD technology in the design process increase the number of ideas in the synthesis activity and increase the number of simulation in the simulation activity. This study also demonstrates the use of a digital studio in the design process was to build an environment to enhance students' desire to gain more knowledge and design ideas. CAD technology had been able to increase the students' abilities in producing good design ideas and rapid changes of design ideas from 2D to 3D. The integrated design process not only increases the number of solutions for design problem, but was able to improve the quality of the design solution presented by the students whether at the synthesis level or in the simulation level. The success of the product in the design process depends on the creativity of the product. To study the characteristics of creativity in determining the success of the design product based on the CPAM models consists of unique, practical and high details. Architectural design process is systematic activity to produce creative products. The integration of CAD technology in the design process had been proven through this study can help students to produce creative architectural product. CAD technology can help students in stimulating creative ideas in during the design process. Conclusions can be drawn for this study that the use of CAD technology in learning architectural design process help students in producing creative products, the CAD software help the students to construct the digital model easily, especially for synthesis and simulation activities in the design process, the use of CPAM model as a basis to evaluate the creative design product enhance the quality of product evaluation and the use of a digital studio in the polytechnic provides the infrastructure that can stimulate students to produce creative design product.

References

Besemer, S.P. & Treffingger, D. (1981). Analysis of creative products: Review and synthesis. Journal of creative behavior. 15, 158-178.

Beqir, M. 2007. *Perfect architectural projects created with 3ds max*. (online) http://www.youtube.com/watch?v=d96arUowsmo. (25 Februari 2014)

Colakoglu, B dan Yazar, T. 2007. An Innovative Design Education Approach : Computational Design Teaching For Architecture. *METU JFA*

Design Folio. 2010. *1st Tunas Politeknik Port Dickson*. Ed 1. Unit Seni Bina Polipd.

Dong, W & Gibson, K. 1998. Computer Visualization: An Integrated Approach for Interior Design & Architecture. 1 St. Ed, USA: McgrawHill.

Kalisperis, L.N & Pehlivanidou – Liakata, A. 2008. Architectural Design Studio : Digital and Traditional. *International Workshop Proceedings*. Leuven, Belgium. 13 – 14 November. pp 73 – 81

Lawson, B. 2007. CAD and Creativity: Does the Computer Really Help? *ISAST*,Vol. 35, No. 3, pp. 327–331.

Michael, K. Y. 2000. A Comparison of Students' Product Creativity Using A Computer Simulation Activity Versus A Handson Activity In Technology Education. *Virginia Polytechnic Institute. Doctorate Dissertation*. p 14 – 15.

Nurul Huda Mohd Raji. 2006. Kajian Ke atas Kurikulum Seni Bina. Pembentangan kertas kerja di mesyuarat pembangunan kurikulum kursus - kursus di Jabatan Kejuruteraan Awam, Politeknik - Politeknik Malaysia. Bayu Beach Resort, Port Dickson. 5 - 9 Jun.

Salman, H.S. 2004. CAAD Impact on the Early Stages of the Architectural Design Process.*Thesis (MSc)*. University of Wolverhampton.

Sanders, K. 1996. The digital architect : a common sense ; guide to using computer technology in design practice. 1st ed. New York : John Wiley & Sons. Inc

Tokman, L.Y & Yamach, R. 2005. A Computer Aided Model for Supporting Design Education. *World Academy of Science, Engineering and Technology*. September. pp 44-47