

Development of Interactive Multimedia-Based Teaching Materials for Learning Technique Mechanical

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Abstract. The Research aims to find learning tools in the form of multimedia-based teaching materials for learning Engineering Mechanics courses in accordance with the profile of graduates of building engineering education. The results of this study are expected to produce (1) competency-based learning materials that can equip students in following Mechanical mechanics lectures in accordance with employment needs, (2) teaching materials in the form of Technical Mechanics learning modules, (4) guidebooks and student assignments, and (5) development of learning programs (software) in the form of Compact Disks that can be used as learning media to learn and teach Engineering Mechanics course materials. This research is planned to be carried out in the 2018 fiscal year. The population of this study includes all students of building engineering education at the Faculty of Engineering Unimed. Target populations include students, lecturers and the business world. The sampling technique used purposive random sampling. This research uses research and development (R & D) methods which begins with a survey, teaching material design, teaching material validation, and test the effectiveness of teaching materials. To determine the effect of instructional materials in learning developed on technical mechanics competencies used a quasi-experimental research approach with the design of the control group post test only. The research instruments used included questionnaires, document recording and tests. Data were analyzed using descriptive analysis techniques, T-Test and ANAVA

Keywords: Development, interactive multimedia-based, teaching materials, learning technique mechanical.

1 Introduction

Global interaction causes the integration of values between communities, which shows the high need for quality human resources. The emerging trend is the growing use of industrial technology and information technology. Another challenge that arises in the wave of globalization is the universal of the value of competition. So the most important need is the availability of human resources capable of managing the progress of the technology.

The increase in the capacity of Vocational Schools (SMK) is accompanied by an increase in the quality and improvement of facilities / infrastructure. This means that in 2015 the number of vocational schools will be more than public schools which show that the development of resources that are more oriented to the world of work is a top priority. Meanwhile, it must be admitted that so far the implementation of vocational education has not

paid attention to the learning system that is relevant to the knowledge and needs of the workforce that includes a complete cognitive, affective, and psychomotor competence. Reorientation of vocational education needs to be done by improving learning, learning models and tools that support it to produce learning innovations.

Thus, it is necessary to conduct research and development of learning models in the Engineering Mechanics course, namely a learning package with learning and programming strategies for teaching materials and packaged in modules that are integrated with learning that is suitable for effective and efficient lectures.

2 Literature Survey

2.1 Vocational Building Engineering Education Profile

Vocational education as part of education is indeed designed to prepare someone to enter the workforce (Calhoun and Finch, 1982). Explained that vocational education is part of an education system that prepares a person to be competent and skilled at working in one field of work rather than another (Evans, 1971).

Psychomotor competence and skills greatly influence student learning processes, including the learning concepts used (Stomes, 1983). This means that the concept of learning must consider the characteristics of these psychomotor skills. Therefore, an understanding of the psychomotor domain will be very helpful in the design of the learning model.

In relation to how vocational schools bring their programs closer to the world of work, vocational schools are categorized into five categories, namely (1) work briefing programs, namely vocational schools provide basic and general knowledge about various types of jobs in the community, (2) work preparation programs, namely vocational schools provide the basics of general work attitudes and skills, with both programs students have a greater chance of getting a job; (3) general work field preparation programs, namely vocational schools provide provisions to improve work skills for work fields that require knowledge of similar equipment; (4) specific work field preparation programs, namely vocational schools providing provisions that have led to certain types of work even though not yet in a particular company, and (5) special vocational education programs, namely educating students to meet the requirements requested by a particular company. Vocational education is to improve the ability of students, so they can get a better life than before (Finch and Crunkilton, 1979).

2.2 Multimedia Based Learning

The use of technology in learning is needed in the implementation of the education process. Technology that specifically provides alternative choices in the service of a form of learning. One form of learning in question is learning by utilizing the CAI (Computer Assisted Instruction) system and managing CMI (Computer Management Instruction) learning. Computer systems can present a learning process directly to certain individuals by interacting with the subject matter programmed into the system with a variety of possible uses that include learning models so that computers can provide the most effective facilities and the results to be achieved can be maximally obtained.

Training using computers is one part of technology-based training or often called Technology Based Learning (Reynolds in Kelly, 1995). This TBL (Technology Based Learning) is based on learning, management and support from computer devices.

2.3 Development of Learning Models

The model is a picture that arises from reality that has a sequence of specific sequences (Richey, 1986). According to him the model can be used to organize knowledge from various sources and then use it as a stimulus to develop hypotheses and build theory into concrete terms / conditions to apply it to practice or test theory. The practical function of the model, namely: a means to facilitate communication, or regular instructions (algorithms) that are prescriptive for decision making, or planning instructions for management activities (Gustafson, 1984). Model is a model that can help the user to understand what the overall process is fundamentally (Nadler, 1988).

The connection with learning learning model serves to direct us to design learning that is used as a guide in the implementation of learning in order to achieve effective, efficient, attractive, and humanistic. Learning model as a plan or a pattern that is used as a guide in planning learning in a classroom or learning in a tutorial and to determine learning tools and direct us in designing learning to help students so that learning objectives are achieved (Joice, 1992).

2.4 Roadmap

Improving the quality of education organized by State University of Medan Research Institute of Research and Technology directed at expanding learning innovations to realize a more efficient, effective and enjoyable education process in accordance with the level of age, maturity and development of students. In the context of the realization of competitiveness, State University of Medan also encourages the development of learning innovations which are one of the strategic activities in improving quality and relevance whose concepts are aligned with the needs of students, especially the needs of the labor market.

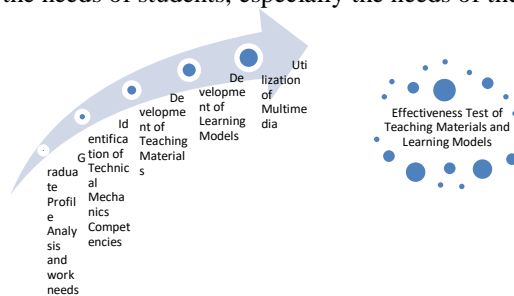


Figure 1: Reserach Roadmap

Several results of research conducted over the past two decades have provided evidence of the impact of technology on student performance and learning environment. Cotton (1991), for example, has conducted a study of 59 research results regarding computer-aided learning and learning outcomes. Studies that focus on this technology are better than studies that discuss the impact of technology on the overall learning environment and student learning outcomes. The findings of this study also show that researchers who try to find answers directly to student

learning problems, the results have not been satisfactory. However, teachers who understand the complexity of learning and teaching, the results of the study showed encouraging things and showed that new technology proved effective. In addition, technology has shown the impact of very positive results based on research studies. Innovative learning techniques (for example, question techniques included in the text, advance organizers, and the media) specifically show the progress of the average learning outcomes of students by 15.20 points or more. This means that the average student score reaches the 50th percentile in conventional learning, and the 65th percentile in the group is taught with technology (Heinich, Molenda, Russel, & Smaldino, 2002).

3 Research Method

3.1 Development Research Approach

This research approach uses the Borg & Gall (1983) development model combined with Dick & Carey's learning design model (2009). In accordance with the Research and Development approach model, the implementation of this research follows the steps, as follows: preliminary survey, textbook model design, textbook model testing, textbook validation and dissemination. This research was conducted in the Department of Building Engineering Education Faculty of Engineering State University of Medan in 2018.

3.2 Place and Time of Research

The implementation of this research will be carried out in the Odd Semester of 2018-2019 Academic Year. The research was carried out to collect data about Engineering Mechanics lectures, current learning conditions, validation and the implementation of the initial model trials in the classroom.

3.3 Population and Sample

The population of this study was all students and lecturers who were active in the prows of lecture TA 2018/2019. As for the sample of this study, students planned to take Technique Mechanics 1.

3.4 Data Collection Techniques and Data Analysis Techniques

The implementation of research data collection is the preparation and development of research instruments used in data collection including questionnaires, interviews, and recording and documents. The data analysis technique used was descriptive and statistical analysis of research data conducted through group trials.

4 Conclusion

1. Behavior and type of competence in the Mechanica Technique I course which can provide students with the skills acquired based on the survey of employment needs of the business world is still very lacking and needs additional teaching materials.
2. Mechanica Technique I learning tools through programming instructional materials and the use of multi media in learning Mechanical Engineering courses are very effective to do.
3. The initial design results of interactive multimedia-based learning models as shown above with six (6) stages of learning activities. Stages of learning activities: Introduction, Direction, Connection, Organization, Demonstration, and Evaluation.
4. Interactive multimedia-based learning models are suitable to be used to improve the development of Mechanica Technique I.

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