Development of Electric Motor Control Trainer Kit as Student Practicum Media

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Abstract. The issue that lecturers and students have when conducting practicum is that some of the existing trainer kits have not been adequately arranged and coordinated, and some trainer kits need to be modified. When completing practicum, lecturers and students face the difficulty that some of the available trainer kits have not been efficiently structured and coordinated, and certain trainer kits require modification. The purpose of this research is to provide an electric motor controller training kit as a practical medium for students of electrical engineering education. This study employs the following iteration of the ADDIE development paradigm: (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation. Based on the findings and discussion, it can be said that the created electric motor regulation trainer has a very good feasibility rate of 86.34% according to media experts and 84.85% and 83.19%, respectively, in small group and large group trials.

Keywords: trainer kit, electric motor controller.

1 Introduction

The main focus to improve human resource capacity in Indonesia is 21st century competence. This competency is used as a standard to produce competitive employees in the world of work [1]. Strive to achieve 21st century competence through the use of approaches that combine learning from teachers, learning from other students, and learning from oneself. So, educators must be innovative and able to incorporate information and communication technology into the teaching and learning process [2]. Therefore, this design must consider four things: the role of teachers as learning planners, the application of HOTS elements, the application of various learning models and approaches, and the integration of technology [3].

In the modernization era, all work can be controlled by machines to facilitate human work [4], one of which is a machine that is widely used in human work is an electric motor, in the manufacturing industry electric motors are the most important part that is widely used as a production process machine, in the steel manufacturing industry electric motors are used as stamping machines to produce products according to what is desired [5]. Not only in the

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manufacturing industry, electric motors can be developed and utilized in the fields of technology, food processing, household and entrepreneurship. In the field of fast rail transportation technology, ships, aircraft with the worst time constraints by using superconducting motors as electric drives that are more efficient and lightweight [6]. Another research is on the development of electric motors as soybean grinders based on electric motors on tofu productivity in 5 MSMEs that produce quality products at affordable costs [7]. Researchers are interested in researching and creating a product in the field of education related to learning in schools to improve student learning outcomes since electric motors offer many benefits and functions that have been widely established. Media trainers visualize an idea, idea or theory so that it can make students not quickly forget the information.

In essence, media is a part of the educational system. Media should be considered a component that is both essential to and consistent with the whole learning process. The usage of the media in educational activities that allow students to engage with the chosen media is the final selection advice. The Latin word media, which means "middle," "intermediary," or "introduction," is the source of the English word media. Media is an intermediate or messenger in Arabic who carries a message from the sender to the intended recipient. Therefore, the media is a means for delivering or communicating educational messages [8]. Media is used in the field of education so that the term becomes educational media [9]. In the process of learning and teaching, educators and students can both benefit greatly from the usage of media. AECT, however, claimed that in 1979, media were seen as a type of channel for the information-transmission process [10]. Based on a few of these viewpoints, it may be said that the media is a tool for communicating messages from the sender to the recipient. Everything that is utilized to channel messages and potentially pique a learner's interest, thoughts, or feelings is considered learning media. This is done in an effort to support deliberate, controlled learning. There are two issues with learning media, the first of which is the medium's limitations, especially the uneven and current lack of availability of learning media. As a result, different types and quantities of media are used. While some educators utilize a range of media to their fullest potential, others do not [11].

Different media types have different benefits and drawbacks that must be considered when choosing which to employ for the practical learning process. The aspects of the content and the chosen learning strategy must be taken into consideration. The trainer kit is one of the educational tools that may be employed during the learning process [12]. A trainer kit is a practical learning resource that takes the shape of a collection of tools, materials, and measurement devices that may be used to simulate an experiment or series in a more usable way that facilitates learning [13]. Trainer kits must be used in a manner that is entirely consistent with both the implementation of the learning process and the features of the material. This is such that all learning processes can't be covered by a single training kit. An analysis of the characteristics of the material and the learning process is therefore required when selecting and deciding on the trainer kit that will be utilized in the learning process. This will be simple to accomplish if the trainer kit being used is a product of its own development and is specifically designed to meet the requirements of the learning process.

Trainer kits are typically utilized during the practicum learning process to imitate specific circuits or experiments in order to validate theoretical information including student learning activities. Depending on the qualities of the material and the learning approach employed, training kits are also different for each type of learning process [8]. A set of equipment called

a "trainer" is utilized in labs as a practical method of honing pupils' skills. By allowing students to apply the ideas and information they have learned to actual situations, they can also aid in their learning. The electrical engineering education study program at Universitas Negeri Medan has up till now used trainers as learning tools for the operation and management of motors; however, the limited number of trainers and the customary approach to motor control hinder the process of teaching and learning. Students' comprehension of the subject given is significantly impacted by the usage of modular learning media. Students are made aware that the given content is not optimal and still presents challenges in practice due to the lack of a learning environment in the form of trainers as well as the use and placement of electric motors.

Students use the electric motor control trainer developed in this study as a training kit for the practical learning process, which involves using and regulating electric motors. The Electric Motor Control Trainer Kit is a collection of components and instruments for the motor control practicum that have been put together into a single device. Based on the requirements of the practical learning process, this equipment can be used to mimic a variety of electric motor controllers, including quick right bell, delta star connection, forward reverse, and simulation of opening a garage gate.

2 Method

Research and development (R&D) is the research methodology employed in this study. A strategy or research methodology called research and development (R&D) is potent enough to enhance practice [14]. The process of developing new products or improving ones that already exist is known as research and development. The item can be either software or hardware. Hardware includes things like books, modules, and teaching aids for the lab or the classroom. Software includes computer programs for data processing, in-person instruction, research in libraries or labs, educational models, training, management, and more.

The technique of developing the learning tools used in this study is based on the ADDIE model developed by Dick and Carry. The analysis, design, development, implementation, and evaluation phases comprise the five components of the ADDIE development paradigm. [15]. The choice of this model was made after taking into account that it was created methodically and was built on the theoretical underpinnings of learning design.

Specific to the use of questionnaires and observations during the expert formulation and validation stage, the instruments used to gather data were developed in compliance with the methods followed at each level of the project. For this study, a qualitative analysis was conducted on the data. At the level of data analysis techniques in accordance with the given problem formulation, this study verified the trainer kit using validation specialists. This validated the trainer kit's viability. The obtained validation data will be examined using the subsequent procedures: (1) validate the media with the help of media experts and small-scale trials, (2) assess the assessment tools and, if necessary, make corrections to the content and media, (3) quantify validation research in accordance with the assessment weight, (4) tabulate the data, and (5) determine the percentage of items [16].

3 Results and Discussion

3.1 Electric motor setting trainer

The ADDIE development process was used to create an electric motor management trainer through five stages: analysis, design, creation, implementation, and evaluation. An overview of the electric motor setting trainer is provided below.

Fig. 1. Components of the module trainer electric motor arrangement.

Fig. 2. Electric motor setting trainer.

3.2 Results

Two media professionals validated the electric motor setup trainer in the field of media. The evaluation is conducted to gather data that will be used to raise the caliber of trainers. The findings of the validation are presented in Table 1 below in the form of assessment ratings for the trainer component.

Table 1. Media expert validation results.

No	Aspects	Reviewer		Average	Score
		1	2		
1	Technical use	4.3	4.5	4.4	88%
2	Technical product design	4.5	4.4	4.45	89%
3	Technical learning design	3.9	4.3	4.1	82%
Average				4.32	86.34%

Experts in the field of materials claim that the 86.34% motor setting trainer meets the "Very Good" category's range of value standards (75% to 100%). Students have rated electric motor management trainers as being simple to use in small group trials with 5 students and field tests with 15 students, which are requirements for practical learning media. Table 2 below shows the outcomes of small group trials of motor setting media trainers based on average assessment.

Table 2. Results of small group trials of learning media.

No	Aspects	Score
1	Ease of media use	86.54%
2	Time effectiveness	80.72%
3	Media interpreters	82.54%
4	Media appeal	87.98%
	Average	84.85%

Based on Table 2's information. The results obtained from small group trials are above average (84.85%), thus it can be said that the motor regulation media trainer is deemed "practical" to be used by students as a learning guide in the practical course of using and regulating electric motors. Additionally, 15 students who were enrolled in practical courses on the usage and regulation of electric motors had field testing with the media trainer for electric motor settings. Table 3 displays the outcomes of field tests on learning media based on average assessment.

Table 3. Results of large group trials of learning media.

No	Aspects	Score
1	Ease of media use	84.76%
2	Time effectiveness	79.32%
3	Media interpreters	80.34%
4	Media appeal	88.32%
	Average	83.19%

According to Table 5's statistics. The motor control media trainer has an above-average (83.19%) success rate in small group trials, earning it the classification of "practical" that students use to aid in their learning during the practical course of using and regulating electric motors.

3.3 Discussion

According to the study's findings, the electric motor control trainer is rated as extremely good and can help students during their practicum on the usage and control of electric motors since it can pique their interest in the subject and enhance their learning objectives for students studying electrical engineering education. This is consistent with other studies on electric motor control trainers, which are employed as useful teaching tools to enhance students' comprehension of electrical power installation techniques and provide jobsheets to help improve learning results [17]. Additionally, electromagnetic trainer media can significantly enhance learning quality, and media-based learning can benefit student learning [18]. The

trainer's design is based on what is actually appropriate for use in everyday life and the industrial sector [12].

4 Conclusion

Based on the findings and analysis, it can be said that the created electric motor regulation trainer has an excellent feasibility rate of 86.34% from media experts, and small group and big group trials have feasibility rates of 84.85% and 83.19%, respectively. The created trainer is very adaptable and has a nice design. This is demonstrated by the module trainer, which can be reconfigured to meet specific requirements while in use.

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