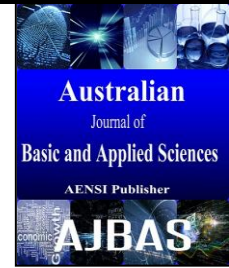




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### The Development of Engineering Graphic Module for Furniture Studio

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#### ABSTRACT

Project-oriented learning is a main approach which implement in workshop furniture, Faculty of Creative Technology and Heritage, University Malaysia Kelantan (UMK). However, the implementation of project-oriented approach is undirected and just expect to lecturer and student initiatives without appropriate guidelines, particularly in the application of engineering processes. Workflow-based engineering is important in learning furniture making. Workflow can be driven right through the systematic and methodical process. Therefore, engineering graphics module has been designed and developed to provide guidance to students in performing the work properly and indirectly the self-directed learning through project-oriented learning approach can be implemented more better and effectively.

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### INTRODUCTION

Studio furniture in the Faculty of Creative Technology and Heritage provides various facilities to students studying a Bachelor of Creative Technology in product elective. The presence of studio furniture has helped the students to learn the technique of making furniture. Basic skills of designing and making furniture also taught in this studio. Creative technology students in product elective will be entered in the third year studio furniture. Students who enter the studio furniture, initially briefed to undertake development projects of furniture that will be planned. Students will be distributed in several small groups composed of three to five members. Then the students are left to create and develop their own planning. Students will begin to implement their projects after obtaining mutual agreement and confirmation by the lecturer. The process of furniture development which is running by students without any specific guideline do cause of unsmooth work flow among the students. Regarding that, students also cannot be work together due the lack of systematic coordination among them. Students will easily lost their control and demotivate to perform their task regarding the less of efficiency to distribute a specific task among them (Brockett, R., & Hiemstra, R., 1991). The implementation of learning through student oriented learning approach

is needed a complete guidelines (Yahya Buntat, 2004). Through a complete guidelines, student oriented learning will become more directed. With directed learning, the learning objective could be achieved more easily and effective. Thus, for the learning process to study about furniture making, it's important to create a module which is compatible with the concept of furniture development (Song, L., 2005). The furniture development module will provide a complete guideline to make student learn in directed learning approached. Students also will be exposed with actual practice which is applied by the industry. Serena (2003) state education system in Malaysia is less to emphasis the approached of self-directed learning. Serena (2003) said most students just coincidently learn techniques or skills to learn. This situation exist because students did not have any specific guideline in order adopt self-directed learning. Siti Hawa Munji (1987) found students' awareness of higher education about the skills of self-directed learning are relatively at a low level.

#### 1. Methodology:

##### 1.1 Overview of Early Requirements Engineering Graphics Module:

Planning to design and build engineering graphic modules for use in furniture studio has started to make a preliminary survey on the needs of the module. Initial survey for over 15 students in 3rd

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year which is pursuing Bachelor of Creative Technology with Honours (Product Design) in the Faculty of Creative Technology and Heritage, Universiti Malaysia Kelantan (FTKW, UMK) to see the level of self-directed learning readiness among the students. Self-Directed Learning

Readiness (SDLR) can be measured by looking at three main constructs such as self-management, determination to learning and self-control. Table 1 shows the findings of the preliminary study on the level of students' self-directed learning readiness.

**Table 1** : Percentage Level of Self Directed Learning Readiness (SDLR).

| Construct of Self Directed Learning Readiness (SDLR) | Low | Moderates | High |
|--|-----|-----------|------|
| Self-Management                                      | 22% | 58%       | 20%  |
| Determination to Learning                            | 10% | 55%       | 35%  |
| 1%   | 75% | 24%       |      |
| Self-Control   |     |           |      |

Referring to the Table 1, the finding shown only 20% of students have a high level of self-management, 58% had a moderate level of self-management and 22% lower levels of self-management. While the item level of determination to learning, only 35% of students have a high level of determination to learning, 55% had a moderate level of determination to learn and 10% had a low level of determination to learn. For an item for self-control, only 24% of students have a high level of self-control to study, 75% had a moderate level of self-control and 1% had a low level of self-control. Thus, moderate level is an overall level of self-directed learning readiness (SDLR) among the students. Whereas through interviews over a several of students and lecturers who are directly involved in product design programme at Faculty of Creative Technology and Heritage, UMK, the feedback from

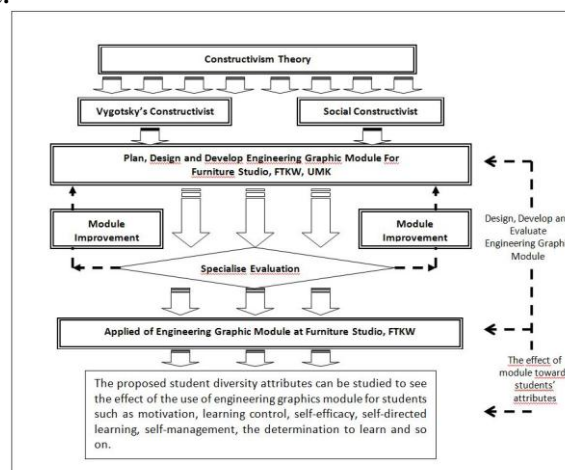
the respondent was shown below:

Aspects of students' readiness for learning independently; "Okay ... okay as long as the project is completed around la ... do not care what mark we get, as long as is pass..." (Students)

"The students actually very hard to come and see lecturers ... they do their project without follow the proper technique ... very difficult to monitor their progress, but usually the project that give to them will complete. However, they never reach the level of proper standard..." (Lecturer)

Regarding to the initial survey made, found students do not have the level of self-directed learning readiness at a high level. Therefore, based on this initial survey, it was concluded that engineering graphics module capable of creating self-directed learning environment.

## 1.2 Conceptual Framework:

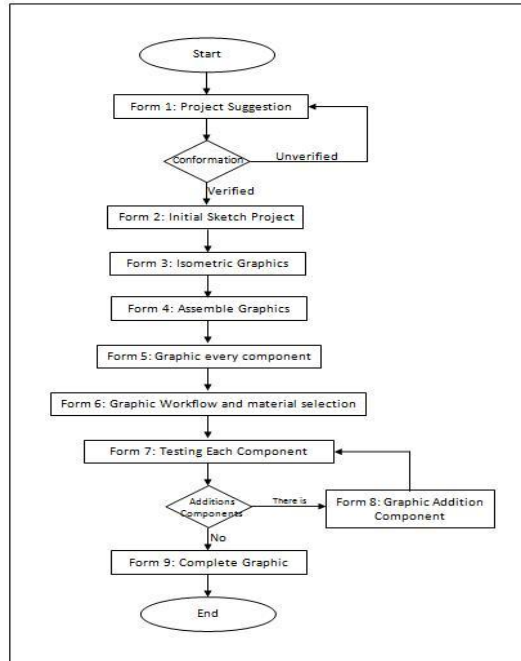


**Figure 1:** Conceptual Framework to Develop Engineering Graphic Module at Furniture Studio, FTKW.

The development of engineering graphics module was designed based on constructivist theory. Constructivist learning theory is the basis for self-directed learning. It is student-oriented learning methods (Rahman, M.B.A., Daud, K.A.M., Jusoff, K., and Ghani, N.A.A., 2009). Students who learn through this method are needed inner strength and motivation and willingness to learn the firm. Thus, this self-directed learning will be achieved by using

the constructivist learning theory. Therefore, the design of this module was developed based on constructivist theory. In this module, various forms have provided to be used by students in order to design and develop their products. The forms are designed in order to drive students learning direction through self-directed learning or student-oriented projects.

### 1.3 Flow Implementation For Engineering Graphic Module:



### 1.4 Modules for Engineering Graphics Studio Furniture:

The development of engineering graphics module was designed to suit with the fundamental concepts to making furniture in studio. The process to design module also consider with the learning approach will be used. The approach of self-directed learning will be applied in the furniture studio. Through the approach of self-directed learning, students will be distributed by three or five members per group. Students will work in groups. They will discussion among them, and the next will propose some sketched as their furniture design proposed to be developed. The drawing will be made using the form provided in digital graphics module. Workflow or guidelines for the use of engineering graphics module for studio furniture can be found from the flow chart 1: Conceptual Framework for Engineering Graphic

#### 1.4.1 Form 1: Proposed Project:

Develop form for project proposed to allow students to make an initial proposal after they organize their group discussion. The proposed project only involves details such as the title of the proposed project, the materials used and the estimated price that will be used in the furniture manufacturing process. This project proposal form must be submitted along with the form 2: initial sketch project.

#### 1.4.2 Form 2: Initial Sketch Project:

Project proposal form is designed to enable students to make an initial sketch before submit to the studio furniture lecturer. Preliminary sketches are then required to obtain verification from the lecturer before the fabrication task begins. After verification

and approval of the lecturer furniture available, they will be able to start the project. Construction of the furniture will be more organized and focused when students begin apply form 3: Isometric graphics.

#### 1.4.3 Form 3: Isometric Graphics:

Through the use of form 3: Isometric graphics, students are required to draw the estimated shape of the product to be developed. Sketch isometric graphics will show the estimated size of the actual shape of the angled front view on side of  $45^{\circ}$ . Through this isometric graphics, product design can be seen more clearly in 3 -dimensional view. Isometric graphics will assist students to develop their products more effectively.

#### 1.4.4 Form 4: Graphics Installation:

Form 4, the combination graphic is a graphic were developed by the students before the beginning of the product development. Firstly, students need to identify each component that they plan to develop. Every components that have been identified to be estimated their dimension accurately and set their specifications such as length, high and wide. Dimensions of each component must be compatible and match with each particular components. It's important especially in assemble process, to avoid from any defect and waste.

#### 1.4.5 Form 5: Graphic of Each Component:

Graphics of each component is very important. Through this form, the specification of each component can be explained more clearly. Work on the development of furniture can be more neat and organized. Segregation of duties can be implemented more effectively among students. Priorities can be set

to perform the work and this will give a very positive impact on every student in their work group.

#### **1.4.6 Form 6: Graphic Workflow and Materials Selection:**

Graphic workflow will provide detailed information to students about the flow and priority work to be performed while in the studio furniture. A detailed description is easily understood by the students as it is described in graphic form. In addition, through this work flow chart, students will be able to plan the time taken to perform a task and make it easier for students to estimate the time to complete the requirements of a component. Components that have been completed thus goes through a finishing process. After that, the test will be conducted for each component was developed before these components through the installation process. The process of testing of each component is very important to ensure that each component is developed to meet the quality and basic features of a product, especially in terms of durability, neatness and safe to use.

#### **1.4.7 Form 7: Testing of Each Component:**

Every component has been developed to be tested in terms of safety, durability of components, and finishing. Quality is an aspect that should be seriously considered by every student who develops a product or items of furniture. Practice of emphasizing quality in the development of the product is very important to develop a good attitude among students. Regarding to the testing, if there was a relatively poor quality components or not in accordance with the prescribed standards, the improvement works to be carried out again. If the components are not meet a satisfactory level, then students must be rebuilt that particular components again. The rebuilt components must be through the testing process in order to ensure the meet of high quality.

#### **1.4.8 Form 8: Adding Graphics Components:**

Additional components can be developed after the assembled to form a complete product. At the end of the development of a furniture product, possibility of adding a component is likely to exist. Adding components exist if there is a need to gain the value or to enhance the quality of the product. Therefore, to make the addition of a component in a product being developed, the students need to use the form 8: Graphic Addition Components. The components will be drawn according to the specifications. Then these additional components will be developed. Additional components that have been developed are going through a finishing process. Additional components are also going through the testing process. After that, additional components will remain attached to the product.

#### **1.4.9 Form 9: The Complete Graphics:**

The complete product will then be drawn to the actual specification development. Engineering graphics will be available in two forms, namely isometric view and graphics first or third view. Complete engineering graphics will be developed digitally using computer-aided design software (Computer Aided Design). In this graphic, the complete dimensions were shown. In addition, the types of materials used are also described. Other standard requirements such as group name, title of the project and drawing scale will also be set out.

#### **2 Scope of Implementation:**

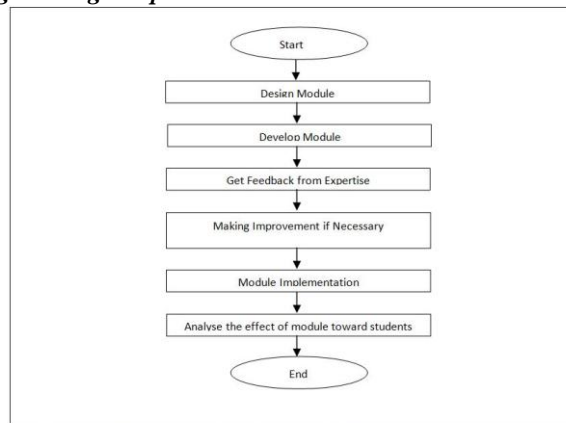
Engineering graphics modules developed will be used by the 3<sup>rd</sup> year students whose are took product design programme at Faculty of Creative Technology and Heritage, University Malaysia Kelantan. These students will undertake development projects in the furniture studio. The study will be carried out using the method of self-directed learning.

#### **Validity and Reliability Engineering Graphics Module:**

Engineering Graphics Module is designed to enable the method of self-directed learning applied among the students. Through the use of engineering graphics module, the lecturer will only act as a facilitator. Engineering elements are widely applied in engineering graphics module. This module is specially designed for students to develop furniture as a product at studio. Therefore, to ensure the use of these modules can have a positive impact on students, then test the validity and reliability of the module is to be carried out (Md. Baharuddin Abdul Rahman & et. al, 2011). The module has been developed to be distributed to a number of expert groups such as lecturers, some engineers, lecturers who are experts with self -directed learning approach and also to a number of experts who have been involved in the furniture industry. Opinions and suggestions from the experts were taken to make improvements and enhancing the engineering graphics module (Md. Baharuddin Abdul Rahman & et. al, 2011) . In addition, the views and reviews of some lecturers in the Faculty of Creative Technology products and Heritage will also be taken into account. Engineering graphics module will then be applied to the third year students whose are took product design programme. Initial briefing on this module will be explained to students before use. The module then will be distributed to the students. Initial briefing should also be delivered to the lecturer in order to supervise the use of the graphics module among the students (Md. Baharuddin Abdul Rahman & et. al, 2011). Preliminary studies on the effectiveness of the use of engineering graphics module can be made by looking at the results of the students in the development of this furniture. It is hoped that students' performance in the course of this

furniture will be improved after the implementation of engineering graphics module during their studies. Testing the validity and reliability of engineering graphics module can be found through the flow chart 2.

### 3. Design and Applied Engineering Graphics Module:



Flow Chart 2: Designing and Applied Engineering Graphic Module in Product Studio

#### Discussion and Conclusions:

The development of engineering graphics module for studio products is expected to increase the level of readiness for self-directed learning among students (Md. Baharuddin Abdul Rahman & et. al, 2011). Other than that, it is hoped that through engineering graphics module, students will be able to learn more directed through student-oriented learning approach. The basic concept of collaborative engineering are applied in engineering graphics to convey such information in the manufacturing process is also expected to give exposure to the students about the requirements and working practices in the industry. However, the validity and reliability are important for the development and use of digital graphics module. In regards studies the effects of engineering graphic module towards students attributes will be conducted in the future.

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