

Harmonization of Automation and Fire Alarm System Teaching Materials: an Effort to Improve the Quality of Aviation Safety Education

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ARTICLE INFO

Keywords: Learning Module, Air Navigation Technology, Learning Effectiveness

Received : 22, November

Revised : 24, December

Accepted: 26, January

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ABSTRACT

This study aims to achieve harmonization of Course Learning Outcomes (CPMK) through standardization of teaching materials at UPT PPSDMPU in the Air Navigation Technology Study Program, and improve the competence of cadets with teaching material books. The method used is the S. Thiagrajan development model modified from 4-D to 3-D, with a focus on the Development stage (Develop) to produce learning modules that are valid and ready to be implemented, as well as for time and cost efficiency. The results showed that the learning module developed was declared valid by expert validators, met the criteria of very practical based on student responses, and proved effective through pre-test and post-test tests, so it is feasible to use in the learning process to support the quality of education.

INTRODUCTION

Automation and fire alarm system education is an important element in the development of human resources in the aviation sector, especially at Makassar Aviation Polytechnic. The need for quality education and adaptive to technological developments is very important to maintain safety standards in flight operations. In this context, the development of teaching material books for automation courses and fire alarm systems is crucial to support the competence of cadets. As an educational institution that aims to produce professionals in the aviation field, Makassar Aviation Polytechnic is required to update its curriculum and teaching materials to comply with rapidly developing industry standards, especially in safety aspects such as fire alarm systems. Magdalena et al. (2020) emphasized that a well-designed teaching material book not only conveys information but also facilitates a deep understanding of the concepts of automation and fire alarm systems. This is in line with Puspitasari (2021) who highlighted the importance of coursebooks that combine theory and practice and encourage critical thinking

As part of the Air Transportation Human Resources Development Center (PPSDMPU), Makassar Aviation Polytechnic faces the challenge of developing teaching materials that are harmonious with other UPTs so that graduates have equal quality and in accordance with national standards. In addition, the development of teaching material books that are relevant to the latest curriculum is very important to ensure that cadets are able to keep up with technological developments and best practices in the aviation industry. Innovative and interactive teaching methodologies are also important factors in the preparation of teaching materials, including equalizing perceptions between teachers in delivering automation materials and fire alarm systems in the Air Navigation Technology Study Program. This research aims to develop effective and relevant teaching materials for automation and fire alarm systems, and integrate them into the existing education system. The urgency of this research is to achieve uniformity of teaching materials in all UPTs under PPSDMPU, in order to significantly improve the competence of cadets in the field of aviation safety.

LITERATURE REVIEW

Teaching materials are all forms of materials, information, tools, and texts used to support the teaching and learning process. According to Abdul Majid, teaching materials can be written or unwritten materials and are designed to help cadets understand curriculum content. The characteristics of thematic teaching materials include five aspects: active, interesting, fun, holistic, and authentic. Teaching materials must encourage cadets' activeness in learning and provide a holistic understanding of the phenomena studied. The preparation of teaching materials needs to follow certain principles, such as starting from easy to difficult, using repetition to strengthen understanding, and providing positive feedback to motivate cadets.

The development of teaching materials has significant benefits for teachers and cadets. For teachers, teaching materials that are in accordance with the curriculum and the needs of cadets can improve the quality of teaching and enrich learning resources. For cadets, interesting and relevant teaching materials make it easier for them to learn independently and achieve the desired competencies. In this context, printed teaching materials, such as books, handouts, and modules, are the focus of development, where modules are designed to support independent learning. The curriculum also plays an important role as a guide in the educational process, as seen in the 2020 Curriculum issued by PPSDMPU, which regulates the implementation of study programs at the Air Matra Education Unit.

METHODOLOGY

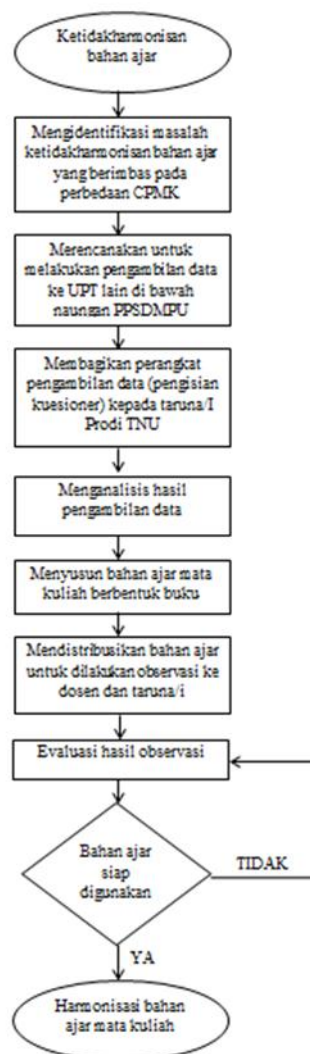


Figure.1 Flowchart

This research uses a qualitative approach to deeply understand the material and learning process of automation and fire alarm systems. The research subjects are cadets of the Air Navigation Technology Study Program under PPSDMPU who have studied the course. The main data sources came from the Head of the TNU Study Program, lecturers, as well as supporting documents such as curriculum, syllabus, and input from cadets. Data were collected through observation, interviews, and questionnaires distributed to the cadets. The researcher acted as the main instrument supported by observation guides, interviews, and questionnaires. Data analysis was conducted in three stages: data reduction, data presentation, and data verification to simplify and present information clearly. The research model used is a modification of the 4-D model (Define, Design, Develop, Disseminate) to 3-D (only up to the Develop stage), which was chosen because of the effectiveness of time and cost, and produces a valid learning module that is ready to be implemented.

RESEARCH RESULT

This research produced a valid, practical, and effective Fire Alarm System and Automation learning module, using the 3-D development model which is a modification of the 4-D model. In the defining stage (Define), an initial analysis was conducted to identify problems at Makassar Aviation Polytechnic. It was found that the material taught by lecturers was still based on general textbooks that were not specific to the airport environment, so students often had difficulty understanding the material. The analysis also included the characteristics of students who had limited knowledge about airports and needed more relevant material. This stage includes analyzing tasks, concepts, and formulating learning objectives that are structured according to curriculum outcomes.

In the planning stage (Design), researchers compiled learning tools, including RPS, questionnaires, and pre-test and post-test questions. The developed module is focused on airport-based thematic learning, adapted to the characteristics of the material and students. The module was designed with a format that refers to the Ministry of Education and Culture's textbook standards, and includes elements such as competencies, indicators, materials, and evaluation tests, to facilitate understanding. The initial design of this module also considers the condition of students who need material that is close to the airport environment so that learning is more optimal.



Figure.2 Book Cover

In the development stage, the Fire Alarm System and Automation learning module went through a revision process based on input from experts, namely material experts, language experts, and design experts, to ensure the validity of the module. After the initial product was completed, the validity test was conducted by Aeron Satria Bayu Aji (material expert), Muhammad Agung Raharjo (linguist), and Andi Fadhilah Nugrah (design expert). Their input became the basis for module revision, so that the resulting module was not only valid in terms of material, language, and design, but also ready to be used in learning. The results of the validators' assessment, including suggestions and criticisms, helped researchers in improving the developed module.

The material expert suggested adding content and essence of learning material so that students can better understand and summarize what is taught, as well as encouraging deeper discussion about airports to hone students' critical thinking skills. On the other hand, linguists recommended improving the module's writing structure by paying attention to reference sources to reduce the risk of plagiarism. The module was then revised by clarifying the sources used. The suggestions from these validators became important guidelines in the revision process to ensure the validity of the module. After the revision process is complete, the module will be tested on a group of TNU XIII B students at Makassar Aviation Polytechnic, and the assessment is carried out based on the criteria set by the expert validators.

Table.1 expert validators

Validator	Jumlah	Kategori
Ahli Materi	92,67 %	Valid
Ahli Bahasa	87,33 %	Valid
Ahli Desain	88,67 %	Valid
Rata-rata	89,56 %	Valid

DISCUSSION

This study aims to develop an airport-based learning module that is valid, practical, and effective as additional literature for lecturers. The researcher used a modification of the 4-D model into 3-D, focusing on the develop stage. In the defining stage, an initial analysis was conducted to identify problems at Makassar Aviation Polytechnic, where it was found that the textbooks used were not airport-based, causing students to have difficulty understanding the material. In the design stage, researchers compiled research tools and selected appropriate modules, while in the development stage, the module was tested through validation by material, language, and design experts, and tested on students to assess practicality and effectiveness.

The validation results showed that the airport-based thematic learning module was declared valid with an average score of 89.56%. The trial on students showed very positive results, with the practicality assessment in the very practical category. In addition, the effectiveness test through pre-test and post-test showed a significant increase in student learning outcomes, with a sig. (2-tailed) of 0.000, which indicates the difference in average learning outcomes before and after using the module. This research proves that the developed learning module is effective in improving students' knowledge of airport-related materials.

CONCLUSIONS AND RECOMMENDATIONS

The conclusion of this study shows that the airport-based learning module is declared valid and feasible to use based on the assessment of expert validators, which include material, language, and design experts. In addition, the module meets the criteria of very practical and effective, as evidenced by the results of student response questionnaires and effectiveness test analysis which shows a significant increase in student learning outcomes after using the module. The suggestions given include the hope that the developed Learning Module for Automation and Fire Alarm System can be used on campus to increase students' knowledge about airports.

ADVANCED RESEARCH

The researcher also recommends that future studies consider further development at the disseminate stage to expand the use of this module in the learning process.

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