Implementation of the use of AutoCAD applications in increasing basic competence in describing techniques in vocational education

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Abstract. Technology helps a drafter speed up work completion, including CAD (Computer Aided Design) applications. AutoCAD which is an application (CAD software) is used to draw, design drawings, even analyse a design to realize a commercially viable product. This program has advantages and convenience to make images visually, accurately and precisely. The lecture strategy with the help of a computer is a lecture method via computer where, the user (User) can more easily & quickly understand & apply what information is learned through an attractive image display. The product design of a gear with a cycloide (Cycloide) gear profile is used as an instrument to realize student competencies in machine element courses. An evaluation of the previous material provided an initiative in the development of the module. The module development referred to uses the term 4-D or better known as (Four-D). The 4-D development model has 4 stages: defining, designing, developing, and disseminating. The final results of the development of CAD learning modules with the 4-D method received a very good response from students and lecturers of PTM Study Program STKIP Eleven April Sumedang.

1. Introduction

The success of the implementation of a lecture process is very dependent on the role of lecturers and lecturer competence \cite{1}, because some of these abilities will determine the learning process and student learning outcomes. Competent lecturers will be better able to manage classes according to students' needs and create an effective and efficient learning environment so that student learning outcomes are at an optimal level \cite{2-4}.

Competence in developing teaching materials ideally has been well controlled by lecturers \cite{5,6}, but in reality there are still many lecturers who have not mastered it, so in conducting the lecture process it is still dominated by lectures that are centered on lecturers. Observations made on the third semester PTM Study Program computer drawing (CAD) in 2017/2018. The observations show the teaching and learning process in the course still uses a jobsheet so that the explanation of the material delivered by the lecturer is not yet fully understood for some students. Learning process planning includes a syllabus and learning implementation plan that contains at least learning objectives, teaching materials, teaching methods, learning resources, and assessment of learning outcomes (PP No. 19 of 2005), referring to these regulations, one of the competencies that needs to be had a lecturer in carrying out his duties, namely by developing teaching materials \cite{1}. Development of teaching materials is important to be done...
by lecturers so that lectures are more effective, efficient, and do not deviate from the competencies they want to achieve [7]. Development of teaching materials in the form of modules [8] for the eyes technical drawing lectures (CAD) [9-11], at the PTM Study Program STKIP Eleven April Sumedang arranged based on the needs of the learning process in semester III with 25 students. The module development referred to uses the term 4-D or better known as (Four-D). The 4-D development model has 4 stages: defining, designing, developing and disseminating [12], before the learning module is used in drawing lectures (CAD), some processes are first carried out. First, validation to ensure the results of the revision carried out by expert lecturers related to the concept, module format, language, design and content. Second, ensuring the students' responses from the questionnaire given related to the assessment of the modules that have been developed. Third, the lecturer response aims to determine the extent of module quality and module benefits for lecturers [13]. Furthermore, to determine the effect of using the drawing module with a computer (CAD) effectively in improving learning outcomes cognitive tests and psychomotor domain tests were conducted. This test is carried out to determine the completeness of the indicators achieved in the subject of machine elements, namely to determine the ability of students to master computer drawing (CAD).

2. Method
The type of research in this paper is development research focused on education. Development research is an attempt to develop an effective product for school use and not to test theory [11]. From this opinion it can be concluded that research development is a process used to develop and validate products used in education [11].

![Figure 1. 4-D (Four-D) development research flowchart.](image)

This research method adopts a 4-D lecture module development model [12] or better known as (Four-D). The 4-D development model has 4 stages, namely the definition, the design phase, the development stage and the dissemination stage. The explanation of the 4-D results is as follows:

- **Beginning End Analysis**, preliminary analysis to find out the extent of students' ability in mastering drawing material with the help of AutoCAD and the final results to be achieved.
Concept, Student, Task, The concept of learning strategies towards one group of students and the tasks related to achieving the intended competency.

Formulation of Learning Objectives, determine learning material to realize student competencies through practicum instructions at a later stage.

Design Development of learning modules, determine learning material to realize student competencies through practicum instructions at a later stage.

Module Validation (Lecturer Competence in CAD Drawing Skills), asking for input from lecturers related to their expertise in using software in the form of AutoCAD.

Revision, revising modules that have received input from lecturers who are experts in their fields.

Module Study (Linguist and Media Expert), asking for input from lecturers related to the content, feasibility and language of the module that has been made.

Revision, revising modules that have received input from lecturers who are experts in their fields.

Limited Trial, limited trials conducted on several lecturers and students to provide input related to the feasibility of modules that have been prepared on the Guttman scale.

Data analysis, Analysis of data on the feasibility responses given by lecturers and students to the modules made.

Packaging and distribution, packaging, refinement, module layout and distribution to printing parties or interested parties.

Module, the final result is a module that is ready to be used for practicing drawing natural techniques to realize mastery learning.

3. Results
This section will describe the research design that will be carried out in the odd semester, that is, the research design consists of the stages of defining, developing, and disseminating.

3.1. Defining phase
The defining stage consists of 5 stages of analysis namely beginning and end, students, concepts, assignments, and formulation of learning objectives. The formulation of the learning objectives are: (1) able to prepare the process of depicting parts. (2) able to combine parts in the form of assembly. (3) able to display images in sheet drawing. (4) able to display the assembly in the form of drawing. The product design of a gear with a cycloide (Cycloide) gear profile is the theme to be achieved competency in the eyes of the engine element.

3.2. Design phase
After the define phase, it is then used as a framework reference in preparing the module's initial draft so as to produce a draft module.

3.3. Development stage
At this stage, it has 2 steps: (1) the draft module I module is validated by content experts, linguists and design experts. (2) Limited trials.

3.4. Disseminate
The final results are in the form of modules and are ready to be distributed as practical instructions.

4. Discussion

4.1. Module validation questionnaire sheet
The module validation questionnaire sheet is used to collect data from the results of the assessment of the expert lecturers (validator) of the lecture modules that have been made from the development process. This assessment questionnaire was then used as the basis for revising the lecture modules that
were made. In the assessment to be carried out, there are several indicators including the concept, module format and module quality developed. In addition, this study involved 6 expert lecturers as evaluators of module validation questionnaires covering linguists, designs and contents.

4.2. Student response questionnaire sheet
In the student response questionnaire sheet is intended only for students as research samples. The purpose of this questionnaire is to determine the response obtained from the results of assessments given by students to the use of computer-based lecture modules (CAD) in the computer drawing skills program.

4.3. Lecturer response questionnaire sheet
In the lecturer response questionnaire aims to determine the extent of module quality and module benefits for lecturers. There are 2 supporting lecturers who are asked to provide lecturer responses to the use of modules.

4.4. Learning outcomes test
This learning achievement test is based on the completeness of the indicators achieved, which is to determine the ability of students in the mastery of drawing with a computer (CAD). There are 2 types of tests namely cognitive domain tests and psychomotor domain tests.

4.5. Analysis of learning outcomes
Analysis of learning outcomes tests aims to determine the increase in student learning completeness after using a computer-based lecture module (CAD) running effectively and optimally.

5. Conclusion
The conclusions of this research design are as follows:

- Module eligibility shows the average value of module eligibility to reach 80% of the criterion score so that it is included in the appropriate criteria.
- Student responses to the CAD learning module show an excellent response by obtaining a large percentage.
- The lecturer response to the use of the CAD module obtained a large percentage. These results indicate that the use of CAD modules received very good responses from lecturers.

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