DEVELOPMENT APPLICATION OF MEDIA LEARNING AUTOMOTIVE ENGINEERING CONVENTIONAL DIESEL ENGINES FOR CLASS XI (CASE STUDY: SMK KB PUSDIKPAL CIMAHI)

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ABSTRACT

This research is motivated by the existence of some problems in the conventional learning methods, especially in automotive engineering subjects in class XI SMK KB Pusdikpal Cimahi. Based on the interview with Mr. Agus Saripudin as head of automotive engineering program which also doubles as the automotive engineering faculty said that the practical tools which provided limited only 3 units of diesel engines. Similarly, the results of questionnaires initial research on students of class XI automotive engineering SMK KB Pusdikpal Cimahi can be concluded that the learning materials are delivered poorly understood and instrument lab which provided limited, the impact of these problems led to a lot of students who have qualified in the subjects of automotive engineering diesel engine conventional.

In this study, the method used for the construction luther Sutopo instructional media applications where the stage is the concept, design, collection of material, design and testing. For the learning process using Computer Aided Learning (CAL), which is used in the explanation of the method tutorial materials and components, whereas the simulation methods used in the installation of the components of a conventional diesel engine.

Applications media that built a simulation learning applications of conventional diesel engines based desktop berobjek 3D which can help overcome the limitations of the tool lab and increase the value of technical competence automotive conventional diesel engines that can be seen by the test data Acceptance performed on each class XI Automotive Engineering obtained level the approval of this application is over 80% and based on the results of tests carried out by Pre Test and Post Test that the average value of students increased, the class XI tO 1 average value of 73.9 to 86.3, in the classroom XI TO 2 average value of 71.2 to 83.5 and in class XI TO 3 average value of 73.3 into 84.1.

Keywords *: conventional diesel engines, Instructional media, learning, simulations, tutorials*

1. INTRODUCTION

1.1. Background

Engine / diesel engine is one form of internal combustion engine (internal combustion engine) in addition to gasoline engines and gas turbines. Diesel engine called the compression ignition engine (compression ignition engines) due to ignition of fuel caused by the temperature of the compressed air in the combustion chamber. This can happen because the combustion air is compressed in the chamber with pressure and temperature exceeding the ignition temperature and pressure of the fuel itself and has 2 working system that distinguished the 2-step and 4-step. In the history of its development, engine / diesel engine is the prime movers are very lightweight and compact, known as a type of internal combustion engine that has high efficiency.

SMK KB Pusdikpal Cimahi is located at Jl. South Poncol 24 Cimahi is a vocational school that has four, one of which is of Automotive Engineering (Light Vehicle) where vocational one of them is studying a conventional diesel engine, especially for an automobile engine. Based on the results of observations conducted on learning methods in vocational KB Pusdikpal Cimahi. Obtained conventional learning methods still are still using the lecture method where teachers explain the learning material with instructional media tools used glued to the book so that students lack a clear picture of the material presented. Besides observation also conducted interviews to Mr. Agus Saripudin as head of automotive engineering program that also doubles as a teacher of automotive engineering SMK Karya Bhakti Pusdikpal Cimahi. From the interview result that today there are several obstacles that arise when giving lessons automotive engineering conventional diesel engines in vocational KB Pusdikpal them a practical tool of conventional diesel engines supplied is limited to only three units of the engine alone and for practical activities students are divided into several groups practice each group consisting of 5 to 6 students. Such problems also affect the lack of understanding of learning students of SMK KB Pusdikpal Cimahi seen from the results

of the data if the value of repetition during the reporting period has a value limit of competence, namely 75 that can be said in class XI TO 1 there were 16 students who did not graduate from a total of 30 students , while in class XI TO 2 there are 19 students who did not graduate from a total of 28 students, and the class XI TO 3, there were 15 students who did not graduate from a total of 29 students. In order to get the number of students who do not pass the presentation of the total as many as 87 students is 57%.

Therefore based on the issues that have been outlined, we need a system that can provide learning and simulations regarding the conventional diesel engines that can be used as a medium of learning by teaching vocational KB Pusdikpal Cimahi. Thus it will be built a learning medium conventional diesel engine that uses a desktop-based 3D objects with methods of Computer Aided Learning (CAL) is a learning method that uses simulation tutorial computer media. The use of this method because this method can provide learning tutorials, simulations and practical exercises as well as the evaluation so that the application is expected to provide solutions to the problems that exist with the title "MEDIA APPLICATION OF LEARNING TECHNIQUES CONVENTIONAL AUTOMOTIVE DIESEL ENGINE FOR CLASS XI".

1.2 Identification of Problems

Identification of the problem is one of the research process that is arguably the most important among other processes. The research problem will determine the quality of the research, even determining whether an activity can be called research or not. Based on the background that has been presented, obtained the identification of issues that will be examined as follows:

1. *Limitations of conventional diesel engines practical tool.*
2. *Many students who have not yet reached a value competent.*

1.3 Purpose and Objectives

The purpose of this research is to establish a Learning Media Applications Conventional Diesel Engine for Class XI at SMK KB Pusdikpal Cimahi.

The purpose of this study is as follows:

1. *Provide a virtual learning media that are expected to cope with limited practical means of conventional diesel engines.*
2. *Helping to increase the yield value of students learning the techniques of conventional automotive diesel engines through a desktop-based multimedia learning.*

1.4 Research Methodology

The research method is a process to solve a problem that is logical, and it requires the data to support the implementation of a study. The method used is descriptive method is a method that examines a group of people, objects, conditions, and thought in the modern era. The research method consists of the method of data collection and software development methods. The depiction of the research methodology can be seen in Figure 1.

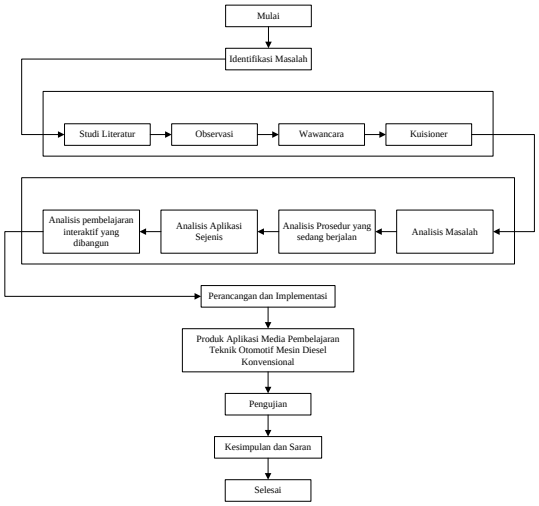


***Figure 1**. Research Methodology*

1.5 Automotive Engineering

Automotive engineering is one of the branches of Mechanical Engineering. Automotive majors only offered via the education sciences, precisely named Automotive Engineering Education. Education Automotive Engineering to study the development of automotive engineering, chassis, body, electrics. In the presentation material is divided into the design, development, production, and automotive care.

1.6 Learning

The learning activities are designed to provide a learning experience that involves mental and physical processes through interaction with other students, students with teachers, the environment and other learning resources in order to achieve basic competence. This is consistent with the view Hamalik saying that "Learning as a combination composed include the human element, material, facilities, equipment, and procedures that influence each other to achieve the learning objectives" [2].

1.7 Multimedia Based Learning

According to Vaughan was quoted as saying by Effandi [4], Multimedia is the "integration of the use of various media such as text, audio, vidio, animation, printing and graphic formats emitted combinations result in the screen monitor to form a single offering." Multimedia-based learning is a

learning activity that utilizes computers to create and combine text, graphics, audio, moving images (video and animation) by combining links and tools that allow users to navigate, interact, create and communicate.

1.8 Computer Aided Learning (CAL)

*Computer Aided Learning (CAL) or in Indonesian called Learning Computer Assisted (CPB) is a computer application as an integral part of the learning system of the teaching and learning process that aims to help students in their learning can be through a pattern of two-way interaction via computer terminals and multi-way expanded through a computer network (either local and global) and also expanded its functions via an interface (interface) multimedia. Basically CAL (Computer Aided Learning) is a learning method that uses computer media, where this method can deliver direct instruction to students through how to interact packaged in the form of software. CAL (Computer Aided Learning) has four concepts, among others:**Penjelasan (Tutorial) :** digunakan untuk menyampaikan materi pengajaran yang dimana materi dipresentasikan dalam bentuk teks dan gambar dan dilakukan secara bertahap.*

1. ***Drill and Practice :*** *used to test the level of knowledge of students and to practice their knowledge, thus making tailored to the abilities of the learner. In this case, the researchers provide or primary materials to students through the existing software, so that the software will students be able to do the exercises of the questions that have been provided.*
2. ***Simulation :*** *used to demonstrate something (skills) so that students feel like being in a real situation. In this concept available simulation program by combining design and training equipment so that students can study the behavior of systems that present real life.*
3. ***Game :*** *enhancement as a learning facility, the students can learn to play with a relaxed atmosphere in this way is an effective way of learning, because with a relaxed atmosphere so that students do not get pressure can help improve students' learning motivation.*

1.9 Multimedia Interactive

Forms of utilization models of interactive multimedia computer based learning can be a drill, tutorial, simulation and games [3]. The main objective of interactive multimedia learning is best to replace or complement and support elements such as materials, objectives, methods and assessment tools that exist in teaching and learning in conventional education systems are wont to do.

2. RESEARCH CONTENTS

2.1 Analysis Procedure on Going

Analysis of current procedures are analyzing the activity of work procedures that occur in existing systems. Procedures that occur or walk in learning activities in vocational KB Pusdikpal Cimahi today is as follows:

1. Procedures for the subject matter
2. Procedures to exercise subject matter
3. Procedure practicum conventional diesel engines

The procedures involved can be explained as follows:

1.1.1 Procedure Giving Lessons

Procedures for granting BPMN subject matter depicted in Figure 2, while the flow of the procedure is as follows:

1. Teachers prepare the subject matter is seen in guidebooks / modules to be delivered in the classroom
2. Teachers deliver material in a conventional or a lecture and gave a summary of the subject matter
3. When or after the teacher explains the material, the student can ask if there is material that has not been understood
4. If there is, then the teacher will explain the return of material in question
5. If no, students can pick up learning activities by teachers to record material given in the record books each.

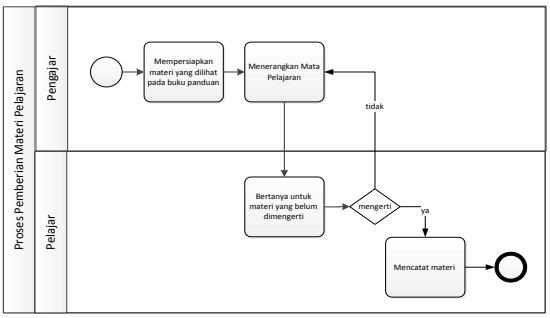


Figure 2*. Granting Procedure Subject Matter*

1.1.2 Procedure for Provision of Training Learning Materials

Procedures for granting exercise BPMN subject matter depicted in Figure 3, while the flow of the procedure is as follows:

1.Teachers provide exercises to students
2.Students do exercises given faculty
3.Students collect the answer sheets practice questions to teachers
4.Teachers check and assess the answer sheets of the students practice questions

5.Teachers provide an assessment of the answer sheet that has been collected learners
6.Teachers create assessment documents by entering a value to book value as archives
7.Teachers give answer sheets that have been assessed to the student.

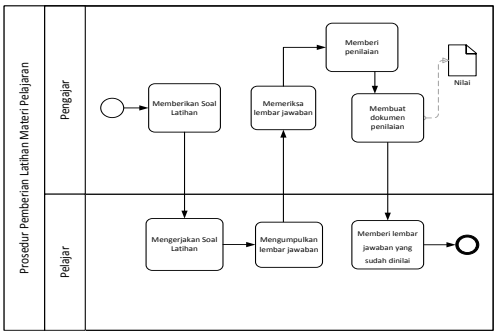


***Figure 3**. Granting Procedure Training Learning Materials*

1.1.3 Conventional Diesel Engines

Conventional diesel engine lab procedures described in BPMN in Figure 4, while the flow of the procedure is as follows:

1. The teacher divides the group practicum
2. Teachers provide practical materials to students
3. Students do lab work in groups
4. The teacher assesses a student from the practicum
5.Teachers create assessment documents by entering a value to book value as archives

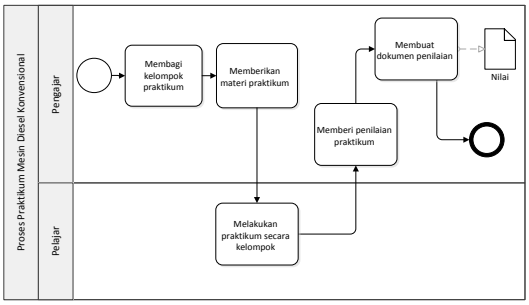


***Figure 4**. Practical procedures Conventional Diesel Engines*

2.2 Analysis Similar Applications

Analysis of this kind of application in it will discuss various things about the kind of learning applications Lightweight Vehicle Engineering (Automotive Engineering) who have been there, including components supporting what is in the application so that it can be a reference for application needs to be built.

2.3 Analysis of Interactive Learning Built

Interactive Learning conventional diesel engine is a computer-assisted interactive learning application that contains several learning materials Automotive Engineering conventional diesel engines. Interactive learning is intended for a class XI student of SMK KB Pusdikpal Cimahi.

2.4 System Architecture

Applications to be built based desktop, the application serves as a medium of learning the techniques of conventional automotive diesel engines. In using this application users use the computer as a tool running media applications automotive engineering learning conventional diesel engines. System architecture automotive engineering instructional media conventional diesel engines can be seen in Figure 5

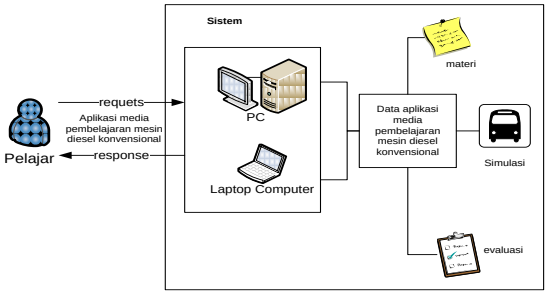


***Figure 5**. System Architecture*

2.5 Design System

The design of the system is part of a software development methodology that should be done after going through the stages of analysis. This section will explain the design of the proposed system.

2.6 Analysis of Non-Functional Requirements

Analysis of non-functional requirements illustrate the need for external systems needed to run applications built. As for the non-functional requirements in Automotive Engineering Simulation Interactive Learning Conventional Diesel Engines, include hardware requirements, software requirements and system users who will use the application. Analysis of non-functional requirements intended that an application built to be used as needed.

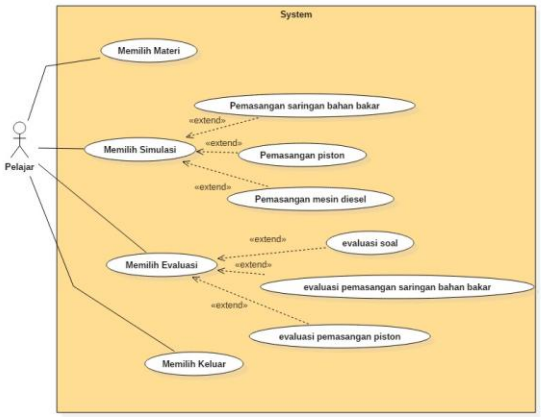
2.7 Functional Needs Analysis

Analysis of functional requirements is the analysis used to make the flow of data. Analysis of functional requirements describe the activities to be implemented in the system and explain the necessary requirements for the system to run smoothly and according to need. The functional requirements on the applications that will be built with modeling OOP (Object Oriented Programming) using StarUML tools.

2.7.1 Use Case Diagram

Use case modeling is modeling system from the perspective view of the end user. Use Case Diagram is the highest part of the functionality of the present

system which will describe how the person or factor will use and exploit the system.



***Gambar 2**. Use Case Diagram*

2.7.1.1 *Definitions Actor*

Actor definition serves to explain the actor found on Use Case Diagram. Definition actor can be seen in Table 1.

***Table 1**. Definitions Actor*

No	*Actor*	*Deskripsi*
1	*Student*	*User of application*

2.7.1.2 *Definitionns Use Case*

Use Case definition serves to explain the process in each Use Case. Its definition can be seen in Table 2.

***Table 2**. Definitions Use Case*

No	*Use Case*	*Deskripsi*
1	*Matter*	*The process to display the menu of matter*
2	*simulations*	*The process to display the menu simulation*
3	*Evaluation*	*The process to display the menu of evaluation*
4	*Installation of a fuel filter*	*The process to display the installation of a fuel filter simulation*
5	*Installation of piston*	*The process to display the installation simulation piston*
6	*Installation of diesel engines*	*The process to display the installation of the diesel engine simulation*
7	*evaluation Problem*	*The process for displaying the evaluation stage about*
8	*Evaluation of Fuel Filter Installation*	*The process for displaying the evaluation phase installation of the fuel filter*
9	*Evaluation Installation of Piston*	*The process for displaying the evaluation stage piston installation*
10	*Exit*	*The process to exit the application*

2.8 Interface Design

The design of the interface serves to give an overview of the software to be built, in order to further facilitate the creation of the software later.

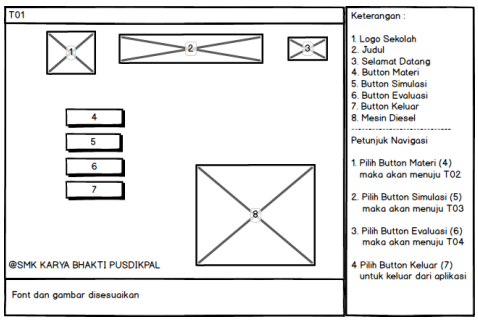


***Figure 3**. Home Interface*

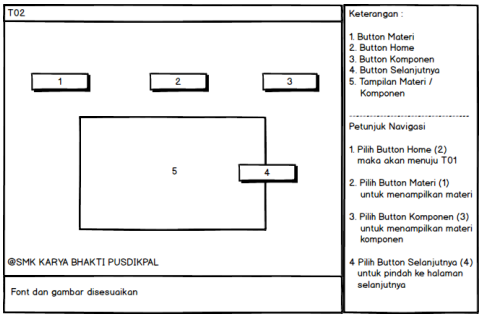


***Figure 4**. Matter Interface*

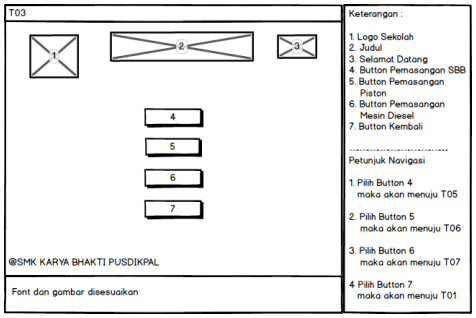


***Figure 5**. Simulations Interface*

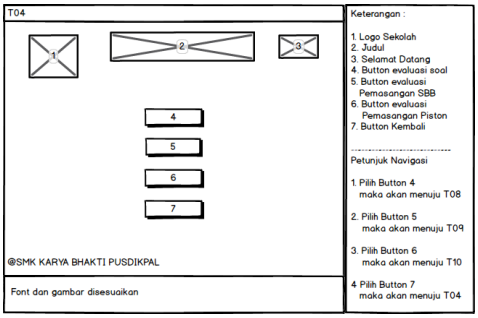


***Figure 6**. Evaluations Interface*

2.9 Menu Structure

The menu structure is a common form of a draft program to facilitate users in running the computer program. The following is the menu structure design

Learning Media Applications Automotive Engineering Conventional Diesel Engines can be seen in Figure 11.

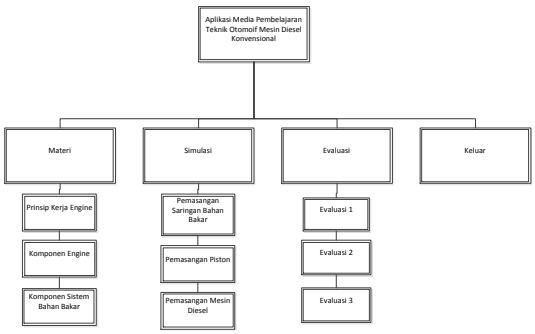


***Figure 7**. Menu Structure*

2.10 Implementation

Implementation stage is the stage of translating the design based on the results of the analysis into a programming language and application software that is built on a real environment. The discussion consists of a hardware implementation, software implementation, implementation class and interface implementation.

2.11 Testing System

System testing is a stage to find errors or deficiencies in the software that is built so it can be known whether the software meets the criteria in accordance with the goals / needs or not. Tests were carried out to test the application of automotive engineering study media conventional diesel engines for class xi have 2 stages of testing is black box testing and Acceptance testing.

2.11.1 BlackBox

Black box testing are functional testing held in neighborhood development by a group of users who will be using the software. Parties to accompany development and noted the mistakes and problems perceived by users. Black box testing is done on automotive engineering applications instructional media conventional diesel engines for class xi ie black box testing scenarios, cases and outcomes black box testing, black box testing and conclusion.

Here is the test data blackbox:

***Table 3**. Material Testing Menu*

Cases And Test Results (Normal Data)			
Data Input	***Expected***	***Observation***	***Conclusion***
Click Menu of material	*Menu Display appears Material*	*Can Go To Menu Display Material*	*[√] Accept*

***Table 4**. Simulations Testing Menu*

Cases And Test Results (Normal Data)			
Data Input	***Data Input***	***Data Input***	***Data Input***
Click Menu of simulation	*Menu Display appears simulation*	*Can Go To Menu Display Simulation*	*[√] Accept*

***Table 5**. Evaluations Testing Menu*

Cases And Test Results (Normal Data)			
Data Input	***Data Input***	***Data Input***	***Data Input***
Click Menu of Evaluations	*Menu Display appears Evaluations*	*Can Go To Menu Display Evaluations*	*[√] Accept*

2.11.2 Acceptance

Acceptance testing is a test that involves a set of data to get a decision on the acceptance of the software that has been built and aims to test whether the system is in accordance with what is in the functional specification of the system. Acceptance testing conducted objectively where tested directly into the field which schools sampled, by giving questionnaire consists of four questions to the class XI student of automotive engineering with a total of 87 students and teachers interviewed subjects automotive motor.

This questionnaire consists of four questions using a Likert scale of a scale of 1 to 5. As for the question of the questionnaire Acceptance testing is as follows:

1. Do you think this app gives a clear picture of learning conventional diesel engines?
2. Do you think this application can be used as a tool to support learning activities in the study of conventional diesel engines?
3. Do you think the simulation menu on this application component model and stages of processing are in accordance with the requirements described the practice field?
4. Are the materials contained on this application is easy to understand?

The following is the assessment score given by using a Likert scale on each question, which can be seen in Table 6.

***Table 6**. Score Assessment Questionnaire*

Answer	*Information*	*frequency*
SA	*Strongly agree*	*5*
A	*Agree*	*4*
O	*Ordinary*	*3*
DA	*Disagree*	*2*
SDA	*Strongly Disagree*	*1*

As for the reference range Likert scale can be seen in Table 7.

***Table 7**. Reference range Likert Scale*

Nilai	*Keterangan*
349 – 435	*Strongly agree (SS)*
262 – 348	*Agree (ST)*
175 – 261	*Ordinary (RG)*
88 – 174	*Disagree (TS)*
0 – 87	*Strongly Disagree (ST)*

After testing, the results of calculation of the questionnaire obtained as follows:

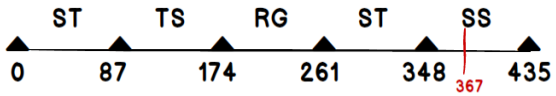


***Figure 8**. Calculation results Questionnaire No. 1*

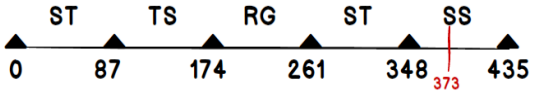


***Figure 9**. Calculation results Questionnaire No. 2*

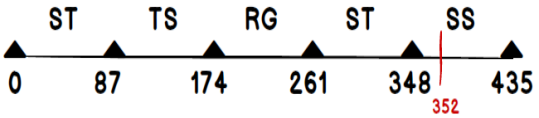


***Figure 10**. Calculation results Questionnaire No. 3*

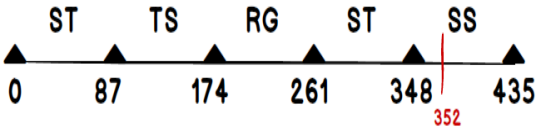


***Figure 11**. Calculation results Questionnaire No. 4*

Based on the calculation results of testing Acceptance app users this instructional media, it can be concluded that the development of applications Learning Media Automotive Engineering Diesel Engines Conventional for Class XI-based desktop is in conformity with the objective to be achieved is to overcome shortcomings / limitations practical tool, providing a medium of learning techniques conventional automotive diesel engines as a means of supporting and helping to improve the results of the value of students learning the techniques of conventional automotive diesel engines through a desktop-based multimedia learning.

2.11.3 PreTest and PostTest

Pre Test and Post Test done by providing exercises to the class XI students of Automotive Engineering SMK KB Pusdikpal Cimahi with the materials on learning 1. Testing was conducted before and after using learning application that has been given to 87 students of class XI of Automotive Engineering at SMK KB Pusdikpal Cimahi.

3. COVER

3.1. Conclusion

Based on the results of the implementation and testing that has been done in the completion of the final project with the title "Learning Media Application Development Automotive Engineering Conventional Diesel Engine for Class XI (Case Study: SMK KB Pusdikpal Cimahi)" This, obtained some conclusions are as follows:

1. Application of this learning media can help overcome the limitations of practical tools that can be seen from the data Acceptance test results performed on each class XI Automotive Engineering obtained the approval of the application's level is above 80%.
2. Application of this learning media can help students to better understand the learning material as well as help improve the results of competent students who can be seen from the test data Pre Test and Post Test that the average value of students increased, the class XI TO 1 value an average of 73.9 to 86.3, the class XI TO 2 average value of 71.2 to 83.5 and in class XI TO 3 average value of 73.3 into 84.1.

2.1. Suggestion

After doing all the stages in the development process Learning Media Applications Automotive Engineering Conventional Diesel Engines, obtained some suggestions that have been obtained are as follows:

1. Features updated material.
2. Client-server
3. networks to facilitate teachers to manage the application.
4. The view was made much more interesting.

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