

COMPUTER – AIDED LABORATORY MODULE FOR DRAFTING TECHNOLOGY AT STATE UNIVERSITY

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ABSTRACT

This study assessed the competencies of the Architectural Drafting Students using Computer Aided Design CAD at Surigao del Sur State University, Cantilan Campus in order to propose an enhanced laboratory module. The purposive sampling method was used in this study with a survey questionnaire, CAD application skills test and informal interviews were also utilized to determine the CAD competencies of the drafting students. Factors considered were based on: profile of respondents in terms of age, gender, parent's educational background, socio-economic status of the parents, computer experience and exposure, acquisition of basic computer skills. In terms of computer knowledge/ skills/ competencies, the respondents were asked to rate themselves as to their mathematical and computational skills ability, operational skills, critical thinking, mindsets and training habits, problem solving analytical skills and to rank identified difficulties encountered during instructions. Results showed that 44 percent of the students with 17 years of age were male. The parents' occupation were farmers with the educational attainment of a high school graduate and a monthly income between Php 10,000 to Php 21,000.00. Other results indicated their computer experiences and exposure were learn during high school and in the internet café wherein the skills achieved through curiosity and exploration. Furthermore the respondents perceived their mathematical and computational skills with verbal rating of moderate and less moderate besides in their critical thinking, mindset and training habits and problem solving analytical skills obtained a verbal rating of less moderate, likewise the difficulties encountered during

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CAD instructions were ranked and it was found out that personal crisis was the most difficult encountered by the respondents, followed by tired or stress due to workloads at school, and the third was laziness. Based on the findings of this study, the CAD module was designed as an alternative solution to these difficulties.

Keywords: Computer – Aided Design, competency, Drafting, Performance, Interactive Module

INTRODUCTION

Today the potential employers want graduates to be a high quality professional which is very unlikely to be accomplished in a short training course. The general trend seems to be that students in the future will spend even less time in formal classrooms, instead more opportunities will be given to the students to study at their any convenient time and place. Teaching and instructional design are in many ways very similar. In both, decisions about which instructional methods to use are made given the instructional outcomes that are to be attained and the conditions under which instruction are to occur. Teacher and designers make instructional decisions and teachers are often in a better position to adapt instruction to changing instructional conditions. Furthermore, in teaching, while instructional decisions are often made during lesson planning, it is highly likely that decisions will also be made on the spot by the teacher once instruction has begun. There are also instances, that for a variety of reasons, there has recently been an explosive increase in the number of occasions, instruction is given with no teacher present.

In today's world, the days of hand drawing for final drawing are all but over. Universities no longer require the use of protractors and compasses to create drawings, instead there are several classes that focus on the use of CAD software. Jacobson (2001), found out that the exercises in descriptive geometry typically utilized in undergraduate structural geology courses are quickly and easily solved using the computer drafting program AutoCAD. The ease of the computer constructions reduces frustrations for the student and provides more time to think about the principles of the problems. In this regard, instructors and professors need to enhance their individual skills in CAD in order to be more equipped and be competitive in their field of profession.

The subject of this study is to ascertain that competence of drafting students to use CAD and to establish the difference with the approach of using enhance CAD laboratory exercises manual/ module as guide that differs in relation to architectural program in scope. In the Philippine education system, there are disadvantages with updated training and facilities but

the Filipinos are very resourceful that could arrive at the end product to compete with the global standards. Schools, colleges and universities are improving due to modernization, using courses in their curricula, especially with the technological schools. In the case of the Surigao del Sur State University (SDSSU) Cantilan Campus, Bachelor of Science in Industrial Technology (BSIT) and Bachelor of Technical Teacher Education (BTTE) offers Architectural Drafting as one of the shop majors, CAD and the use of its software was integrated to enhance the skills of the drafting students computer software as tool for drafting and designing. Some instructors and professors who have laboratory subjects has to integrate Computer-Aided Instruction application and some program intended exclusively for Drafting technology to produce better graduates and later on successful architectural draftsmen, CAD operator and designers to match the needs of existing or potential areas in private practice, employment and even the multi-national firms.

The Surigao Del Sur State University met a lot of problems, with students enrolled in Architectural drafting course. It is of great importance to look into the impact of CAD instruction to drafting technology students to guide them. This makes learning AutoCAD a difficult task for drafting because books are not enough to suffice the need of the student. There are also those students who do not have any lesson and experienced using computers or personal computers. Thus, those who are experienced can easily be overwhelmed, which means that there is a greater disparity between the performance of those who have knowledge in using computers and those without. The computer unit that is available in the drafting laboratory is outnumbered by the number of students. The status of the drafting technology program at the university are conducted from time to time and the results could pave the way to enable the university to provide the necessary measures in meeting these challenges.

THEORETICAL BACKGROUND

The Computer Aided Drafting in Surigao del Sur State University, Cantilan campus combines computer-aided drafting with conventional methods of graphic communication to solve drafting and basic design-related problems. The program balances classroom theory and hands-on applications in a laboratory environment. Students create a variety of drawings of various sizes on different drawing media using conventional and computer-aided drafting software at different version. If one has a tough drawing ability, visual aptitude and attention to detail, studying Computer Aided Drafting and Design may fit his/her skills and interests.

CAD originally meant Computer Aided Drafting because in the early days CAD was really a replacement for traditional drafting board. Now, CAD usually means Computer Aided Design to reflect the fact that modern CAD tools do much more than just drafting. CAD is sometimes translated as “computer-aided drafting”, or a similar phrase. Related acronyms are CADD, which stands for “Computer-Aided Drafting and Design. CAID for Computer-Aided Industrial Design, CAI, for Computer Aided Instruction and CAAD is for Computer Aided Architectural Design”, all these terms are essentially synonymous, but there are little or slight differences in meaning and application. CAM (Computer-Aided Manufacturing) is also often used in a similar way as a combination of CAD/CAM.

This study is anchored on the CAD/CAM theory and practices. Ibrahim Zeid (2010) advocated that expert’s knowledge-based system have made a great deal of progress in this regard that develop a tool that leads to better technique of an efficient teaching – learning process. Efficient learning in the sense that it help the instructor to impart the topic to the student easier and clearer for better understanding. According to Bill Martin-Otto, (2012), CAD/CAM Evangelist, Lenovo, more than 82 percent of CAD/CAM users are either using advanced techniques like real-time rendering and simulation or are interested in doing so.

In CAD/CAM, both design and manufacturing are tightly integrated into a continuum of activities. Continuing the integration, we have Computer Integrated Manufacturing (CIM), which includes CAD/CAM, but also extends to embrace the business functions of a manufacturing firm. The manufacturing support system contains procedures and systems used to manage production and solve the technical and logistical problems associated with designing the products, planning the processes, ordering the materials, controlling work-in-process as it moves through the plant, and delivering products to customers. Product design and its associated use of computer-aided design/computer-aided manufacturing (CAD/CAM) systems, represents one of the most important aspects of the manufacturing support system.

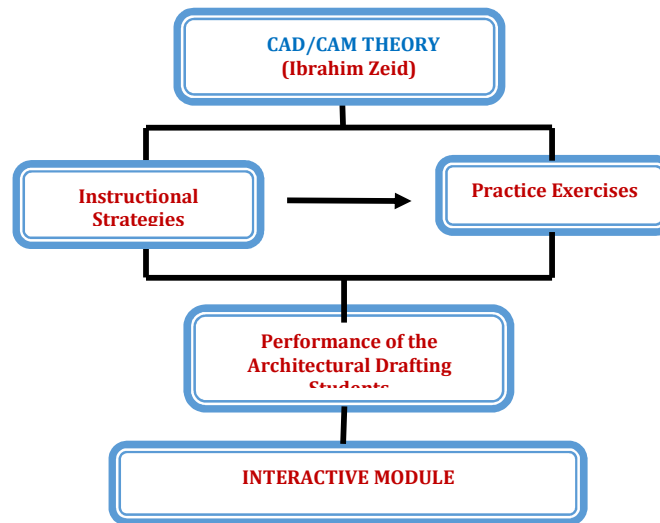


Fig.1. Theoretical Framework and Schematic Diagram

In this unit a discussion and definition of product design and CAD are given, where an analysis of the design process and the actual application of computer-aided design principles are highlighted. CAD system hardware is reviewed before a general introduction to CAM, together with its relationship with CAD, and how it fits into the infrastructure of CIM. Because of science and technology, there was the introduction of computer technology, thus new teaching-learning techniques are explored such as the use of computers in the teaching learning process. Research shows that the use of computers, plus the conventional method of teaching guide to better accomplishment and retention, affirmative learning attitude among students and faster understanding of concepts. Because of this application of computers in the classroom has turned out to be more and more apparent, more so that the rapid development of this technology has made multi-media ready computers quite common and relatively economical nowadays (Sasing, 2001). Another study which is conducted by Arenasa (2007) and Garces (2008) and also Pantallano (2006) suggest that the idea of manifestation as a part of the teaching strategy give more emphasis to the topic.

Bugna (2004) also cited in his study that the application of courseware meant a class seeing a presentation that required an audio tape player and either a filmstrip projector or a slide projector. Later, multi-media came to mean a larger audience seeing and hearing more complex presentation that required several audio tape players, slide projector, and movie projectors all under the control of a special purpose computer. He further said that modular approach is one of the teaching strategies used to facilitate learning. Interactive module is a self-paced type of education technology that has the advantage of acquiring knowledge using

personal computer. In a traditional approach of teaching, the preparation of visual aids and devices such as charts, mock-ups, cards, pictures, models, and others requires much time and effort. In this case, Bugna (2004) suggest that students are trained in the traditional way of preparation in the shop project making, experiment, activity, and others, which is very common practice in the shop. This happens due to lack of instructional facilities found in the shop. As a result, learning took place through self-activity. It is through continuous individual practice on learned subject matter that more learning takes place. If learners were given more practicum exercises learned in the class they would gain knowledge of the new concept being taught. (Garcia, 2003, Pantallano, 2006 and Garces, 2008)

CAD software literacy can help graduates develop knowledge and skills that they can use to pursue career opportunities in a variety of entry-level positions in various fields involving drafting and design. Drafting fields include, among others, mechanical drafting, piping drafting, architectural and construction drafting, civil drafting, interior design, illustration and design detailing.

STATEMENT OF THE PROBLEM

This study assessed the competencies of the Architectural Drafting Students using Computer-Aided Design (CAD) at Surigao del Sur State University, Cantilan campus, during the academic year 2012-2013 in order to propose an enhanced laboratory module.

Specifically it sought answers to the following:

1. What is the profile of the respondents as to: age and gender, computer experience/exposure; socio-economic status of the parents.
2. As perceived by the respondents, what are the competencies in terms of: computer knowledge/skills; acquisition of basic computer skills; mathematics and computation skills; operation skills; critical and analytical skills, mind sets and training habits; problem solving analytical skills ; and performance based on the researcher administered test.
3. What are the difficulties encountered by the students in using CAD application?
4. Based on findings, What CAD laboratory module could be proposed?

METHODS AND MATERIALS

The descriptive method was used in this research study. This study was conducted in order to propose a laboratory manual using CAD-Based Laboratory Exercises in Drafting Technology subject in Surigao del Sur State University, Cantilan campus as to acceptability during the second semester of the academic year 2013. This type of research method is a fact-finding

study with adequate and accurate interpretation of the findings and can be classified as a descriptive research.

The flow as shown in a Diagram (Figure 2) categorizes the inputs, process of analysis, and the output for the study. The input reflects the profile of the students, competencies in the computer knowledge and skills, difficulty encountered during CAD instruction by respondents, and their performance. The process analyzes the inputs through the administered questionnaires, informal interviews and appropriate statistical observations. The expected output will be the development of the proposed computer-aided laboratory module for the Drafting Technology

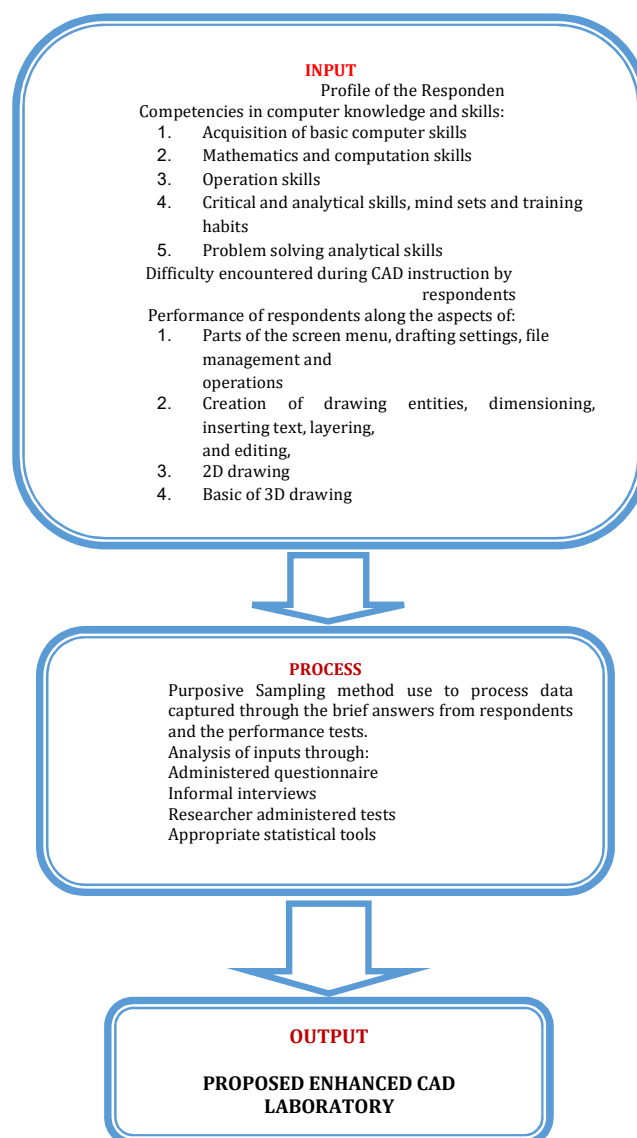


Fig.2. Flow of the Study

The research instruments used in the study were the questionnaire and checklist. The questionnaire served to supply the data needed for the problems of the study. There were two (2) sets of questionnaires to be answered by both BSIT and BTTE drafting students. The questionnaire is adapted from the unpublished book of Mangura, Michael T. (2011)

Questionnaire 1 was used in gathering data on the profile of the student-respondents in terms of age and gender, it also include the socio-economic status of the parents of the respondents in terms of their occupation, educational attainment and income. The respondents checked specified blanks on the category they belong in terms of their knowledge/skills as to computer experiences/exposures and the acquisition of knowledge in computer program. They also checked the different skills where the respondents inclined like in Mathematics and Computation, Operational Skills, Critical Thinking, Mindset and Training Habits, and Problem Solving. In order to determine the difficulties encountered by the respondents, they ranked it from the most difficult to the less difficult. Questionnaire two (2) was utilized to find out the performance of the respondents on the CAD application test and CAD performance test. The respondents were made to answer and the results were tabulated and computed and these will be the basis for constructing a Module.

RESULTS AND DISCUSSION

On personal background or the respondent's majority were 17 years of age and mostly were male. Ponce (2005) supported this findings, s study revealed that more male students were inclined to take the drafting course. This implies that male are more interested to this course and can easily adjust to the language of new Technology.

It also reveals that there was a declining of number of students in the course. This is due to the fact that once they passed the National Assessment Competencies during their second year as conducted by TESDA, some of them were indulge for a job. On the other hand, some students shift to the other course hence they find it very difficult especially on higher shop subject involving AutoCAD and architectural graphics on house planning.

The occupation of the parents were farmers. Majority of the occupation of the parents of the respondents were farmers. This result stresses that being a farmer is not a hindrance in pursuing their children to college. This simply means that as a farmer he can sustained the needs of his children especially when education is concerned. As observed from these results, mostly of the educational attainment of the parents are high school graduate. This would mean that their parent are very interested of sending their children to school besides of their way of life and education as well. Lareau (2003), in her

study recommended that parents should continue to improve on their education levels through adult education program. The combined income of the parent was P21, 000.00. This would mean that the income of their parent did not affect in sending their children to school, based on the findings. Collins (2003), recommended that children of this low income parents should be given scholarship by the government. He suggested further that children from low socio-economic backgrounds should try to school because schooling eventually has a redeeming effect on their poor plight.

Perceptions of their competencies in terms of identified variables

On computer knowledge and skills the respondent had their experiences/exposure during their high school days. Mostly they acquired their knowledge in computer programs through curiosity and exploration. In mathematics and computation the first year respondents were **moderate** in all skills, while on second year respondents were also **moderate** whereas, in the third year respondent mostly were **less moderate**. These findings explained further, that majority of the student-respondents were only exposed on computer technology during their High school days. High school now a days geared toward the application of basic computer technology. Most of the respondents were also exposed into using computers at the internet café, where in information are easy to retrieve using web pages. The student-respondents acquired their knowledge through curiosity and exploration. This would mean that the student-as they grow older tend to be curious especially on technologies. The results cited further, that the third year student-respondents had a **less moderate** descriptive rating in mathematics and computation skills. This implies that the respondents should undergo effective instructional strategies. Marzano (2004) stated that instructional strategies are important to develop the needs of the learners as well as to achieve the learning objectives. Likewise, this would help to enhance the performance of the learners. Furthermore, the operational skills, the first year and second year respondents mostly are **moderate** while in third year respondents were **less moderate**. On the other hand, in the critical thinking, mindset and training habit, the first year respondents obtained a descriptive rating of **moderate**, the same with the second year respondents. However, in the third year mostly were **less moderate** on the different skills. Moreover, in the problem solving analytical skills almost all of the respondents from first year to third year were **less moderate** on different skills. The findings explained further that the third year student-respondents were lack of abilities in operation skills. This implies that the students should be exposed in manipulating computer involving operations. Ponce (2005) claimed that the students need to be taught with

basic operation of the computer unit, not limit on CAD instruction only but the instructor should include some related activities like Microsoft Office.

It revealed also the third year student-respondents acknowledged that the skills on critical thinking, mindset, and training habits are **Less Moderate**. This implies that there is a poor implementation of CAD instruction in drafting classes due to lack of computer units. As perceived further the student-respondents from all year level obtained a **Less Moderate** descriptive rating in Problem solving Analytical Skills. This implies that CAD s should be fully implemented to the drafting students.

Based from the findings, the performance of the respondents on CAD application/written test from first year to third year, majority of the respondents out of 42, Eleven(11) or 26 percent acquired a raw scores of 17, this means that they belong to the average level only. Hence, the researcher should make an effective instructional strategies to improve the performance of the respondents. On the same manner, the three year level had an average score of 80.66 in the three activities. In general, based on the table the respondents of the three year level has a poor performance in activity 1 with a total average score of 76.37. This means that the respondents find difficulties in doing such activity applying the AutoCAD simply because they are beginners of CAD instructions.

Difficulties encountered by the respondents during CAD Instruction.

The most difficult problem encountered by the respondents on CAD instructions is the personal crisis. Ranked second as most difficult was tired or stress due to workloads at school. Third was laziness. It was also pointed out that some of the respondents found difficulties in frustration, discouragement and troubled due to bad grades. Hence CAD instruction was also felt difficult because of the “I don’t know syndrome I know nothing and empty of the respondents.

The researcher designed an enhance Module laboratory exercises to improve the skills of the drafting students on Cad instructions.

CONCLUSION

Drafting students from first year to third level both in BTTE and BSIT have a less basic knowledge on computer. Hence, using the higher terminologies and techniques on CAD instructions they encountered difficulties based on the findings. This concludes, that there is a need to design a new and effective Instructional Materials. Thus, a CAD Laboratory module for Architectural Drafting was proposed.

RECOMMENDATIONS

Based on the results of this study the following are suggested:

1. It is highly recommended that the proposed CAD laboratory module be adopted by the Surigao del Sur state University, Cantilan Campus to improve the instruction in drafting technology of the BTTE and BSIT students.
2. The administrator should always support on the financial needs of the instructor in preparing the CAD module and the materials needed.

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