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DEVELOPMENT OF QR CODE-BASED E-MODULE ON STUDENT RESPONSES AT SMK DRIYOREJO

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Abstract

This research aims to, analyze the feasibility of a QR code based E-Module to support learning in the independent curriculum electric motor installation subject implemented at SMK Negeri 1 Driyorejo class XI TITL, then to analyze the first feasibility, namely product validity testing, based on the test results The validity of the QR Code-based E-Module received an average rating of 96.6%. Then, to find out how practical the use of Qr-code based E-modules is as seen through student responses, in this test the results were 75.2%, which means that QR Code-based E-Modules are practically used for learning. And finally, knowing students' cognitive learning outcomes to measure how effective the use of QR Code-based E-Modules is after being given treatment. Then, in the results of the N-Gain test which is used to find out how effective the treatment is, the N-Gain score results from 31 samples with an average N-Gain score of 0.64. This value is in the interval 0.30 ≤ n 0.70, which means that the average N-Gain score is in the medium criteria. Thus, the use of the QR Code-based E-Module has proven to be practical and effective so that the QR Code-based Electric Motor Installation E-Module is suitable for use for learning.

Keywords: *Learning tools, Modules, QR Codes*

Abstrak

Pada penelitian ini bertujuan untuk, Menganalisis kelayakan E-Modul berbasis *QR code* untuk menunjang pembelajaran pada mata pelajaran instalasi motor listrik kurikulum merdeka yang diterapkan di SMK Negeri 1 Driyorejo kelas XI TITL, kemudian untuk menganalisis kelayakan yang pertama yaitu uji validitas produk, berdasarkan hasil uji validitas E-Modul berbasis QR Code mendapatkan rata-rata rating sebesar 96,6%. Kemudian, untuk mengetahui seberapa praktis penggunaan E-modul berbasis *Qr-code* yang dilihat melalui respon peserta didik, pada pengujian ini memperoleh hasil sebesar 75,2% yang berarti E-Modul berbasis QR Code Praktis digunakan untuk pembelajaran. Dan yang terakhir yaitu, Mengetahui hasil belajar kognitif siswa untuk mengukur seberapa efektif penggunaan E-Modul berbasis QR Code setelah diberikan perlakuan. Kemudian, pada hasil pengujian *N-Gain yang* digunakan untuk mengetahui seberapa efektif perlakuan yang diberikan, hasil skor *N-Gain* dari 31 sample dengan rata-rata skor *N-Gain* didapat nilai sebesar 0.64. Nilai ini berada pada interval 0,30 ≤ *n* 0,70 yang berarti bahwa skor rata–rata *N-Gain* berada pada kriteria sedang. Dengan demikian, penggunaan E-Modul berbasis *QR Code* terbukti praktis dan juga efektif sehingga E-Modul Instalasi Motor Listrik berbasis QR Code layak digunakan untuk pembelajaran.

Kata Kunci: Perangkat pembelajaran, Modul, QR Code

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INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state (Republik Indonesia, 2003). Thus, education is an academic and non-academic learning activity.

In taking the education level, it is required to take high school education (Sekolah Menengah Keatas) or SMK (Sekolah Menengah kejuruan) or other equivalent. Then, at SMK (Vocational High School) there is one of the electric power installation engineering majors which is basic knowledge about the operation and maintenance of equipment in electric power systems ranging from power plants, transmission systems, power distribution to electrical installations at consumers (Kemendikbudristek, 2022). The Electrical Power Installation Engineering Department educates students with expertise and skills in Planning and Installation of Lighting and Power Installations; Installation and operation of electric motors with Electromechanical, Electronic and PLC (Programable Logic Controller) controls; Maintaining and repairing Electrical Household Appliances and Refrigeration Techniques, as well as rewinding electric motors; so that graduates can work, both independently and in the industrial world as professional mid-level workers (SMK Migas Cepu, 2022). With that, Electrical Power Installation Engineering is one of the majors in Vocational High Schools (SMK) which contains the field of electricity, ranging from home, industrial, and vehicle electricity.

In the learning process, there is a curriculum which is understood as a plan for learning activities for students at school which includes learning outcomes (objectives), teaching materials, learning processes, and learning evaluation. The curriculum is conceptually prepared by experts and has been made a national policy that is used as a reference in the implementation of learning activities. The curriculum as a system, namely that the curriculum is a series of concepts about various learning activities, each unit of activity has a coherent relationship with others, and that the curriculum itself has a relationship with all elements in the education system as a whole (Fauzan, 2017). Thus, the curriculum is a teacher's guide in carrying out a learning process that contains materials that are arranged and programmed coherently.

The Merdeka Curriculum is a curriculum with diverse intracaricular learning, where content will be optimized so that students have enough time to delve into concepts and strengthen competencies. Teachers have the flexibility to choose various teaching tools so that learning can be tailored to students' learning needs and interests. The independent learning policy is implemented to accelerate the achievement of the national education goals, namely improving the quality of Indonesian human resources who have excellence and competitiveness compared to other countries. The quality of superior and competitive human resources is realized in students who have noble character and high-level reasoning, particularly in literacy and numeracy (Khoirurrijal et al., 2022). Therefore, the Merdeka Curriculum offers educational freedom in terms of interests, both academic and non-academic.

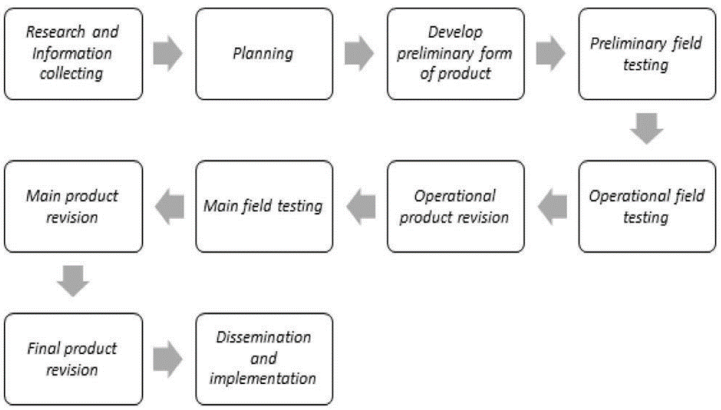
In the Merdeka Curriculum, there is a teaching module that is a learning material arranged extensively and systematically, based on the principles of teaching applied by the teacher to the students. Systematically means following an order, starting from the introduction, content, and conclusion, which makes it easier for students to learn and for teachers to deliver the material (Maulinda, 2022). Furthermore, E-Modules or digital modules serve as a support for the success of the learning process in the Merdeka Curriculum. One of the efforts that teachers can make

to face global challenges is through the development of teaching tools, such as modules implemented in a digital form (e-modules or electronic modules). The combination of teaching materials with computer/electronic media is believed to make the learning process more engaging and challenging for students. In addition, learning by optimizing the use of information and communication technology can help both teachers and students in delivering and understanding the material. With teaching materials equipped with multimedia features like e-modules, the content can be modified into more attractive displays (Najuah et al., 2020). Based on expert validation results, the e-module received an average score of 90% from material experts with a very strong criterion, 90% from language experts with a very strong criterion, and 83.15% from graphic design experts with a very strong criterion. Therefore, it can be concluded that this e-module is very suitable to be used as teaching material (Oktaviara & Pahlevi, 2019).

At SMK Negeri 1 Driyorejo, the Merdeka Curriculum has been implemented since the 2023/2024 academic year. This has prompted the author to conduct research with the title "Development of QR Code-Based E-Module and Its Impact on Student Responses in the Electrical Motor Installation Subject for Class XI of Electrical Power Installation Engineering at SMK Negeri 1 Driyorejo." This study aims to develop a teaching tool in the form of a teaching module using a QR code-based e-module for electrical motor installation lessons that is suitable for use in learning.

RESEARCH METHOD

This research is a Research and Development (R&D) study. This method concerns the development of products through the processes of planning, production, and evaluation of the validity of the produced product. Product development activities involve multiple disciplines in research. Development is an effort to create a product that is effective for use in schools, not to test theories. In his book Metode Penelitian dan Pendidikan (Research Methods and Education), Sugiono mentions that Research and Development (R&D) is a research method used to produce a specific product and test the effectiveness of the product. The steps in this process, commonly referred to as the R&D cycle, include studying research findings related to the product to be developed, developing the product based on these findings, testing the product in a setting where it will eventually be used, and revising it to improve any weaknesses identified during the testing phase. Development research is a systematic study of the design, development, and evaluation of programs, processes, and learning products that must meet the criteria of validity, practicality, and effectiveness..(Sugiyono, 2018).



Gambar 1. Borg and Gall Development Model

The research and development procedure in this study uses the BORG AND GALL model, which consists of the following stages: 1) Preliminary study stage, 2) Planning stage, 3) Design development stage (Develop preliminary product), 4) Preliminary field testing stage, 5) Revision of limited field testing results (Main product revision), 6) Main field testing stage, 7) Revision of broader field testing results (Operational product revision), 8) Feasibility testing (Operational field testing), 9) Final revision of feasibility testing results (Final product revision), 10) Dissemination and implementation of the final product.

The researcher uses a research design in the form of a one-group pretest-posttest. This design involves administering a pretest, followed by treatment or intervention, and then a posttest (Sugiyono, 2018).

$$O_1 \; X \; O_2$$

Gambar 2. Desain Penelitian

This research was conducted at SMK Negeri 1 Driyorejo, Gresik, East Java. The research took place during the second semester, starting in May 2024. The population of this study consists of all students in class XI of the Electrical Power Installation Engineering program at SMK Negeri 1 Driyorejo, totaling 66 students. In quantitative research, a sample is a portion of the population with specific characteristics (Sugiyono, 2019). In this study, the sample size used to determine whether there is an effect of using the QR code-based E-Module is 31 students. This sample was selected using a Non-Probability Sampling technique with a saturated sampling approach. Non-Probability Sampling is a sampling technique that does not provide equal opportunities for each element of the population to be selected as a sample member (Sugiyono, 2019).

The data collection technique and research instruments include practicality testing using validity analysis and student response questionnaires. Effectiveness testing is conducted using the pretest and posttest scores. The feasibility of the QR code-based E-Module is assessed through the practicality and effectiveness tests. Lastly, classical assumption testing includes reliability testing, normality testing, T-test, and N-Gain testing.

RESULTS AND DISCUSSION

This research and development resulted in a product in the form of a learning module, specifically a QR Code-based E-Module. This learning module can be accessed through smartphones, tablets, laptops, or computers. The QR Code-based E-Module is designed to address the issue of inadequate lesson planning in the Electrical Motor Installation subject for class XI students in the Electrical Power Installation Engineering program. The QR Code-based E-Module applied in student learning is a teaching tool that has been approved and deemed feasible for use.

In this study, several tests were conducted, including:

Practicality Test

The practicality test of the QR Code-based E-Module includes two aspects: In the validation sheet instrument for the QR Code-based E-Module, there are two aspects evaluated by the three validators. These two aspects are content and construction. To see the recap of the validation calculation by the validators. In the validity test, the Likert scale score determination is done a priori, with the following score scale:

Tabel 1. Percentage Range

Achievement Percentage	Score Scale	Interpretation
76% ≤ score ≤ 100%	4	Very Valid
51% ≤ score ≤ 75%	3	Valid
26% ≤ score ≤ 50%	2	Less Valid
0% ≤ score ≤ 25%	1	Not Valid

In the validity test, the overall score obtained was 96.68%, indicating that it is very valid. In the practicality questionnaire, the total score was 2215 from 31 respondents. The maximum value is calculated based on 31 respondents answering 19 questions on the questionnaire with a score of 5 (perfect score), which results in a maximum score of 2945. To see the recap of practicality, the following formula can be used.

$$H = \frac{\Sigma SV}{\Sigma SM} X100\%$$

Explanation:

H = Rating result

SV = Score obtained (2215)

SM= Maximum score (2945)

Tabel 2. Practicality Rating

Practicality Percentage	Criteria
81% < p ≤ 100%	Very Practical
61% < p ≤ 80%	Practical
41% < p ≤ 60%	Sufficiently Practical
21% < p ≤ 40%	Less Practical
0% < p ≤ 20%	Not Practical

Sourch : (Sukardi, 2002)

$$H = \frac{2215}{2945} X100\% = 75{,}2\%$$

According to the data results presented in Appendix 6, the calculation using the formula above shows that the QR Code-based E-Module obtained a result of 75.2%, which means that the QR Code-based E-Module is practical for use in teaching.

Effectiveness Test

The effectiveness test, which was based on the pretest and posttest results of the students, involved normality test results, reliability test, T-test, and N-Gain test.

The normality test for the experimental class was conducted to determine whether the data collected is normally distributed. This normality test was performed on one class using the Shapiro-Wilk test with SPSS 25 for Windows, with a significance level of 0.05. After data processing, the output display can be seen in the table below.

Tabel 3. Uji Normalitas

Tests of Normality Shapiro-Wilk			
	Statistic	df	Sig.
Pretest	.959	31	.273
Posttest	.940	31	.084

Based on the table above, the normality test using the Shapiro-Wilk test obtained a value of 0.084. This result indicates a value greater than 0.05, which suggests that the data is normally distributed.

This research requires a reliability test to measure whether the questionnaire used in the study is consistent or not in assessing the feasibility of product usage. Before conducting the reliability test, there must be a decision-making basis, which is an alpha value of 0.60. A variable is considered reliable if its value is greater than 0.60; if it is smaller, the variable cannot be considered reliable because it is less than 0.60. The results of the reliability test are as follows.

Tabel 4. Reliability Statistics

Crocbach's Alpha	N of items
,758	20

Based on the table above, the results of the reliability test using Cronbach's Alpha analysis show that if the Cronbach's Alpha value is greater than 0.758, it can be concluded that the QR Code-based E-Module product is reliable or consistent in learning, and therefore can be used for research.

This test is used when you hae two sets of data measured on the same subjects before and after treatment. In the T-Test calculation using SPSS 25, the significance value obtained was < 0.05, which indicates that there is a significant difference.

Tabel 5. Paired Samples Test

Paired Samples Test					
	Mean	Std.Deviation	t	df	Sig. (2-tailed)
Pair 1 Pretest-Posttest	-24.67742	9.59848	-14.318	30	.000

Based on the data in Table 4, the T-test results using the paired sample T-test technique obtained a significance value of 0.000. Therefore, it can be concluded that there is a significant difference.

Normalized gain analysis (<g>) is conducted to determine the extent of improvement in students' learning outcomes. The maximum gain score refers to the highest score that students could potentially achieve. The independent learning model is considered feasible if the learning outcomes show improvement, as indicated by the results of the pretest and posttest.

Tabel 6. Uji N Gain

	N	Minimum	Maximum	Mean	Std. Deviation
NGain	31	.25	.91	.6404	.16085
Valid N (listwise)	31				

The N-Gain test obtained N-Gain scores from 31 samples, with a minimum value of 0.25 and a maximum value of 0.91. Therefore, the average N-Gain score is 0.64. This value falls within the interval of $0.30 \leq n \leq 0.70$, which indicates that the average N-Gain score is in the moderate category. Thus, the use of the QR Code-based E-Module has been proven effective.

Based on the results of the tests above, it can be concluded that the use of the QR Code-based E-Module is proven to be feasible for learning.

CONCLUSION AND SUGGESTIONS

Based on the results and discussion in this study, several conclusions can be drawn. First, in the practicality test, which includes the validity of the QR Code-based E-Module, the average rating obtained was 96.6%. Furthermore, the practicality questionnaire received a rating of 75.2%, indicating that it is practical for use in learning.

Regarding the effectiveness test, which was observed through the pretest and posttest results of the participants, the normality test with Shapiro-Wilk showed a value of 0.084. This result indicates a value greater than 0.05, meaning the data is normally distributed. In addition, the T-test using the paired sample T-test technique yielded a significance value of 0.000, which indicates a significant difference. The N-Gain test results showed that the scores of 31 samples ranged from a minimum value of 0.25 to a maximum of 0.91, with an average N-Gain score of 0.64. This value falls within the interval of $0.30 \leq n \leq 0.70$, indicating that the average N-Gain score is in the moderate category. Therefore, the use of the QR Code-based E-Module has proven to be effective.

Based on the test results above, it can be concluded that the use of the QR Code-based E-Module is feasible for learning. In light of these conclusions, the researcher offers several suggestions. First, schools should use these findings as a basis for evaluation to ensure they are always prepared for curriculum changes along with the necessary teaching materials and devices. This will allow both students and teachers to carry out the learning process smoothly and comfortably. Furthermore, for future research, it would be beneficial for subsequent researchers to be more creative, varied, and innovative.

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