THE CONSTRUCTION OF THE VIRTUAL WORKSHOP PRACTICAL REPAIR AND SHIP ENGINE MAINTENANCE ON DEPARTMENT OF TKN CLASS XI (CASE STUDY at SMK N 2 SUBANG)

Agung Gumelar[1], Richi Dwi Agustia[2]

[1, 2] Teknik Informatika – Universitas Komputer Indonesia
Jl. Dipatiukur 112-114 Bandung
Email : agunggumelar7@gmail.com[1], richi @email.unikom.ac.id[2]

ABSTRAK

SMK Negeri 2 Subang vocational high school is a State that has one of course Trading Ship and Teknika has one of the main subjects namely subjects improvements and engine maintenance ship. Based on the results of observation found that learning methods that do still use the method of lecture and practical tools are limited so that students have difficulty in understanding the material of machine maintenance and repair the ship. The purpose of the research conducted to build a companion in the form of virtual media workshop to address the limitations of existing tools in school and helps students to easily understand any material about how to care for and repair the ship's engines. By utilizing computer-assisted or technology is often known as the CAI (Computer Assisted Instruction), the researchers built a virtual application workshop for the practical work, repair and maintenance of ship engines, so the students of Class XI TKN SMK N 2 Subang can do practical work virtually. The results of the research conducted in the form of a virtual application workshop practical improvements and engine maintenance ship machine in SMK N 2 Subang. Based on the test results, the response of the students against the acceptance of applications is very positive and also done testing by way of a pretest and posttest students has increased the value of the average value of 62.39 be 80.00. Then it can be inferred that the media pembelajran that are built can help students of Class XI TKN SMK N 2 Subang in understanding the subject matter.

Keywords: Virtual workshop, repair and Maintenance of ship Engines, Ship Commerce Teknika, Computer Assisted Instruction, Multimedia

1. INTRODUCTION

1.1. Background Problem

SMK Negeri 2 Subang was originally named STM agriculture, then in 1995 was renamed SMK Negeri 2 Subang group of agriculture and forestry, and since the year 2000 until today becomes 2nd State of SMK Subang, with 14 competency skills, one of which is the Commercial Ship Teknika program. Courses Ship Commerce competencies Teknika's expertise as an operator of the machine, take care/keep the machine and the Administration against the ship effectively and efficiently. On the learning process take care/keep the machine theory and practical classes. On the theory of class students to listen to and understand the teachers who are delivering as well as discussion. While the class teaching could not be implemented because the school only has 1 room for practical work, and the room is already in use by another class.

Based on the results of observation conducted in SMK N 2 SUBANG. It was found that the method of learning is still using methods lectures. In addition to observations carried out also from the results of the interview, the interview with the father of Maulana as teachers teaching machine maintenance and repair ship at SMK N 2 SUBANG retrieved that students have difficulty in understanding the material of machine maintenance and repair the ship. This occurs because the process of learning theory that is still centered on the teacher and the teacher just explain the theories contained in the reference book and does not give an illustration or picture on the material being studied, resulting in a lack of interest in and understanding of students regarding the material presented and the existing equipment at the school is limited to only have 4 pieces of machinery and new school has 1 room for practical work, and the room is already in use by another class. The difficulties that have an impact on the results of the average value of the students lack good i.e. minimum graduation criteria under (KKM). As for the results of questionnaire toward students of courses of the commercial Ships of Class XI Teknika, that of the 18 students 12 students or 66.67% of students have difficulty in maintenance and repair of ship engines. And yet the existence of the media learning as a tool to understand the subject matter of machine maintenance and repair ships of Class XI Teknika Ship Commerce courses at SMK N 2 SUBANG.

Based on problems that have been described, needed a supporting media learning which can be an additional media in learning activities, so that the submission of theoretical and practical work will be more interesting and easy to understand. As for the results of questionnaire toward students of Class XI TKN from 18 students all agree to create an application in multi media advocates as a learning tool. One form of media that can be used as a tool in

the process of learning is visual media. Visual media is media that is used concerning the sense of sight. The message to be delivered would be poured into symbols of visual communication [1]. One of mia visual is virtual reality. Based on research conducted by the Department of Information System University of technology Malaysia, obtained that students learning with the help of technology are greater than the value of the students who do without using the help of technology [2]. Based on the exposure to authors interested in creating a visual media applications with methods of Computer Assisted Instruction (CAI) IE-based method of drill and practice, simulated, and a tutorial entitled "development of a Virtual Workshop Practical repair and Ship engine maintenance On Department of TKN Class XI (Case Study At SMK N 2 SUBANG)".

1.2. Goal and Purpose

The intent of doing research (writing) this is to build a virtual workshop teaching machine maintenance and repair the ship.

As for the goal of building a virtual workshop practical ship machine maintenance and repair is to:

a. Build a companion in the form of virtual media workshop to address the limitations of existing tools in schools and facilitate teachers in the delivery of the material.
b. Help students to understand easily in any material about how to care for and repair the ship's engines.

1.3. Research Methods

The research method is the stages that have been specified in the conduct of a study that is useful as a guide in the process of doing the research so that research can be done properly and systematically. Here are the stages that will be done in the research as follows:

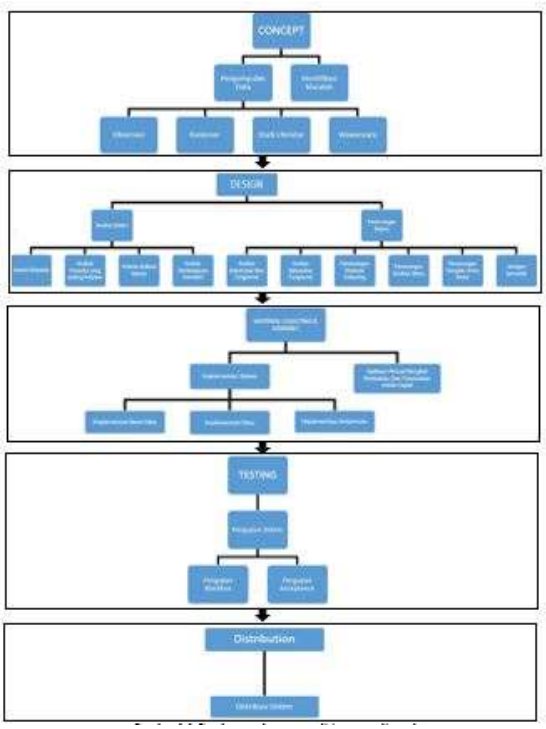


Figure 1. Stages of research

1.3.1. The Stages of Problem Identification

Problem identification is the action that is necessary to find out the crux of the issue, the cause of the problems that are being faced by SMK N 2 SUBANG.

1.3.2. The Stages of Data Collection

In the data collection, there are multiple ways to use, here are some ways that are used in the collection of data in research.

a. Review Of The Literature
   Learn the basic theory of various literature, journals, books and the internet about the theories that would later be used in the research.
b. Interview
   Data collection by direct questioning with Mr Maulana as teachers subjects on the repair and maintenance of ship engines in SMK N 2 SUBANG on matters related to issues that are examined.
c. Questionnaire
   Data collection by giving the now to the students of Class XI TKN SMK N 2 SUBANG.
d. Observation
   Collect data material learning practical repair and maintenance of ship engines in SMK N 2 SUBANG fit with textbook curriculum used i.e. 2013, curriculum and plunge directly into the environment SMK N 2 SUBANG.

1.3.3. The design of the system

This stage is carried out the design of the system for the application by analyzing several aspects, namely:

a. Non Functional Requirements Analysis
Non functional requirements analysis i.e. analysis of the needs in terms of non-functional for the development of applications in the form of hardware needs analysis, requirements analysis, software and user needs analysis.

b. Functional needs analysis
Needs analysis, functional analysis, namely in the form of stage portrayals, planning, and production sketches for the application to be built. A functional needs analysis includes a usecase diagrams, activity diagrams, sequence diagrams, and class diagrams. As for the design of the system are as follows:

a) Designing material collecting
The design of collecting material that is designing is done to meet the needs of their assets from the application to be built. These assets include assets, asset the sounds, images and animation asset.

b) The design of the menu structure
The design of the menu structure that is designing the form of the depiction of menus that will be built on the application. The design of the menu structure menu structure covering application

c) interface Design
Designing the look of the interface that is the design of the display on the interface of the application.

d) design of interface messages
The design of interface messages, namely the design of the interface that contains the message or notification of the application to be built.

e) Semantic Network
Semantic networks namely data network that shows the relationships between the various objects. Semantic networks in the form of semantic network for applications that will be built.

1.3.4. System implementation

This stage is carried out the implementation of an application that has been built based on the design that has been made, namely:

a. implementation of Database
Database implementation is the stage of creation of database applications that use SQL syntax.

b. Implementation Class
Implementation class is the implementation phase of the classes contained in the application. Implementation of class consists of the implementation class backend and frontend implementation class.

c. Implementation of the interface
Implementation of the interface is the discussion of the appearance-the appearance of the applications that have been created. Implementation of antamuka consists of the implementation of the interface.

1.3.5. A Virtual Workshop For The Practical Work, Maintenance And Repair Of Ship Engines

This stage is the stage of application development is done after the process of implementation of the system. Applications that are built based on the design and analysis that has been done before.

1.3.6. System Testing

This stage done testing on applications that have been built. The testing will be carried out aiming to find out the deficiencies contained in the application is built.

1.3.7. Distribution Systems

This stage is the final stage that is distributing the applications that have been built. At this stage done spread application built in SMK N 2 SUBANG, as well as provide conclusions and suggestions in an effort towards improving the quality of research conducted in order that the development could be done better.

1.4. Literature review

1.4.1. Virtual Workshop

According to the great dictionary of the language of virtual Indoesia (KBBI) online, virtual means (by) real [4], while the workshop according to the great Indonesian Language Dictionary (KBBI) Online, the workshop has a sense of place and fix cars, motorcycles, etc. Small factories and places do an activity with a definite direction and purpose [3]. The virtual workshop is a series of workshop tools-software (software) computer-based interactive multimedia, computer-operated and can simulate the activities in the workshop as if users are on the actual workshop.

1.4.2. Computer-assisted Learning

Media learning computer-based or Computer-Assisted Instruction (CAI) is media of learning that utilizes a computer to aid in learning, or it is used include the presentation of the information content of the subject matter, exercise, or both. Learning media CAI allows in presenting a tutorial for understanding, as well as practice or simulation for implementation [5]. Learning devices or often called Computer Assisted Instruction (CAI) was defined as computer users to provide content instruction training with Drills and Practice format, tutorials, and simulation [6].

Drill and Practice is the easiest type of and focuses on training in the form of an evaluation study is to perform tests to expect a user learns from the mistakes from the previous test (Trial and Error)

1.4.3. Method of Luther Sutopo

Multimedia development conducted based on 6 stages, namely, concept, design, collecting material, assembly, testing, and distribution. The sixth stage does not have to be sequential in practice. Each stage can mutually exchange position, though once the stage of concept indeed should be the first thing done. Here is a picture of luther sutopo method [7].

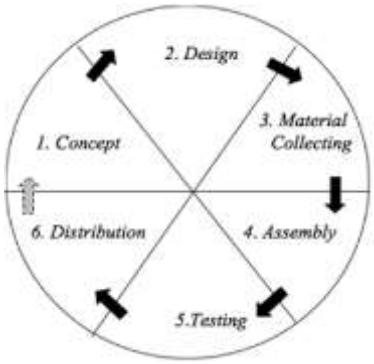


Figure 2. Development of multimedia Luther-Sutop

An explanation of each of the stages are as follows:

a. Concept
   The stage concept i.e. determining objectives, including identification of audiences, the kinds of applications (presentations, interactive, and others), the purpose of the application (information, entertainment, training, etc.) and general specifications. Basic rules for the design are also determined at this stage as the size of the application, the target, and others [9].
b. Design
   Stage design is to create specifications in detail about the architecture project, style, and material needs for the project. The specifications made quite detailed so that at a later stage, i.e. collecting materials and assembly of the new decision is not required, but using what is already determined at the stage of design [9].
c. Material Collecting
   Material Collection can be done in parallel with the stages of assembly. At this stage done gathering ingredients such as clipart images, animations, audio, here the making of images, photographs, graphics, audio and other things needed for the next phase [9].
d. Assembly
   The assembly stage is a stage where the whole multimedia object is created. The manufacturer of the application based on the storyboards, the flowchart view, the navigation structure, or the diagram object that derives from the stage of design [9].
e. Testing
   This stage of testing is done after finishing the stage of manufacture and all data have been entered. First of all carried out testing modular to ensure whether the results as desired [9].
f. Distribution
   When a multimedia application will be used with different machines, use of the doubling of floppy disk, CD-ROM, or the distribution network is indispensable. This stage is also the stage where the evaluation of a multimedia product is done. The evaluation is done with, will be able to dikebangkan a better system later [9].

2. The Content of Research

2.1 Description of the system

Application of virtual practical workshop of repair and maintenance of the ship's engines to be built is a desktop-based client-server system built using the method of Computer-Assisted Instruction (CAI) with the concept of a tutorial, drill and practice, and simulation. Now here is the overview of the architecture of the system that will be built. The system will have two interfaces i.e. a FrontEnd and a BackEnd.

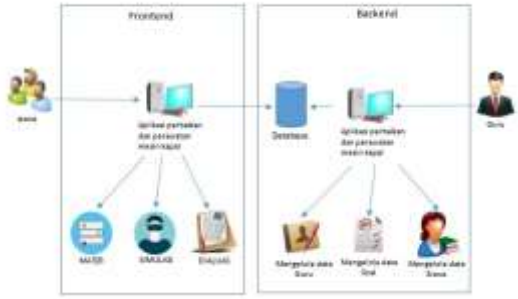


Figure 3. System Architecture

2.2 Analysis of learning methods

Learning methods used can affect the success of the learning process, of course, need to be supported using the appropriate media so that the learning objectives can be achieved. Learning methods used in the development of this application is the method of Computer Assisted Instruction (CAI) with the concept of a tutorial, drill and practice, and simulation.

a. Tutorials
   The concept is used for the submission of tutorial material. Material to be submitted on each babnya is the basic theory of praktikumnya only. So that in a short time, it is expected students can understand the gist of the material in the chapter. Groove concept tutorials on the application of virtual practical workshop of repair and maintenance of ship engines can be seen in the following image:

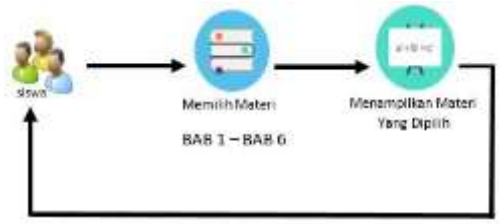


Figure 4. Groove Concept Tutorials

b. Dril and Practice

Dril concept and Practice used to train or test the students by way of showing a series of exams, the students are already familiar to the overall material provided or not. The test is done in the form of test theory and practical exams. Test the theory in the form of a series of practical exams while esay problem i.e. students do practical work, pensimulasian activities without a referral will be given by the system. Groove concept Dril and Practice on the application of virtual practical workshop of repair and maintenance of ship's engines can be seen in the following figure.

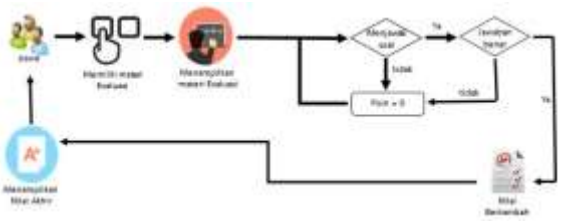


Figure 5. Groove Concept Dril and Practice

c. Sumulasi

The concept of simulation is used to give an overview to the students how the process of teaching activities undertaken. So the students are expected to understand and know how practical activities are carried out. Concept flow simulation on the application of virtual practical workshop of repair and maintenance of ship's engines can be seen in the following figure.

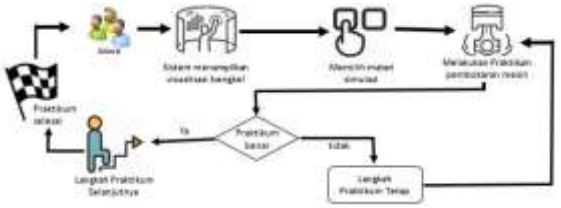


Figure 6. Flow Simulation Concepts

2.3 Use Case

Use case diagrams are used to describe a number of external actor with a use case that is contained in the system. Use case diagram this is only describing the State of the system environment which can be seen from the outside by the actor. Use case consists of three parts, namely the definition of actor, definition, and use case use case scenario. Use case contained in the construction of the virtual workshop practical repair and maintenance ship engines can be seen in the following image:

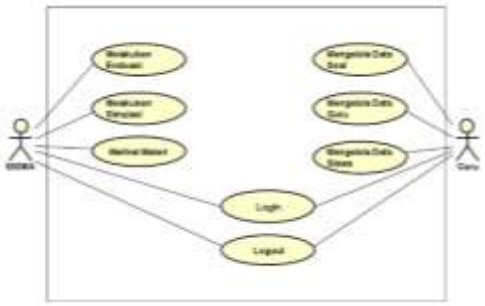


Figure 7. Use Case

2.4 Use Case Scenario

The following is a table of the use case scenario Login on the system that is being built, in table 1 is the explanation of action of Login use case.

Table 1. Use Case Scenario Login

Use Case Name	Melakukan Login
Actor(s)	Siswa dan Guru
Description	Melakukan login untuk bisa masuk ke dalam sistem (menu utama)
Trigger Event	Menekan button login
Actor	**Sistem**
Skenario Utama	
1. Memasukan username dan password	
2. Menekan button Login	
	3. Validasi inputan dari *actor* (Benar)
	4. Menampilkan menu utama
Actor	**Sistem**
Skenario Alternatif	
	3.1 Validasi inputan dari *actor* (Salah)
	3.2 Menampilkan pesan Error
Preconditions	Siswa dan guru berada pada halaman login
Postconditions	Siswa dan guru berhasil masuk ke dalam menu utama
Assumption	Siswa dan guru menginputkan username dan password yang valid

2.5 Activity Diagram

The following is an overview of the use case scenario Login described in an activity diagram Login.

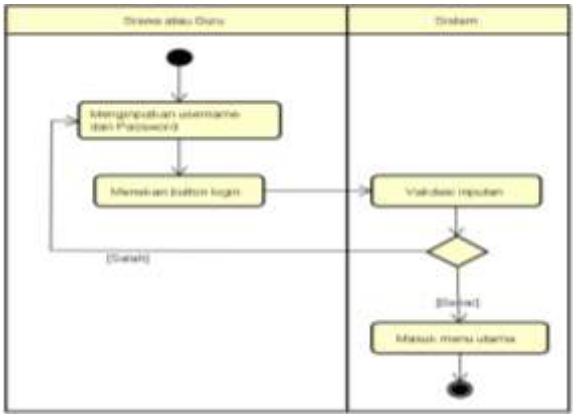


Figure 8. Activity Diagrams Do Login

2.6 Class Diagram

*T*he class diagram is a diagram that is used to display some of the classes that exist in the application to be built. Class diagram gives an overview of the application and the relationships that exist. As for the class diagram on the application of virtual practical workshop of repair and maintenance of ships is as follows below.

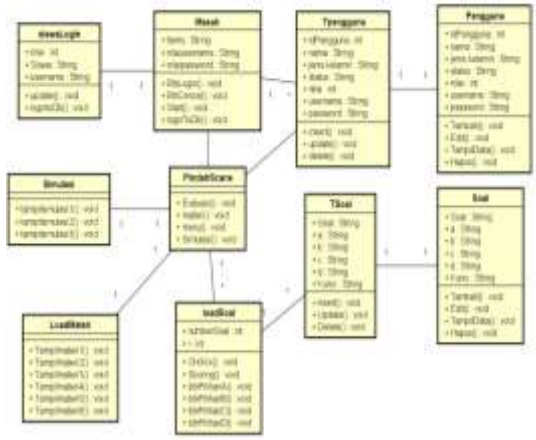


Figure 9. Class Diagram

2.7 Sequence Diagram

Sequence diagrams are used to describe the behavior of a scenario. This diagram shows a number of examples of objects in the message (message) which is placed between the objects in the use case.

The picture below is the explanation of sequence diagram Login on the application of virtual practical workshop of repair and maintenance of ships that will be built.

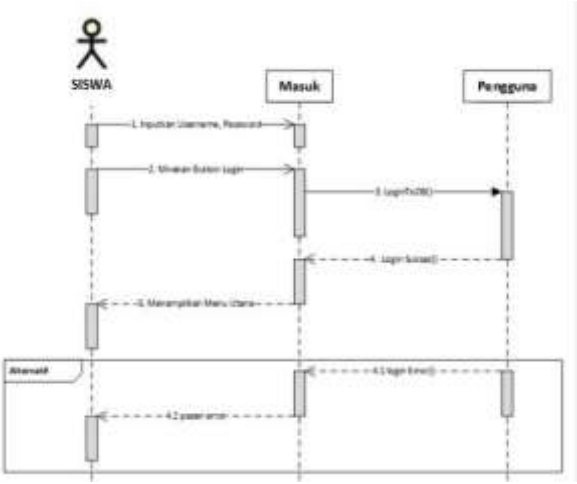


Figure 10. Sequence Diagram Login

2.8 Design Menu structure

Menu structure on the application of virtual practical workshop repair and maintenance ship has 2 main menu i.e. main menu the main menu for students and teachers. Here is the design of the structure of the main menu of the students, in Figure 11 demonstrated relationship between the menu from the main menu.

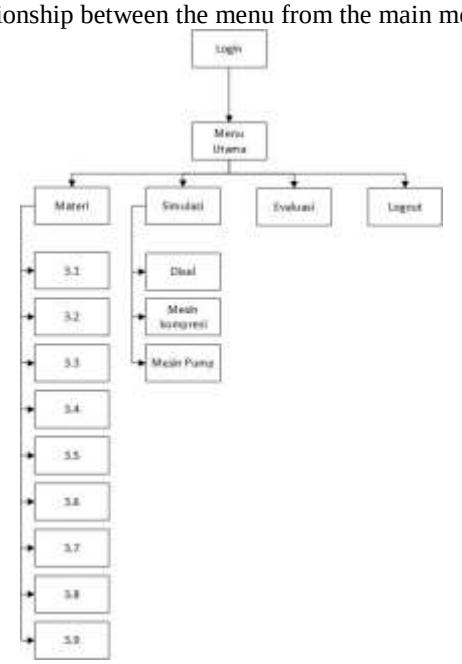


Figure 11. The Structure Of The Main Menu For Students

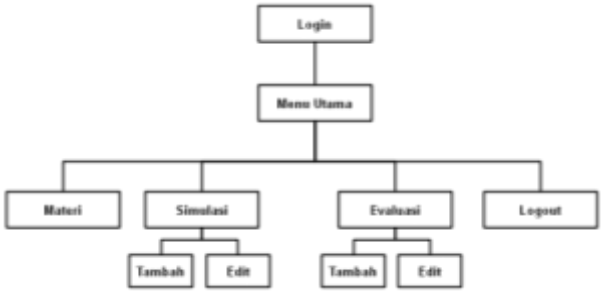


Figure 12. The Structure Of The Main Menu Teacher

2.9 Implementation Class

In the construction of the application there is a class contained in the Virtual application Workshop Practical repair and Maintenance ship Engines, tables implementation class can be seen as follows.

Table 2. Implementation Class

No	Nama *Class*	Nama File Fisik	Keterangan
1	masuk	masuk.cs	*Class* yang digunakan untuk melakukan *login* dan *logout*
2	PindahScene	pindahScene.cs	*Class* yang digunakan untuk mengganti *scene*
3	LoadMateri	loadmateri.cs	*Class* yang digunakan untuk menampilkan materi
4	LoadSoal	loadSoal.cs	*Class* yang digunakan untuk menampilkan soal
5	Pengguna	Pengguna. Php	*Class* yang digunakan untuk mengakses data pengguna
6	soal	Soal.php	*Class* yang digunakan untuk mengakses data Soal

2.10 Black Box Testing Scenarios

Scenario testing exposed the sequence and it is tested in a test conducted on the application.

Table 3. Black Box Testing Scenarios

No	Bahan Uji	Skenario Pengujian	Jenis Pengujian
1	login	Verifikasi login	*Blacx Box*
2	Halaman materi	Menampilkan materi	*Blacx Box*
3	Halaman Simulasi	1. Menampilkan Simulasi Disel	*Blacx Box*
		2. Menampilkan Simulasi centrifugal	*Blacx Box*
		3. Menampilkan Simulasi Comprresor	*Blacx Box*
4	Halaman evaluasi	Menampilkan halaman evaluasi	*Blacx Box*
6	Mengolah data siswa	1. Tambah data siswa	*Blacx Box*
		2. Edit data siswa	*Blacx Box*
		3. Hapus data siswa	*Blacx Box*
7	Mengolah data soal	1. Tambah data soal	*Blacx Box*
		2. Edit data soal	*Blacx Box*
		3. Hapus data soal	*Blacx Box*
8	Mengolah data guru	1. Tambah data soal	*Blacx Box*
		2. Edit data soal	*Blacx Box*
		3. Hapus data soal	*Blacx Box*

2.11 Black Box Testing Conclusions

Based on the results of testing a black box has done with cases that have been tested, then it can be inferred that in the application of Virtual Practical Workshop repair and Maintenance ship Engines can run well and there are no errors on the existing functional process i.e. login, display material, showing simulation, showing the evaluation, showing the value, data megelola students, manage data, manage data of teachers and do logout runs as desired.

2.12 Acceptance Test Scenarios

For megetahui response and assessment users against the application of Virtual Practical Workshop of repair and Maintenance of ship Engines, dissemination of the questionnaire to the respondent based on target user in this case is a student of Class XI TKN SMK N 2 SUBANG that add up to 18 people.

After it's done with likert scale calculation that is used to measure the attitudes, opinions, and perceptions of a person or a group of people about social phenomena. In this study where data were analyzed by calculating the average answer based on skoring any answers from respondents who were then based on the average of the answers of the respondents and then aggregated.

Table 4. The calculation of the value of the goal questionnaire 2

ASPEK PERTANYAAN DAN HASIL PENGUJIAN					
Pernyataan	Aplikasi ini memberikan gambaran kegiatan praktikum yang sesungguhnya (seperti di Bengkel asli).				
Kategori Jawaban	Sangat Tidak Setuju	Tidak Setuju	Biasa Saja	Setuju	Sangat Setuju
Responden	0	0	0	10	8
Jumlah	(0 x 1) + (0 x 2) + (0 + 3) + (10 x 4) + (8 x 5) = 80				
Pernyataan	Dengan teknologi multimedia pembelajaran praktikum menjadi lebih menarik				
Kategori Jawaban	Sangat Tidak Setuju	Tidak Setuju	Biasa Saja	Setuju	Sangat Setuju
Responden	0	0	0	6	12
Jumlah	(0 x 1) + (0 x 2) + (0 + 3) + (6 x 4) + (12 x 5) = 84				
Pernyataan	Memberikan pemahaman materi perawatan dan perbaikan yang lebih interaktif				
Kategori Jawaban	Sangat Tidak Setuju	Tidak Setuju	Biasa Saja	Setuju	Sangat Setuju
Responden	0	0	0	6	12
Jumlah	(0 x 1) + (0 x 2) + (0 + 3) + (6 x 4) + (12 x 5) = 84				
Pernyataan	Memberikan pemahaman materi perawatan dan perbaikan yang lebih interaktif				
Kategori Jawaban	Sangat Tidak Setuju	Tidak Setuju	Biasa Saja	Setuju	Sangat Setuju
Responden	0	0	1	7	10
Jumlah	(0 x 1) + (0 x 2) + (1 + 3) + (7 x 4) + (10 x 5) = 81				

2.13 Acceptance Testing Conclusions

Based on the results of the Acceptance of the conclusion to be drawn from the totality of the questions asked of respondents obtained the percentage above 71%. Questions 1 to 3 gained over 80% were either very much agree to the questions asked and the question to 4 obtained 90% of declared very much agree to the questions asked. So it could be said that application was built already in accordance with the expected goal.

2.14 Test Post test scenarios

Test post test obtained from testing applications built, while the results of pre test was obtained from students on the lesson rapot values
certain

Table 5. Criterion Pretest and Posttest on testing

Materi	**Jumlah Soal**	**Nilai Setiap Menjawab 1 Soal**	**Total Nilai Semua Jawaban Benar**
Perbaikan dan perawatan mesin kapal	20	5	100

2.15 Cases and the results of the test Post test

To see the results of student learning in the cognitive domain before and after using the application, then the need for processing and analysis of data against the pretest and posttest scores. Improved student learning outcomes in the cognitive domain after using media applications of learning can be seen based on the value that is the difference between a score of pretest with posttest.

Table 6. The results of a Pretest and Posttest

No	**Nama**	**Perbaikan dan perawatan mesin**		**Jumlah peningkatan**
		Pretest	**Posttest**	
1	ABDUL GHOFUR HIDAYAT TULLOH	68	80	12
2	ADE PEBRIANSYAH	60	76	16
3	ADITIA AMOR PRATAMA	65	78	13
4	ARYANTO	60	75	15

5	DEDE. A. SURYA NA	65	83	18
6	DICKY KURNIA WAN	58	90	32
7	GUNTO RO SUPAR MAN	68	92	24
8	IHSAN SANTIK A NURGU NAWAN	58	76	18
9	IMAN RASIMA N	68	83	15
10	IRIN BUDIMA N	65	87	22
11	REGI ADITYA REPANS HA	58	78	20
12	RIKVA'I MUHAM AD	65	79	14
13	RIO PANJI SANTOS O	68	83	15
14	RIZKI SALAM UDIN	65	81	16
15	TAUFIK DEAN RAMAD HAN	60	75	15
16	TOPIK EGA HERYA NTO	55	85	30
17	TOTO IRFAN	55	77	22
18	YUSUP PARIZD	62	80	18
Total		1123	1440	335
Rata-rata Nilai		62,39	80,00	18,61

3. CLOSING

3.1 Conclusion

Based on the results of the research, analysis, design and implementation of the system, as well as testing, can be drawn the conclusion that the development of the application of virtual practical workshop repair and maintenance of ship's machinery is as follows

a. Based on the results of the interviews and testing the invalidated that applications can facilitate teachers in providing a picture or illustration on subjects on the repair and maintenance of ship engines
b. Based on the results of a test questionnaire to the deployment of 18 students obtained the results of the overall attitude of respondents towards the goal of students there are very positive on the category and amount of the increase in value was 18.61. Applications can facilitate students in understanding any material by using simulation.

3.2 Advice

Based on the results of the research, then the advice that can be expressed in the future in order to be an improvement and considerations are as follows:

a. The delivery of the material could be upgraded again to make it more interactive and there is static.
b. The addition of features 3-dimensional objects on a simulation and made more interactive and interesting.
c. Working with the more expert in order to obtain practical results that are more accurate.

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