ASSEMBLY SIMULATION OF MOTORCYCLE STARTER SYSTEM AT DEPARTMENT OF MOTORCYCLE ENGINEERING IN SMK MUHAMMADIYAH 2 KADUNGORA

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ABSTRACT

purpose of this research is to help students to be able to try all the stages of the starter system so that they understand the components engine starter motor with a visual shape that matches the original shape. The research flow used is data collection, analysis, application development, testing, drawing conclusions. The results of testing the questionnaire obtained more than 85% stated that the starter system assembly simulation application can help and the pretest results, posttest is used to find the N-gain value. After obtaining the N-gain value, hypothesis testing is used to test the initial assumption. Based on the results of testing hypotheses that have been done then obtained a comparison of the average value tested in the control class and the experimental class shows that the motorcycle starter system assembly simulation application produces significantly better posttest results.

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Keywords : Simulation, 3D, Learning Method, starter system assembly, Desktop.

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1. INTRODUCTION

1.1 Background

SMK MUHAMMADIYAH 2 KADUNGORA, is one of the high school vocationalin West Java province, right in Garut, which was established in 2010, which is located on Jalan Kadungora No. 28 Kadungora Garut. Muhammadiyah Vocational School 2 cadungora initially opened the Information and Communication Engineering Department (ICT) with Computer Network Engineering expertise. Then Reopened the Health Engineering Department with Pharmacy Expertise Competencies, Automotive Department with Motorcycle Engineering Expertise (TSM) and Nursing Assistant Expertise.

Based on the observations in the field it was found that the limitations of the room and the practicum props used were a problem, thus causing students to form several groups of four to five people to enter the room (workshop), this could lead to a lack of maximum practice in students. room (workshop). The results of the interview with Mr. Dandy Kusumawardani, ST as a productive teacher of Motorcycle Engineering (TSM) at Muhammadiyah 2 Vocational School in Kadungora also explained that the results of the job sheet scores of the practice of some students under the designated kkm.

Several studies have been conducted to create learning media to assist students in learning. In Claudia's research, it was found that learning using 3D-based learning media was feasible to be applied to classroom learning activities because the average score obtained by students was higher than the KKM value that had been determined [1]. Likewise, the research conducted by Jusuf Puri Rahardjo and Tati Harihayati M obtained that the learning media application was enough to overcome the limitations of the number of teaching aids available in SMK Negeri 8 Bandung [2]. But in this study there is no creation of a starter system assembly simulation learning media, therefore a study entitled "Assembly of motorcycle starter systems in light vehicle engineering majors at Muhammadiyah 2 Kadungora Vocational School" *will be made* in an effort to help increase the value of results *job sheet* student when practice.

1.2 Purpose and Objectives

The purpose of the construction of this application is to build an assembly simulation system starter application on motorcycle engineering subjects at SMK MUHAMMADYAH 2 KADUNGORA as a learning media with visual images.

The aim to be achieved is to help students to be able to try all stages of the starter system practice so that they better understand the engine components of the motor starter with a visual form that matches the original shape.

1.3 Research methodology

Methodology is a set of rules, activities, and procedures used by actors in a scientific discipline. The methodology is also a theoretical analysis of a method or method. Here is a plot of the research methodology used can be seen in Figure1.1



Figure 1.1 The flow of research

1.3.1 Data Collection

Data collection methods used in the development of this application is as follows

a. Observation
b. Study of literature
c. Interviews

1.3.2 Analysis of

the data analysis stage is the stage to check the completeness data ranging from the results of observations, literature studies and interview results for the needs of a motorcycle starter system assembly simulation application.

1.3.3 Application Development

The software development method used is the Multimedia *Development Life Cycle* (MDLC).

1.3.4 Testing

The testing stages here use the testing phase Hypotheses will later function to find out where this application helps students in learning.

1.3.5 Conclusion Withdrawal

The phase concluding is an assessment of whether a proposed hypothesis is rejected or accepted. If in the testing process there is sufficient evidence to support the hypothesis, the hypothesis is accepted. Conversely if there is no sufficient evidence to support the hypothesis in the testing process, the hypothesis is rejected. The accepted hypothesis is considered as part of scientific knowledge because it meets the scientific requirements. The scientific requirement is to have an explanation framework that is consistent with previous scientific knowledge, and has been tested for truth. Tested for the truth means that no conflicting evidence is found.

1.4 Starter System

Almost all motorbikes generally use two types of engine starters, namely a mechanical starter system and an electric starter system. The use of mechanical starters is known as the kick starter, because in this system when it will turn on the engine using the legs to rotate the crankshaft, while the electric starter system serves as a substitute for the kick starter, so the rider no longer needs to crank to start the engine (to rotate the crankshaft using the motor DC electricity).

1.5 Multimedia

The word multimedia is not new, but has been used even before the computer displays a presentation or presentation that uses several different ways. In the early 1990s, multimedia meant a combination of text with documents image. Another example, the use of 35 mm slides with audio recording is a multimedia form. In line with this opinion, Vaughan said that multimedia is a combination of text, art, sound, animation, and video delivered through computers or electronic and digital equipment [7].

1.6 UML (Unified Modeling Language)

In the development of object-oriented programming techniques, emerged a standardization of modeling languages for software development that was built using object-oriented programming techniques, namely the Unified Modeling Language (UML). UML arises because of the need for visual modeling to specify, describe, build, and document software systems.

2. RESEARCH CONTENTS

2.1 System Analysis System

analysis can be defined as the activity of decomposition of a complete system into components of a computer component with a view to identifying and evaluating problems that might occur to lead to a better direction.

The system analysis phase is very important because if an error occurs at the system analysis stage it can result in an error in the next hold. For that, it requires high accuracy and accuracy to get a good system quality.

2.2 Problem Analysis Problem

analysis is about the problems that existed when conducting research at Muhammadiyah 2 Kadungora Vocational School, before the construction of an assembly simulation. Based on the problems of the results described in the background stated that the infrastructure that is less supportive for the practical activity process that causes students to be formed by several groups, this can lead to less

maximal students in practice activities, and not all students can understand the material presented because the division of the group which caused not all of them could try the stages of the parts of the motorcycle starter system.

2.3 System Description The

motorbike starter system assembly simulation application that will be built is based *client-server desktop* and uses a star (star) topology, with the concept of assembly simulation and evaluation for training. Later it will have 2 user users, namely students and teachers as admin.

2.4 Description of the concept that was built

This application was built to be used by class XI students in Muhammadiyah 2 Kadungora Vocational School in petrifying the learning process of practicum which lacks training equipment in leb. In this application 2 users will be built, namely user students and teacher users where students have 2 main menus, namely:

1. Simulation Menu

   That will be taught the starter system assembly simulation along with the procedures that include, several stages including the inspection phase of the starter motor component, inspection phase series of starter relay coil, inspection phase of the work of starter relay, inspection phase of diode clutch switch, starter clutch inspection phase, pinion starter inspection phase, and stage of assembling starter system.
2. Evaluation Menu

   That is where later will be given training in the form of questions about the starter system, the purpose of which is to understand where students capture the material that has been delivered.
3. The admin menu

is where it will provide information about the results of the student's score and can only be accessed by the teacher. In this context there is also a registration that serves to register students so they can enter the application. Can be seen in table 2.1 below.

Table 1.1 Description of Application Concepts Built

Elements Building	Description
Title	Application of Assembly Simulation of Motorcycle Starter System in Muhammadiyah Vocational School 2 Kadungora
Users	Student and teachers of starter system subjects Class XI
Material	Material applied to the application is material in textbooks which refers to the 2013 curriculum, presented using multimedia components such as text, images, audio and simulations
Audio	deep Audio the application built adjusts to the instructions / instructions in the application.
Animation	Animation in the application built is 3D.

2.5 Network Architecture

Architecture The network architecture in a computer laboratory of Muhammadiyah 2 Kadungora Vocational School is a model *client-server* and uses a star (star) topology. This architecture places the computer in the teacher's desk as a server with a total of 1 computer, while the students' computers as clients number 30 computers. The total number of computers in the computer laboratory of Muhammadiyah 2 Kadungora Vocational School totaled 30 computers.

2.4 *Use case Diagram*

Use case diagram is a model for *behavior* information system that will be created. *Use case* describes the information system that will be created. Roughly speaking, *use cases are* used to find out what functions are in an information system and who has the right to use those functions. can be seen in figure 2.1.

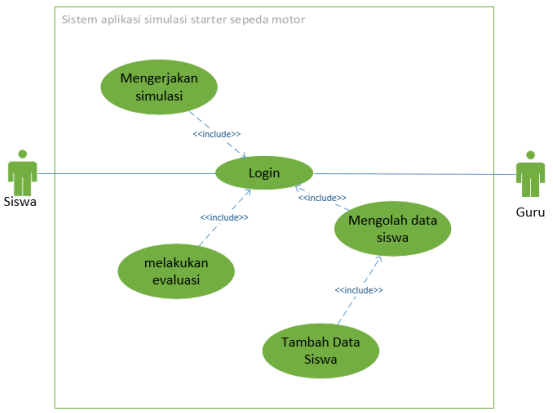


Figure 2.1 *Use case Diagram*

2.5 Results Program

results of this program are done by showing views every program interface created. The following is the interface for students.

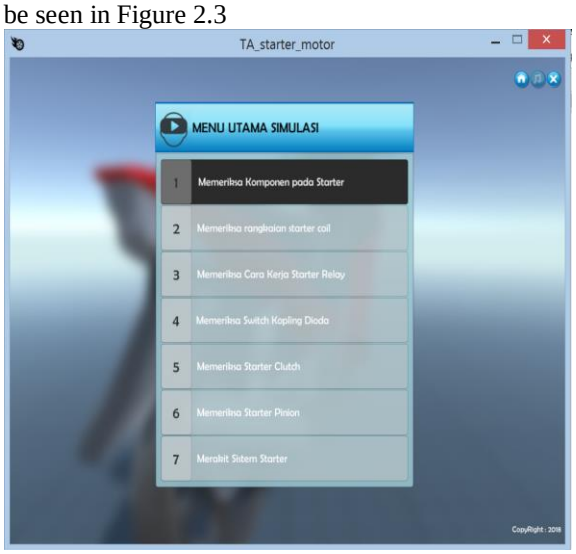
2.5.1 Interface Main Menu Page The

following is the display of the main menu page can be seen in Figure 2.2



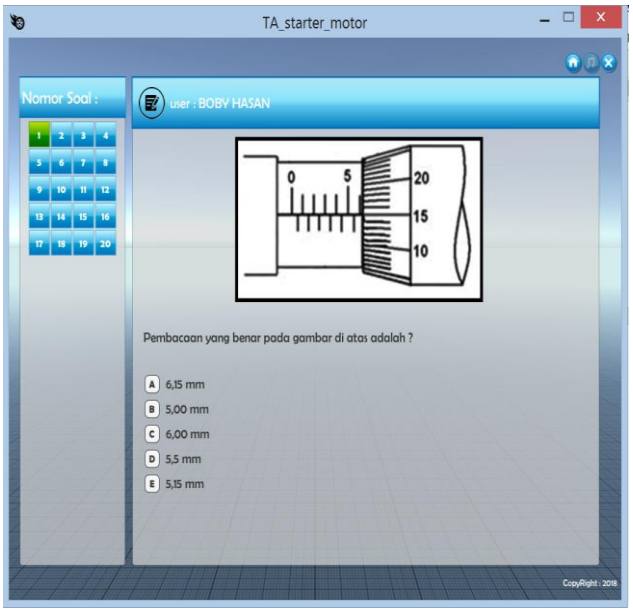
2.5.2 Interface Simulation Menu

Here is the display of the simulation menu page can be seen in Figure 2.3



2.5.3 Evaluation Interface

Here is a view of the evaluation menu page can seen in Figure 2.4



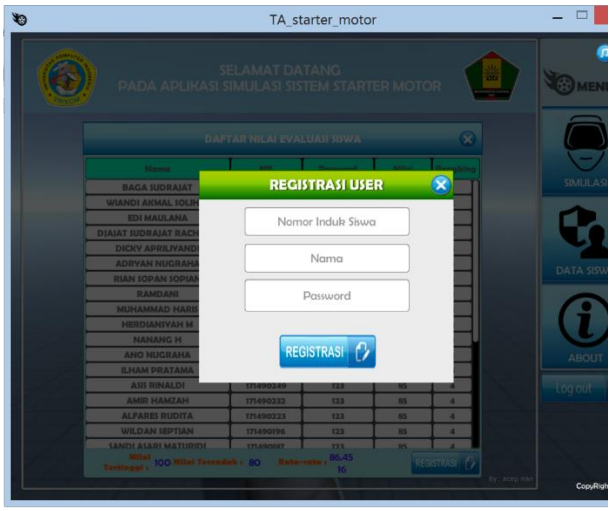
2.5.4 Student Data Processing Interface

Here is a view of the student data processing menu page can be seen in Figure 2.



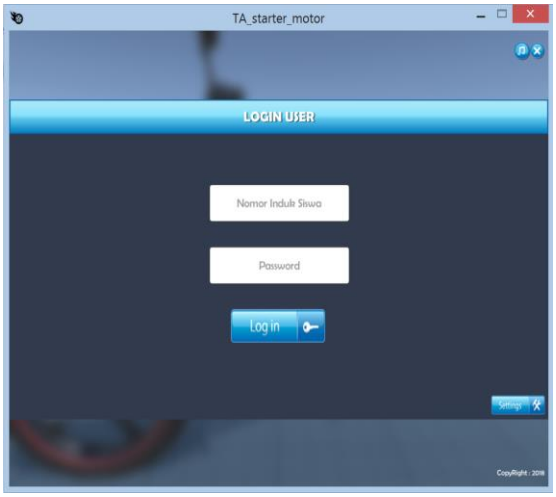
2.5.5 Interface Add Student Data The

following is the display of the menu page added student data can be seen in Figure 2.6



2.5.6 InterfaceLogin

Next is the display of the login page can be seen in figure 2.7



2.6 System Testing System

testing is the most important thing to do to find deficiencies and errors in the software to be tested. Therefore, this test is intended to find out the software that has been made meets the appropriate criteria or not. The following is a system test used to test motorcycle starter system simulation applications.

2.6.1 Alpha testing

Testing *Alpha* or system testing also done using the testing method *black box.* testing *Blackbox* focuses on the functional requirements of the software which consist of the test plan and the test results case testing *Blackbox* performed on the motorcycle starter system assembly simulation application is divided into three parts, including testing scenarios, test results, and testing conclusions.

2.6.1.1 Alpha Testing

Scenarios The testing scenario explains the sequence and the things being tested, in the tests performed on the motorcycle starter system assembly simulation application. The test scenario that is done can be seen in table 2.1

Table 2.1 Testing Scenario

No	Test Class	Test Details	Test Type
1	Login	Login data verification	*Blackbox*
2	Do a simulation	Simulation selection	*Blackbox*
		Component checking	*Blackbox*
		Do a simulation	*Blackbox*
3	Evaluate	Selection of evaluation answers	*Blackbox*
4	Processing student data	Add student data	*Blackbox*

2.6.1.2 Cases and Test Results Test

results contain the exposure of the test plan that has been prepared in the test scenario. Here are the results of testing that has been done on the motorcycle starter system assembly simulation application, based on the test scenario, can be seen in table 2.2

Table 2.2 Test results

No	Test Class	Expected results	Observation	Resuls Testing
1	**Login**			
	True Data NIS: 1234 Password: 123	User data field name and password	User data field name and password	[√] Received [] Rejected
	Incorrect data NIS: empty	Display the wrong username	Display the wrong username	[√] Received [] Rejected

Table 2.2 Test results

No	Test Class	Expected results	Observation	Resuls Testing
	Password: 123	and password	and password	
2	**Do a simulation**			
	Simulation data	The system displays a simulation page	The system displays a simulation page	[√] Received [] Rejected
3	**Evaluate**			
	Evaluation data	The system displays an evaluation page	The system displays an evaluation page	[√] Received [] Rejected
4	**Processing student data**			
	Data is correct Name: Acep NIS:12345 Password: *****	Display registration successfully	Display registration successfully	[√] Received [] Rejected
	Incorrect data Name: Aep NIS:12345 Password: *****	Showing NIS already registered	Showing NIS already registered	[√] Received [] Rejected

Table 2.2 Test results

No	Test Class	Expected results	Observation	Resuls Testing
	Incorrect data Name: NIS: Password:	Displaying the form cannot be empty	Displaying the form cannot be empty	[√] Received [] Rejected

2.6.1.3 Alpha Testing Concern

Based on the tests that have been conducted and tested, it can be concluded that the motorcycle starter system assembly simulation application is running well and can be used by students.

2.6.2 Testing Responses to Application Users This

test is the result of observations from students' responses using the motorcycle starter system assembly simulation application. This response is in the form of interviews and questionnaires that will be given to automotive subject teachers and also in class XI students of light vehicle engineering.

2.6.2.1 Interview

Interviews are conducted to teaching teachers who have access rights as teachers. The results of the interviews that have been conducted with Mr. Dandy Kusumawardani, S. T as a user with the admin user type. Based on the results of the interview with the teacher, it can be concluded that the starter system assembly class XI simulation application can help students in learning independently the starter system lessons, for teachers so that students can try the simulation and practice questions using desktop-based, can be seen in C3.

2.6.2.2 Questionnaire

Questionnaires were given to students of class XI majoring in Light Vehicle Engineering. The following is the percentage of each answer whose value has been calculated using the formula that has been explained. This questionnaire was tested to 30 class XI-1 students of Muhammadiyah 2 Kadungora Vocational School can be seen in table 4.7

2.6.3 Hypothesis

Testing Hypothesis Testing is a procedure that is carried out with the aim of deciding whether to accept or reject the hypothesis. In testing hypotheses, the decisions made contain uncertainty, meaning that the decision can be right or wrong, which creates a

risk. Inferential Statistical Test Parametric is applied to test the evaluation results of the 2 methods applied in the controller class and the experimental class. Data test includes data normality test and data homogeneity test. In the data normality test, the normality of the data will be tested with the provisions:

H0: the sample comes from a population that is normally distributed

H1: the sample comes from a population that is not normally distributed

2.6.3.1 Normality Test Data

With the test criteria that is if the significant value> 0.05, then the data is normally distributed, and if the significant value is <0.05, the data is not normal. The data normality test used is the Kolmogorov-Smirnov statistical test. The results of the normality test of N-Gain data can be seen in table 2.3 below.

Table 2.3 Normality Test Results N-gain Data

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Kelas	Statistic	df	Sig.	Statistic	df	Sig.
Nilai	Kontrol	.177	30	.018	.848	30	.001
	Eksperimen	,119	30	,200*	,926	30	,039

2.6.3.2 Mann Whitney U

Test Based on the results of the above normality test, it can be concluded that the results of the data are not normally distributed for the control class and for the normal experimental class, so that they will be re-tested using Test *Mann-Whitney U*. The results of the test *Mann-Whitney U* are as follows.

H0: There is no increase in students' interest and understanding after using the starter system checking simulation application (ho: μk = μe).
H1: There is an increase in students' interest and understanding after using the starter system checking simulation application (h1: μk <μe).
Test criteria: H0 is rejected if sig <0.05 The following are the results of the test *Mann-Whitney U* which can be seen in table 2.4.

Table 2.4 Mann-Whitney U Test Results

Test Statistics[a]

	Hasil belajar
Mann-Whitney U	303,500
Wilcoxon W	768,500
Z	-2,176
Asymp. Sig. (2-tailed)	,030

a. Grouping Variable: Kelas

Based on the Test value *Mann-Whitney U*, it can be seen in the results of "*Test Statistica*" where the results of the small Z test values are -2.176 and sig values. (2tailed) is 0.030 <0.05. So from the results it can be concluded that H0 is rejected. So that the increase in experimental class is more significant than the control class.

3. CONCLUSION

3.1 Conclusion

Based on the results of the implementation and testing that has been done, the conclusions of the final project entitled "Development of the simulation application assembly system starter motorbike class XI in Muhammadiyah 2 Kadungora Vocational School" as follows:

1. The starter system assembly simulation application can help improve students' understanding of material starter system
2. This starter system assembly simulation application can help and facilitate students in understanding the stages of the starter system assembly with 3D visuals.

3.2 Suggestions

In the construction of the assembly simulation application for the class XI motorbike starter system at Muhammadiyah 2 Kadungora Vocational High School, there are still many shortcomings, so there needs to be some development to make this application better. In this starter system assembly simulation application, the author includes 1 chapter namely starter system material. So that for the future this application will add more material. The other suggestions from students are that this simulation can be based on Android because it can be used at school or at home.

REFERENCES

[1] LJ Claudia, "Development of computer assembly learning media based on 3D multimedia on computer assembly subjects for class X students of TKJ Department IN PACITAN 1 STATE VOCATIONAL SCHOOL," *Computers and Informatics*, no. 8, p. 14-22, 2016.

[2] JP Rahardjo, "Motorcycle Engineering Learning Media For Class XII Vocational Schools Using Desktop-Based Simulations," *Computer and Information Science*, no. 8, p. 45-53, 2014.

[3] AH Sutopo, Information and Communication Technology in Education, Yogyakarta: Graha Ilmu, 2012.

[4] w. Sanjaya, Media Communication Learning, Jakarta: Kencana Prenada Media Group, 2012.

[5] IPAE Pratama, Handbook of Computer Networks Theory and Practice Based on Open Source bonus DVD, Bandung: Informatics, 2015.

[6] AS Rosa and s. M, Software Engineering, Bandung: Informatics, 2016.

[7] H. Winarto, Utilization of XAMPP as a Web, Database and FTP Server in Schools, Pacitan: ICT Center, 2009.

[8] Sugiyono, Research and Development Methods, Bandung: Alfabeta, 2017.

[9] A. Hidayat, "yes," 24 January 2013. [Online]. Available: https://www.statistikian.com/2014/04/mann-whitney-u-test.html. [Accessed 01 August 2018].

[10] I. Guntara, "guntara," February 12, 2010. [Online]. Available: http://www.guntara.com/2013/12/definition-test-normalities-distribution-data.html. [Accessed August 1, 2018].

[11] M. Nazir, Research Method, Bogor: Ghalia Indonesia Publisher, 2014.

[12] S. Amay and M. Tatang, Motorcycle Electricity Systems, Bandung: Library Kubra Bandung, 2014.

[13] H. Bambang, Engineering Object Oriented Systems, Bandung: Informatika, 2004.

[14] N. Juliansyah, Research Methodology, Jakarta: Kencana Prenada Media Group, 2011.

[15] AH Sutopo, Object Oriented Analysis and Design, Yogyakarta: J & J Learning, 2002.

[16] R. Pressman, Software Engineering, Yogyakarta: Andi, 2012.

[17] A. Zaky, Character animation with Blender and Unity, Bandung: Gramedia Digital, 2016.

[18] E. Riadi, Research Statistics, Yogyakarta: Andi, 2016.