



Effectiveness of Implementing Android-Based Variable Valve Actuation (VVA) Media in Learning at Vocational High School

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ABSTRACT

This research aims to determine students' learning outcomes after implementing the android-based variable valve actuation (VVA) media in motorbike engine maintenance learning. The study was conducted on 11th-grade students in the Motorcycle Business Engineering competency at SMK Ma'arif NU Kudus who had participated in learning motorbike engine maintenance. The android-based Variable Valve Actuation (VVA) media implemented in the classroom was evaluated by providing a questionnaire to the students containing their responses to the learning media used. In addition, a pretest and post-test were conducted to determine the effectiveness of the android-based Variable Valve Actuation (VVA) media. The study results showed that the student's responses to the Variable Valve Actuation (VVA) media obtained 84% with the very feasible criteria. The pretest and post-test results show a difference in the increase in value of 29.19, with an average gain test result of 0.67 in the medium category. Based on the obtained research results, it can be concluded that the Android-based Variable Valve Actuation (VVA) media is effective in learning.

Keywords: *Actuation, Media, Valve, Variable.*

1. INTRODUCTION

Science has made strides, which have sparked technological innovation to make a variety of tasks more convenient. A technological advancement that is employed as a companion in daily activities because of its sophistication and convenience is the smartphone. The number of smartphone users nowadays is increasing, which is attributable to the creation of better and more affordable smartphone devices [1]. The current use of smartphones is still not ideal for facilitating daily activities; some smartphone users merely use them to maintain their social status so they may continue living their lifestyles. [2].

An operating system controls how a smartphone functions. Android is one of the mobile phone operating systems. An operating system controls how a smartphone functions. Android is one of the mobile phone operating systems [3]. The Android operating system is rather simple to use, and in addition, it gives users the option to add applications in accordance with

their requirements [4]. According to Lee et al., Android provides an open platform for developers to create applications.[5]. The realm of education can make use of the freedom of access that is offered. Mobile learning is one of the technologies that can be utilized to help tasks in the field of education. [6]

One of the skills of SMK NU Ma'arif Kudus is Motorcycle Business Engineering (TBSM). There are several topics to learn in motorcycle business engineering, such as motorbike engine maintenance. According to Harling and Urbata, a 4-stroke engine features a system of inlet and exhaust valve mechanisms whose function is to control the intake of the fuel-air mixture and the release of burned gas [7]. Many advancements, including the invention of variable valve actuation (VVA) technology, have been made possible by the technology's rapid evolution, in this case the valve mechanism.

Variable valve actuation, abbreviated as VVA, is an innovation in the valve mechanism system developed by

Yamaha. Variable valve actuation (VVA), applied to several motorbikes manufactured by Yamaha with SOHC (single overhead camshaft) type engines. Performance of a 4-stroke motorcycle is significantly influenced by the valve mechanism. The advancement of the valve mechanism strives to simplify the function of the valve so that it has less friction, is responsive while opening and shutting, and is capable of facilitating the greatest possible flow of fluid through it [8]. A unique camshaft with two lobes in and one out, as well as a solenoid that operates at high engine revs, are used in variable valve actuation. When the engine is running fast, the solenoid will activate variable valve actuation (VVA), which uses a camshaft lobe with a higher nose profile.

Media that transmit information are necessary for the learning process. The use of learning media in the teaching and learning process is an integral aspect of the educational landscape. According to Tafonao, learning media includes anything that can be utilized to transmit messages from senders to recipients in an effort to pique students' curiosity and stimulate their mental processes [9]. Since there is no specific media that analyzes the variable valve actuation valve mechanism system, the instructor employs the lecture approach while presenting information using power point slides. PowerPoint learning resources with text and visuals are still static and unable to handle complicated topics, such as comprehending work systems. The use of pertinent learning techniques in conjunction with the selection and use of media that are appropriate and in line with the subject matter will result in high-quality educational implementation [10]. The creation of educational material on smartphones makes use of information technology advancements in the field of education. According to Fatimah and Mufti, adopting smartphones as a learning tool will benefit students because they can study material without a time limit, i.e., outside of class hours, in addition to making learning more engaging [11].

The goal of this study was to evaluate the effectiveness of the learning resources provided by the Android-based variable valve actuation valve mechanism system for students.

2. METHODS

This study used the ADDIE model, a five-step development method that includes the processes of analysis, design, development, implementation, and evaluation. According to Hadi and Agustina, the ADDIE development model is a development model that emphasizes the fundamental stages of media development design, which are straightforward and simple to comprehend [12].

The pre-experimental designs (non-designs) research method was used in this study, and the experimental model used was a one-group pretest-posttest design.

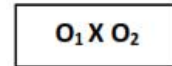


Figure 1. One group pre-post-test.

Keterangan:

- O1 = pretest value (before being given treatment)
 - X = the treatment given
 - O2 = posttest value (after being given treatment)
- [13]

Students learn using established learning resources based on Android in this study and the results of the learning are evident.

Students in class XI at TBSM SMK NU Ma'arif Kudus served as the study's subjects, and the study's focus was on learning materials for variable valve actuation that were based on Android applications. Data on student learning outcomes from the pretest and post-test completed by students are used to determine the field trials' outcomes.

3. RESULT AND DISCUSSION

This study uses the Smart App Creator program to create instructional materials for an Android-based variable valve actuation (VVA) valve mechanism system. The learning media for the variable valve actuation mechanism based on the Android application that has been developed has four main menus: instructions for use, material, practice questions, and an introduction.



Figure 2. Main menu display.



Figure 3. User manual display.



Figure 4. Display the contents of the menu.



Figure 5. Display the question practice menu.

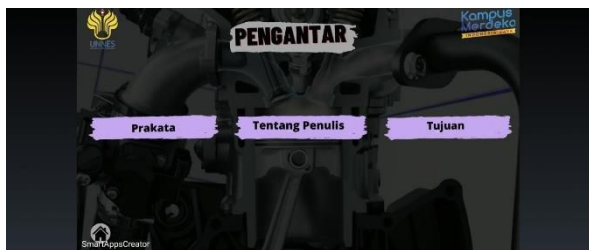


Figure 6. Display the contents of the introductory menu.

Results of pretest and post-test data collection were used to derive test data regarding the efficacy of using Android-based VVA learning media. Test instruments that had undergone validity and reliability testing were used to compare pretest and post test scores. The validity test is carried out to determine the validity of each question to be used, while the reliability test is carried out to determine the level of certainty of the questions to be tested.

The test instrument was tested on 63 TBSM class XII students at NU Ma'arif Kudus Vocational School. The results of the validity test were obtained from 40 questions; there were 8 questions that were invalid, so the questions to be used in the study were 30 questions with all indicators represented. The results of the reliability test with KR-21 obtained a reliable coefficient of 0.75 with 32 items and a criterion value of 0.50. The reliability coefficient calculation yields result that are superior to the provisions. Thus, it can be said that the test is valid and appropriate for assessing the learning outcomes of students.

The results of the pretest and post-test for 36 students in class XI TBSM at SMK NU Ma'arif Kudus are displayed in Figure 7, with an average score of 57.1 for the pretest and 86 for the post-test. Pretest and post-test values are used to find out whether there are differences before and after using Android-based VVA learning media.

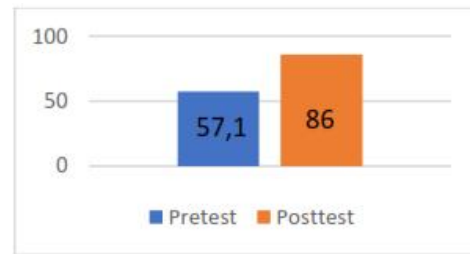


Figure 7. pre-test and post-test values

The results of the normality test from the pretest data using the Chi Square formula at a significance level of 5% obtained χ^2_{counts} of 7,57, and $dk = 36 - 1 = 35$ obtained χ^2_{table} of 7.81. However, the post-test normality test results using the Chi Square method at a significance level of 5% obtained χ^2_{count} of 0.79 and $dk = 36 - 1 = 35$ which obtained χ^2_{tables} of 7.81. Since it can be deduced from the results of these computations that " $\chi^2_{\text{count}} < \chi^2_{\text{table}}$ ", it can be said that the pretest and post-test data are regularly distributed.

Table 1. Normality test results.

No.	Test	χ^2_{hitung}	χ^2_{tabel}	Conclusion
1.	Pretest	7.57	7.81	Normal Distributed Data
2.	Posttest	0.79	7.81	Normal Distributed Data

Based on the results of the homogeneity test, the calculated F value is 1.51 with dk quantifier = $36 - 1 = 35$ and dk denominator = $36 - 1 = 35$ at a significance level of 5%. The F_{table} is 1.75, shown in table 2. Because $F_{\text{count}} \leq F_{\text{table}}$, it can be concluded that the research data obtained are homogeneous.

Table 2. Homogeneity test results.

F_{count}	F_{table}	Conclusion
1.51	1.75	Homogeneous Data

Table 3. T-Test results.

T_{count}	T_{table}	Conclusion
19.17	2.030	Significant

Based on the table of T-test results, it was obtained that the t_{value} was 19.17 at a significance level of 5% with a t_{table} of 2.030. From the results of the calculation above, the t_{count} is in rejection for H_0 . From these results, it can be concluded that there is a significant increase in learning outcomes between the results of the pretest and the results of the post-test. Based on the results of the t-test, it is known that there is a significant increase in learning outcomes, so it can be concluded that the Android application-based variable valve actuation learning medium is effective in increasing students' understanding and knowledge.

4. CONCLUSION

The development of learning media for the variable valve actuation system based on the Android application is effectively used as a learning medium by students. This is based on calculations from the rise in the average value of students who had an average value of 57.1 in the pretest results and increased to 86 with an increase of 29.19 in the post test results. The analysis's findings, which were based on t-test calculations, showed a t-count of 19.17 and a t-table with a significance level of 5% of 2.030, indicating a significant difference between the results of the pretest and post-test.

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