

# Development Of Media Trainer Motor Control Fault Simulation For Electromagnetic Control System Course

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**Abstract:** Improving the quality of learning should be done continuously, especially for learning that its nature explains the concepts and principles, symptoms and phenomena of an event or work process. One effort that can be done is to equip learning with the media that can show symptoms or phenomena. This learning process only uses software applications from the computer so that at the time of learning, students have difficulty seeing the direct form of interference that occurred in the simulation of electromagnetic installation. The purpose of this research is to produce a media trainer fault simulation motor control that is valid, practical and effective on electromagnetic control system subjects (ECS). This type of research is research and development. In the research used 4D development model. The subjects of the study were the students of class XI TITL SMK Negeri 1 Padang, as well as the respondents of trainer practice test. In addition, the teacher of ECS course as well as the respondent for the trainer's practicality test. The research instrument is a validation sheet for validity test, questionnaire of practice, and effectiveness test using objective test. Instruments used to determine the effectiveness of learning has been done statistical tests (validity test, practice test as a requirement of a research instrument). Based on the research result, the average validity is 94%, the average practicality is 89.25%. Media trainer's effectiveness is 85.7%. Thus, this media trainer meets the requirements of validity, practicality and effectiveness to be used as a learning media in the course of ECS, specifically for use on Vocational High School Technology and equal. The implication of this research is improvement of learning quality of ECS subject can be achieved by using trainer as supporting learning process.

**Index Terms:** Instructional media, Trainer fault simulation of motor control, Electromagnetic control system.

## 1 INTRODUCTION

Technology cannot be separated from the development and progress of a nation. To respond to such challenges education is one of the real paths to creating a desire to achieve that goal. Education is expected to encourage this nation to be better, resulting in human resources that can compete in the world of work. Responding to that State University of Padang through the Department of Electrical Engineering with Electrical Engineering Education Study Program contribute actively to produce the best graduates and able to compete in the world of work, by teaching in vocational high schools to produce young students for the next generation. Education is an attempt to develop the potential that exists within a person, the form of activities is learning and teaching. Education emphasizes the learning process that aims to develop all the potential that exists in human beings both on the aspects of cognitive, effective and psychomotor. Formal education conducted in schools is the first step to reach the goal of humanizing humans in order to develop properly. As described in Law no. 20 Year 2003 article 1 verse 1 says that education is a conscious effort planned to realize a quality human being. Teachers are expected to bring education to a better and create a quality human and devoted to the nation and state Support the process of better education with the school can facilitate learning and teaching between teachers and learners, the school is a place to accommodate learners to learn.

Vocational High School is one school that combines science and skills, it is expected to create science and graduates ready to be deployed in the world of work so that graduates can compete and even create their own jobs so vocational high school must be ready to create the best graduates in order to create the period ahead of a better nation [1]. Teachers are people who play an important role in producing quality human beings, with the teachers are expected to bring education to be better and create a quality human and devoted to the nation and state. The observation results show that most or 60.7% of TITL B classes are not able to achieve minimum completeness criteria (MCC), while 54% of TITL A do not reach MCC. Therefore it is necessary to improve the quality of learning needs to be done, resulting in an increase in the number of students whose learning outcomes can reach and exceed the MCC limit. Media trainer fault simulation motor control is a learning media designed to fulfill industrial demands in the field of troubleshooting and simulation of motor control installation. This trainer is able to make engineering interference on the simulation of motor control installation and show the disturbance that happened, this trainer made with the aim so that student can see the disturbance happened at simulation of motor control installation. Slameto suggests that learning is a process of doing a business to gain a whole new behavioral change, as a result of its own experience in interaction with its environment [2]. Furthermore, Oemar Hamalik suggests that learning is a process of an activity and not a result or learning objective not only to see but more broadly than that, that is experiencing [3]. Learning outcomes are not a mastery of training outcomes but behavior change. Learning is not just a memory but also a experience. In a lesson usually teachers also create an atmosphere conducive to comfort students to achieve the purpose of learning purposes of this lesson will be achieved one of them is from the learning itself [3]. According to Hamzah B.Uno that learning outcomes can be classified into three kinds of effectiveness, efficiency, and attractiveness [4].

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In this study used effectively to know the learning outcomes. Arief Sadiman et al found that learning media is anything that can be used to channel the message from the sender to the recipient so that it can stimulate thoughts, feelings of interest and attention in such a way that the learning process takes place [5]. If it is associated with education and learning then technology has a sense as an extension of the concept of media. So technology is not just things, tools, materials or tools, but also the attitudes, actions, organization and management associated with the application of science. In line with that Bruner suggests that the form of conveying ideas or ideas, ideas and ideas here is a thought that in percentage to obtain information applicable [6]. Media when understood in broad outline is the human, material, or event that builds conditions that enable students to acquire knowledge, skills and attitudes [7]. A matter to be considered in the selection of media we can know from the principle of selecting a media [8][9][10]. Media is a tool used to convey ideas or ideas during the learning process takes place. Media in this study is intended as a medium of learning Trainer fault simulation motor control is a trainer that serves to provide a simulation of the control of a three-phase motor. Components of the fault simulation motor control train used include the Miniature circuit breaker which is a safety circuit equipped with a thermals component (bimetal) for over load protection and electromagnetic conductivity for short circuit protection. Sugiyono suggests design validation is a process of activity to assess whether the product design, in this case whether the new teaching method rationally will be more effective than others or not. Rationally, because it is still an assessment based on rational thinking but not based on reality in the field [11].

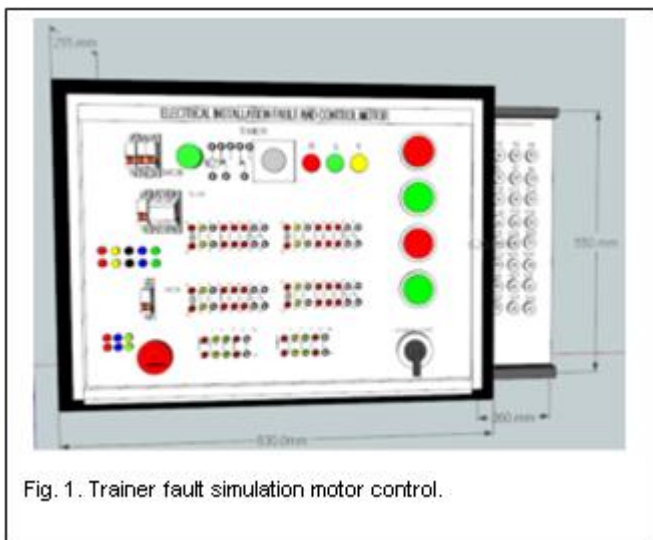


Fig. 1. Trainer fault simulation motor control.

Suharsimi suggests that practicalities means easy to implement, easy examination, and equipped with clear instructions to facilitate teachers and learners in the use of learning devices used [12]. Effective in Indonesian dictionary means that there is an effect (consequently, its effect, its impression). To know the media is said to be effective then done the final test at the end of the learning with the note after the treatment in the form of learning using trainer fault simulation motor control, the media is said to be effective when the students learn mastery when using media trainer

fault simulation motor control into the effective category in accordance with the analysis of data student learning. This subject is one of electricity program subjects of SMK Negeri 1 Padang. In this research, the basic competence 5 is chosen for the research that is to know the points of symptoms of disturbance in the simulation of electric power installation, to analyze the disturbance, and to do the security precaution on the simulation of electric power installation

## 2. TRAINER FAULT SIMULATION MOTOR CONTROL

The motor control error simulation trainer is a trainer whose function is to provide a simulation of a three-phase motor control simulation where the trainer on the switch consists of 32 toggle switches that break the circuit according to the picture for updating the injection.

### Motor simulation component simulation

#### a. Miniature Circuit Breaker

Prih stated a safety circuit equipped with thermic (bimetal) components to protect overload and also equipped with electromagnetic relays for short circuit protection [13]. Three-phase MCB on connections made using 3-phase MCB using 220 Volt operation.

#### b. Earth Leakage Circuit Breaker

Earth Leakage Circuit Breaker or also a leakage current safety device or also called a residual current safety switch (SPAS) works with a differential system, this switch has a current transformer with a ring-shaped core, this core encircles all supply to the machine or secured equipment, including neutral conductor, this applies to all single-phase connections, three-phase connections without neutral or three-phase connections with neutral.

#### c. Contactor

Contactor is a magnetic switch consisting of main contact and NC contact contacts (normally close) and (NO) Normally Open.

#### d. Emergency button

The emergency button is used to disconnect the circuit quickly and immediately lock the circuit when there is a problem with the Trainer. This type of button is a type of closed contact which is usually used to cut off electrical current by pressing the switch so that the contacts are separated, but if the knob is released it will return to original position. This type button is used for the stop button.

#### e. Pilot Lamp

Is an indicator light to see Phase R, S and T operating. At this time the trainer red is used for the R phase, Blue for the S phase and yellow for the T phase.

#### f. Thermal overload relay (TOR)

Overcurrent safety relay is a safety motor due to overcurrent / overload. TOR is installed in series with the main contact of the magnetic contactor. If overcurrent occurs, the bimetallic will bend and mechanically will push the NC 95-96 auxiliary contact. Because in practice the auxiliary contact NC 95-96 is connected in series to the magnetic contactor coil circuit, so if

NC is loose, the contactor coil has no current, the magnetic contactor is inactive and the main contact is cut off. This overcurrent safety value can be set by adjusting the contact driving distance. In practice on the surface of the overcurrent relay, there is a small circular plane, the middle of which can be rotated with a minus screwdriver. There is also a push button to reset

#### g. Timer

Timer is a tool that is used to provide a time delay on the tool or output to be operated, in this trainer the timer also has an error point created. The trainer fault simulation motor control has 1 timer

#### h. Change Over Switch

Change over is used to move the phase load to another phase. In this trainer, change over functions to move the load of the control circuit from 1 phase to another phase

### 3. SOLUTION PROCEDURE

Research type used in this research is Research and Development. The subject of this research is the students of class XI TITL B electrical engineering of SMK Negeri 1 Padang which on the subjects of electromagnetic control system with the number of students as much as 28 people. The proposed instructional tool model Trianto 4D is the definition stage, the design stage, the development stage and the deployment stage [14]. In this research is not done the dissemination therefore this research is adapted and adapted to the needs of 3D are: Define, Design, and Develop. The research instrument used is: validation sheet. This validation sheet is used to measure the level of invalidity and trainer fault simulation motor control validation sheet is composed of several aspects of the assessment that is 1) Didactic requirements are a condition related to the discovery of the concept in accordance with the applicable curriculum didactic conditions used for see media suitability with basic competencies. 2) the terms of construction, the terms of construction is a requirement relating to the construction of learning media to be used. 3) technical requirements, technical requirements are requirements relating to the media trainer's appearance. The instruments used to obtain media practicability include the five components of assessment presented by Sukardi [15]. Questionnaire with indicator 1) ease of use of media 2) time efficiency, 3) media interpretation, 4) product attractiveness, and 5) equivalence. Furthermore, to determine the effectiveness of the use of objective media use. The result of ui instrument shows that from 40 questions stated 34 questions are said to be valid.

### 5. RESULT AND DISCUSSION

This trainer is a Trainer for electromagnetic control circuit, this trainer is used to produce various types of circuit in accordance with the desired by the user. As a trainer motor control trainer can be utilized for (1) Online direct circuit (2) Alternate circuit (3) forward and reverse circuit (4) Automatic turning circuit (5) Delta start-circuit and (6) Automatic star-delta circuit The research instrument used media validation test trainer fault simulation motor control obtained from the validator team's assessment using validation sheet filled by validator. The validator team consists of 2 person, one is a lecturer in Electrical Engineering Department, Faculty of

Engineering, State University of Padang, and one of the technical teachers of SMK Negeri 1 Padang. The validator 1 provides a validation value of 96%. The validator 2 gives 92% value, questionnaire of practice filled by students and subject teachers of electromagnetic control system, the number of students is 28 people. Questionnaires distributed to the teacher obtain an average score of 88% in the practical category. The value of practice students get an average value of 90.5% with a category very practice. Effectiveness test is done based on students' learning completeness taken from the posttest result given to the student at the end of the meeting, the effectiveness using the formula of the percentage of classical mastery. This product is said to be effective if the number of students who meet MCC 80 reaches 85% of the number of students. This learning mastery is analyzed through the formula of percentage of classical mastery. Posttest result of students who meet MCC counted as many as 24 people who did not meet the MCC as many as 4 people with a total of 28 students. Percentage of students who achieve learning mastery is 85.71%.

### 6. CONCLUSION

Based on the result of the research, it is concluded that the development of trainer fault simulation motor control is successful after going through the development stages analyzed based on validity, practicality, and effectiveness. The result of practicality by students is obtained with an average of 94% and stated very valid. The result of practicality by the teacher with a value of 88% and stated very practical. While the results of practicality by students obtained an average of 90.5% and stated very practical. In the effectiveness test using the percentage of classical completeness with the number 85.7% of students graduated. This indicates that the media trainer used is effective. The researcher also suggested to each teacher to operate the electromagnetic control system to be able to use trainer fault simulation motor control to become the reference for the students in applying the more realistic forms of learning is always the spirit of learning and always pay attention to health, and safety at work.

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