DEVELOPMENT APPLICATION OF MEDIA LEARNING SYSTEMS AND INSTALLATION OF AIR (CASE STUDY : SMK NEGERI 1 CIMAHI)

Fajar Ilham Dzulharsa[1], Richi Dwi Agustia, M.Kom[2]

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

ABSTRACT

The learning method used in SMK Negeri 1 Cimahi still use still has some problems. Based on the interview with Mr. Siswo Supriatno, S. Pd as teachers and Tata Air Conditioning Engineering said that the lab work and installation of HVAC systems required a simulation so that students can better understand the material and the installation of air conditioning systems, other than that there are many students who do not meet the value of teaching graduation criteria (KKM) is 70.

Media Learning Systems Application and Installation Tata Air is one of the desktop-based learning media to help students understand the material presented by providing media learning tools. In this learning media application development using methods luther Sutopo where the stage is the concept, design, collection of material, design and testing. As for the learning process using Computer Aided Learning (CAL) is the method used in the tutorial material explanation and simulation methods used in the installation of the components of the air system and can interact by students. In this application, there are three main menus, menu materials, simulations and navigation menu evaluation.

Applications built learning media is a simulation learning applications and installation of HVAC systems based desktop using 3D objects. Based on test results, we conclude blackbox and questionnaires can memeberikan overview of the components of practical tools visually and making support tool in learning the material.

Keywords: CAL, Learning, Simulations, HVAC, Tutorial.

1. INTRODUCTION

1.1. Background

Air conditioning (air conditioning) can be defined as the simultaneous control of all the factors that can affect the physical and chemical condition of the air in a particular structure. Air Conditioner consists of 2 types of AC Split AC Split Indoor and Outdoor, Indoor Split air as the name suggests indoor unit installed in the room, the placement of the indoor unit will affect the performance of the indoor unit. Blower mounted on the indoor unit of this type has a unique Sirocco fan, which is able to issue the tender but gusts could reach a distance farther than propeller-type fan. AC Split Outdoor accordance with its name on the outdoor unit installed outdoors, the placement of the outdoor unit will affect the overall performance of AC Split. Fan mounted on the outdoor unit of the type of propeller fan. Unlike the Sirocco fan, propeller fan is able to issue a strong gusts but can only reach close range. SMK Negeri 1 Cimahi Located at Jl Mahar Martanegara No. 48 Cimahi and has nine vocational, one of which is the Mechanical Refrigeration and air conditioning, one of the study subjects and installation of HVAC systems. And installation of HVAC systems is a matter which study material of the components, inspection of leakage, condensation pressure checks, and assemble the installation of air. Based on the curriculum in 2013, in SMK Negeri 1 Cimahi using AC system Split Split AC Indoor and Outdoor.

Based on observations conducted in SMK Negeri 1 Cimahi, conventional learning methods still use the lecture method. Media learning tools used glued to the book, other than the observation done through interviews to as the teachers of the HVAC system installations SMK Negeri 1 Cimahi Mr. Siswo Supriatno, S. Pd as teachers of the cooling technique in SMK. The interview is the result that there are currently several obstacles that arise when giving lessons and Installation System Administration air at SMK Negeri 1 Cimahi include the lack of a practical tool for the HVAC system and installation is available only 2 sets tough course so that students understand the material provided. Another problem that there is a lack of understanding of learning in students of SMK Negeri 1 Cimahi seen from nillai in class XI TPTU A there are 23 students who are less than KKM than 36 students while in class XI TPTU B there are 20 students who are less than KKM than 35 students, with the value of teaching graduation criteria (KKM) is 70 and the average value obtained by the 67 students and the percentage of students who did not pass by 61%. In addition to interviews

carried out also questionnaires to 71 from 71 students students at SMK Negeri 1 Cimahi to support teachers statement about the condition of the lack of practical tools and installation of HVAC systems and the saturation of the students.

Based on the problems that have been outlined, we need a system that can provide learning and simulation system- and installation of air that can be used as a medium of learning by teachers of SMK Negeri 1 Cimahi. Thus it will be built a media learning systems and installation of air-based desktop by using Computer Aided Learning (CAL) which is a method of learning simulation tutorial that uses a computer, so that the application is expected to provide solutions to the problems that exist with the title "DEVELOPMENT MEDIA APPLICATION PROCEDURES FOR LEARNING SYSTEM AND INSTALLATION OF AIR (Case Study: SMK Negeri 1 Cimahi) ".

1.2. Domestic Air System Components Unit

Unit system domestic air conditioner or resedintal water circulating in Indonesia, a household appliances used for body comfort through the cooling process. In the market there are many types of air conditioning units to meet the needs of consumers.

1.3. Temperature Measurement with Thermometer

High and low temperature indicates the intensity of the heat or heat on the level of a substance. Temperature does not indicate the amount of heat contained a substance. But it only shows the level of warmth or how hot or cold a substance is on the substance. In molecular theory of heat, the temperature scale shows the speed of the movement of molecules. Therefore the use of the term practical application of temperature and heat must be careful. Temperature measuring the speed of movement of atoms in a substance. While the heat is the thermal energy which is owned atom multiplied by the number of atoms that exist in a substance. For example, a copper disk that has a mass of a few grams, heated to 1.340oF (727oC) will not have as much heat as the heat contained by five kilograms of copper were heated to a temperature of 284oF (140oC).

1.4. Thermometers Tubes

The thermometer can be used to measure high temperatures of up to thousands of degrees Celsius. The thermometer is commonly known as the pyrometer. The term connotes high temperature pyrometer. The thermometer is typically constructed by applying a digital scale.

1.5. Computer Aided Learning

Computer Aided Learning (CAL) is a learning method that uses computer media, where this method of teaching can deliver directly to the user through how to interact packaged in the form of software. CAL (Computer Aided Learning) using the computer as a tool to understand what is in teaching, coaching, guiding and assessing the achievements of the students so that the students become more interested and adds to the impression of teaching. CAL (Computer Aided Learning) has four concepts, concepts that include:

1. Description (Tutorial): the material presented in the form of text and pictures and done gradually.

2. Exercise (Drill) and Practice (Practice): Researchers provide or primary materials to users through existing software, so that the user of the software can perform the exercises of the questions that have been provided.

3. Simulation: simulation programs available by combining design and equipment training to obtain a quick response from complicated problems.

4. The game: the game, students can learn in a relaxed atmosphere in this way is an effective way of learning, because of the relaxed atmosphere of students are not under pressure so it's easy to catch the material provided quickly.

2. CONTENTS OF RESEARCH

2.1. Analysis Procedure Ongoing

Analysis of current procedures are analyzing the activity of work procedures that occur in existing systems. The procedures that run in learning activities at SMK Negeri 1 Cimahi today is as follows:

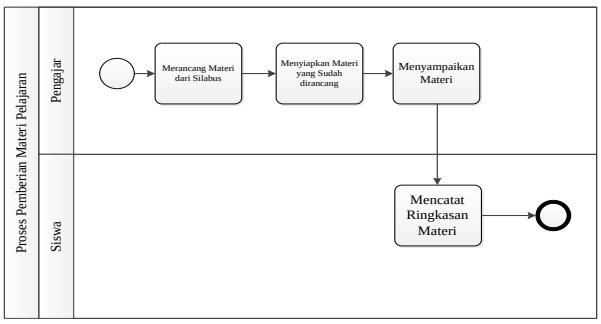
1. Submission Procedures Matter

Chronology of the learning process in the provision of learning materials can be seen below

1. Teachers prepare the material that will be presented in the classroom.

2. The teacher makes a summary of the material and deliver material as study materials.

3. Students record the material presented by the teacher..



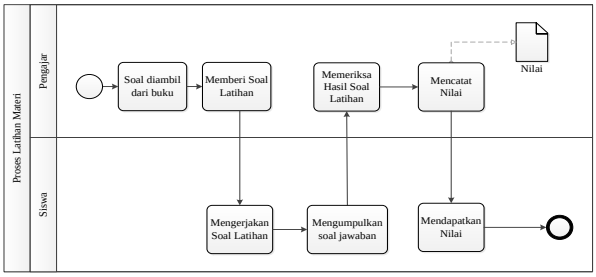
Gambar 1 Prosedur Penyampaian Materi

2. Procedure for Granting Exercise Lessons

Chronology of the learning process in the provision of training course material can be seen below:

1. Teachers provide training materials for students by the material presented in the classroom.

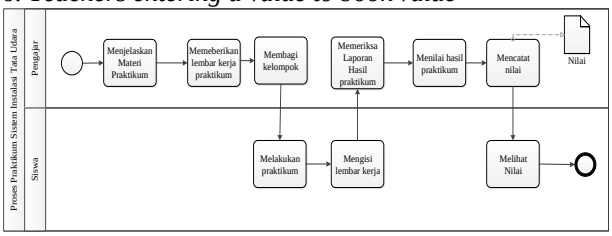
2. Students do exercises.
3. Students collecting the answer sheets of practice questions to the teacher.
4. Teachers check the results of the answer sheets of students practice questions.
5. Teachers record the value of the answers to the student exercises.
6. Teachers entering a value to book value.
7. Teachers give answer sheets that have been assessed to students.



Gambar 2 Prosedur Pemberian Latihan Materi

3. *The procedure Paraktikum Air System and Installation Procedures*

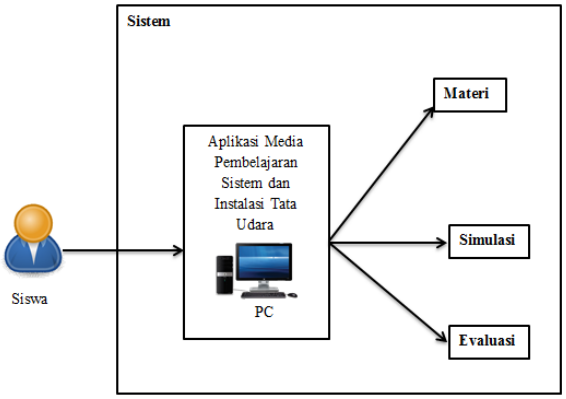
Chronology of the learning process in the lab system and the installation of air can be seen below
1. Teachers provide practical materials to students based on the books and syllabus.
2. Students doing practical work.
3. Teachers check students' lab results
4. Teachers assess students' lab results.
5. Takes note of the value.
6. Teachers entering a value to book value



Gambar 3 Prosedur Praktikum Sistem dan Instalasi Tata Udara

2.2. System Architecture

Applications to be built based desktop, the application serves as a medium of learning systems and installation of air. In using the user application using the computer as a tool running applications instructional media systems and installation of air



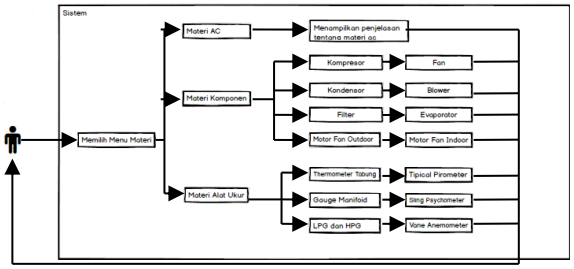
Gambar 4 Arsitektur Sistem

A description of the image above:
1. *This application does not use a database, the information from the data stored in the application and are offline.*
2. *Users use the PC as a tool for running applications of learning systems and installations of air.*
3. *Users can display material, simulation, evaluation, along with the results of the evaluation in the form of a score.*

2.3. Analysis of Interactive Multimedia

Multimedia analysis is an analysis of the needs of multimedia required to support the implementation of interactive multimedia applications of learning and simulation systems and installation of air.
1. Submission Material Flow

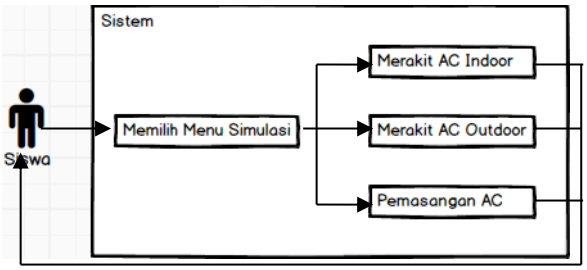
Submission of Material Flow describes the flow of the delivery of content through applications built components. Then the user selects the material component after the application displays the material components according to user's choice



Gambar 5 Alur Penyampaian Materi

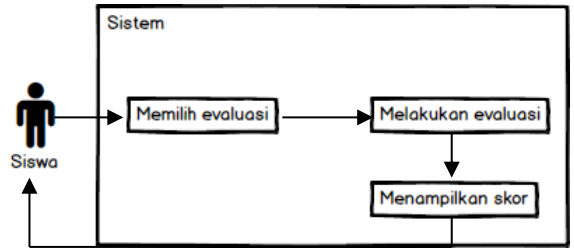
2. Submission Flow Simulation

Submission Flow Simulation simulation illustrates the delivery flow through the applications are built. Users select one menu after the application displays a simulation of simulation method in accordance with the user's choice



Gambar 6 Alur Penyampaian Simulasi

3. Alur Penyampaian Evaluasi



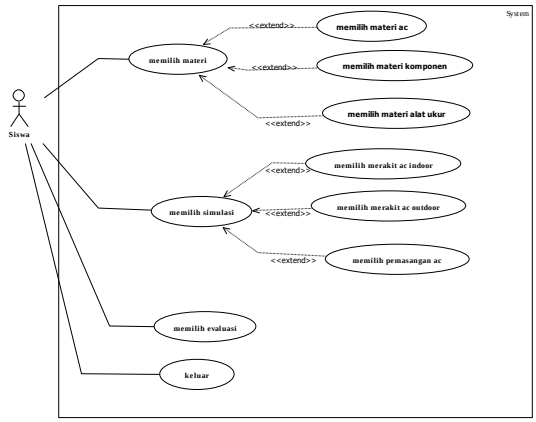
Gambar 7 Alur Penyampaian Evaluasi

2.4. Functional Needs Analysis

Analysis of functional requirements describe the system needs to be built on learning interactive multimedia application systems and installation of air. The functional in interactive multimedia learning applications that will be built by using modeling approach OOP (Object Iruented Programming) with the tools StarUML. Ssitem modeling using UML (Unified Modeling Language) in which the stages of modeling in the analysis include use case diagrams, activity diagrams, sequence diagrams, and class diagrams.

2.5. Use case Diagram

Use Case Diagram is the highest part of the functionality of the present system which would menggambarkanbagaimana person or factor will use and exploit the system. This diagram describes what is done by the system.



Gambar 8 Use Case Diagram

Below is an explanation of the usecase diagram instructional media applications and installations HVAC system that has been described..

1. *Identification Actor*

ABSTRACT actors are from other people and systems that enable the functionality of the target system.

Tabel 1 Identifikasi Aktor

Aktor	Deskripsi
Student	Is a factor that can use the app

2. *Definisi Usecase*

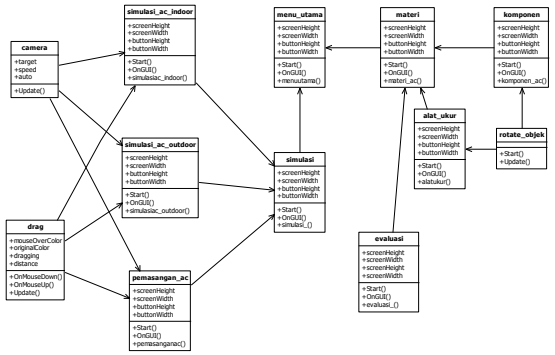
Definisi Use Case berfungsi untuk menjelaskan proses pada setiap Use Case.

Tabel 2 Definisi Usecase

No	Use Case	Deskripsi
1	choosing Materials	The process to display the list of materials
2	Choosing AC Materials	The process for displaying material ac
3	choosing Components	The process to display material components
4	Selecting Measurement	The process for displaying material measuring tools
5	choosing Simulation	The process of displaying a list of simulation
6	Assemble simulation AC Indoor	The process for installing AC Indoor components.
7	Assemble AC simulation Outdoors	The process for installing the AC component Outdoors.
8	Simulation Installation of air conditioning	The process for installing air conditioning.
9	Selecting Evaluation	The process of examination of student learning outcomes
10	Exit	The process to exit the application

2.6. Class Diagram

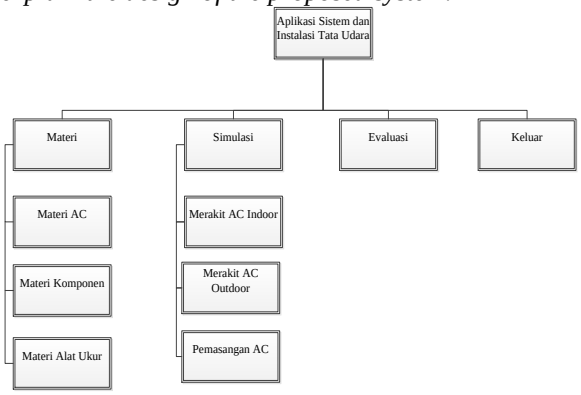
Class diagram describes the types of objects in the system and various kinds of static relationships that exists between them. Class diagram also shows the properties and operations of a class and restrictions contained in the object relationships.



Gambar 9 Class Diagram

2.7. System planningm

The design 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.



2.8. Implementasi Antarmuka

Implementation of the interface is the interface displays the Media Learning Systems Application and Installation of Air.

2.8.1. Tampilan Antarmuka Menu Utama



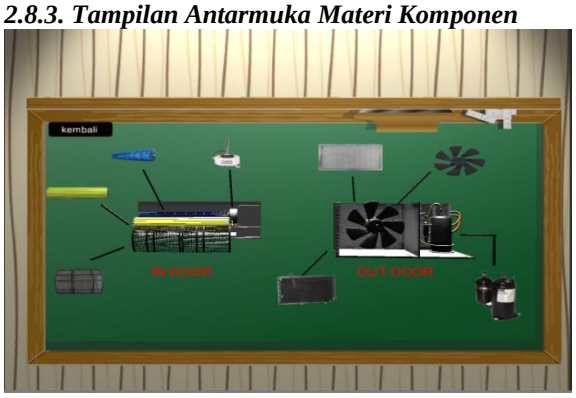
Gambar 10 Tampilan Antarmuka Menu Utama

2.8.2. Tampilan Antarmuka Menu Materi



Gambar 11 Tampilan Antarmuka Menu Materi

2.8.3. Tampilan Antarmuka Materi Komponen



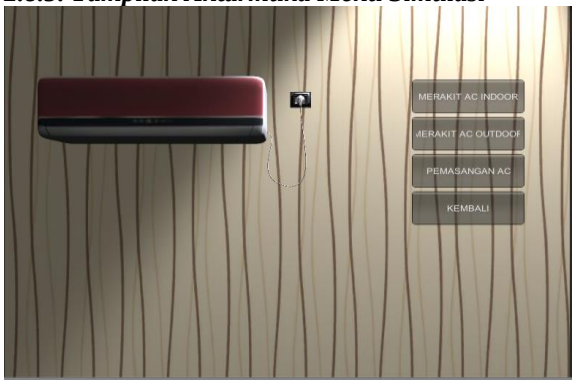
Gambar 12 Tampilan Antarmuka Materi Komponen

2.8.4. Tampilan Antarmuka Materi Alat Ukur



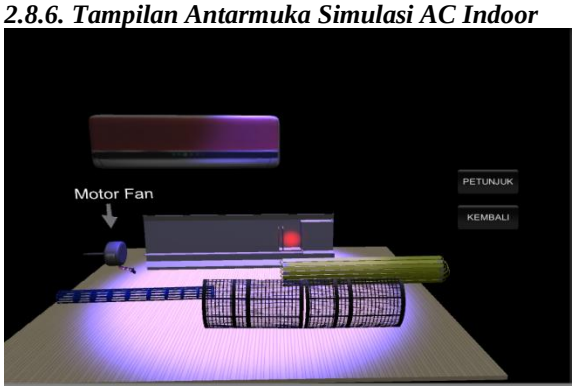
Gambar 13 Tampilan Antarmuka Materi Alat Ukur

2.8.5. Tampilan Antarmuka Menu Simulasi



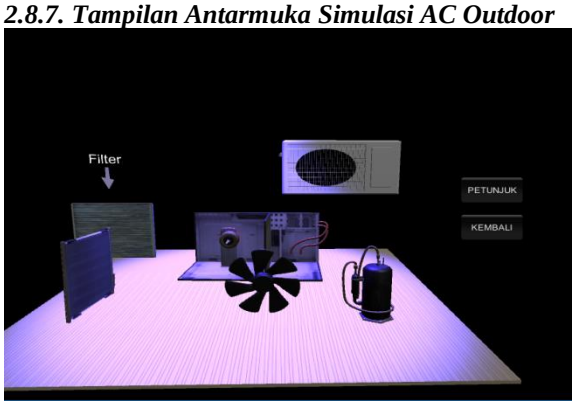
Gambar 14 Tampilan Antarmuka Menu Simulasi

2.8.6. Tampilan Antarmuka Simulasi AC Indoor



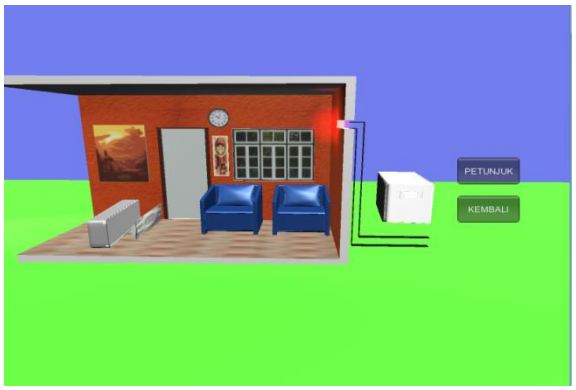
Gambar 15 Tampilan Antarmuka Simulasi AC Indoor

2.8.7. Tampilan Antarmuka Simulasi AC Outdoor



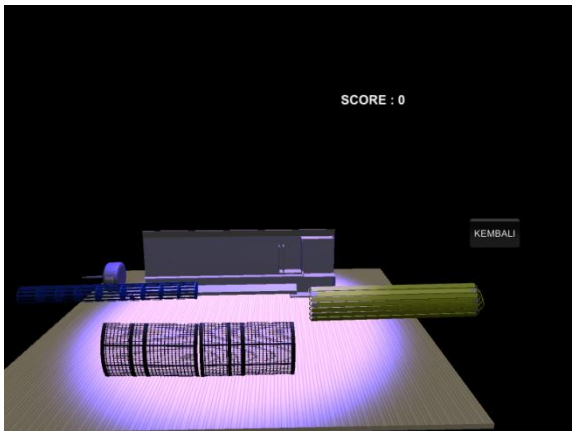
Gambar 16 Tampilan Antarmuka Simulasi AC Outdoor

2.8.8. Tampilan Antarmuka Simulasi Pemasangan AC



Gambar 17 Tampilan Antarmuka Simulasi Pemasangan AC

2.8.9. Tampilan Antarmuka Evaluasi



Gambar 18 Tampilan Antarmuka Evaluasi

2.9. Testing Systems

In the functional testing phase used is intended to test the new system is a black box testing. Black box testing focuses on functional requirements of software consisting of plans and test results.

2.9.1. Skenario Pengujian Blackbox

Tabel 3 Skenario Pengujian Blackbox

Pengujian Aplikasi Media Pembelajaran Sistem dan Instalasi Tata Udara			
No	*Kelas Uji*	*Detail Uji*	*Tipe Pengujian*
1	*Halaman Menu Utama*	*Pemilihan menu*	*Blackbox*
2	*Menu Materi*	*Pemilihan menu materi*	*Blackbox*
3	*Materi komonen*	*Menampilkan materi komponen*	*Blackbox*
4	*Materi Alat Ukur*	*Menampilkan materi alat ukur*	*Blackbox*
5	*Menu Simulasi*	*Pemilihan menu simulasi*	*Blackbox*
6	*Simulasi AC Indoor*	*Perakitan AC Indoor*	*Blackbox*
7	*Simulasi AC Outdoor*	*Perakitan AC Outdoor*	*Blackbox*
8	*Pemasangan AC*	*Pemasangan AC Indoor dan Outdoor*	*Blackbox*
9	*Evaluasi*	*Melakukan perakitan*	*Blackbox*

2.9.2. Case and Test Result Blackbox

Case to test the software that has been built using black box method based on the table of test scenarios that have been made previously.

Tabel 4 Pengujian Halaman Menu Utama

Cases and Test Results			
Data Input	***Expected results***	***Observation***	***Conclusion***
Click Menu	*Menu Display*	*Can Go To Menu*	*[√] received [ ] rejected*

Content	*appears Material*	*Display Material*	
Click Menu Simulation	*Menu Display appears Simulation*	*Can Go To Menu Display Simulation*	*[√] received [ ] rejected*
Click Menu Evaluation	*Display Appears Evaluation*	*Can Go To Display Evaluation*	*[√] received [ ] rejected*

Tabel 5 Pengujian Menu Materi

Cases and Test Results			
Data Input	***Expected results***	***Observation***	***Conclusion***
Click Menu Content AC	*Content Definition Display Appears AC*	*Can Go To Menu Display Materials AC*	*[√] received [ ] rejected*

Tabel 6 Pengujian Materi Komponen

Cases and Test Results			
Data Input	***Expected results***	***Observation***	***Conclusion***
Click Menu Component	*Appears Display Components*	*Can Go To Menu Display Components*	*[√] received [ ] rejected*
Doing Rotation Component Component	*Material Function Component to be rotated*	*Can Do Rotation Component Materials*	*[√] received [ ] rejected*

Tabel 7 Pengujian Materi Alat Ukur

Cases and Test Results			
Data Input	***Expected results***	***Observation***	***Conclusion***
Click Menu Content Measurement	*Appears Display Material Measurement Tool*	*Can Go To Menu Display Measurement Tool*	*[√] received [ ] rejected*
Doing Rotation Component	*Component Material Measurement Tool Can be rotated*	*Can Do Rotation Component Material Measurement Tool*	*[√] received [ ] rejected*

Tabel 8 Pengujian Simulasi AC Indoor

Cases and Test Results			
Data Input	***Expected results***	***Observation***	***Conclusion***
Click Menu Simulation AC Indoor	*Display Appears AC Indoor components are ready to be assembled*	*Can Go to Menu Simulation AC Indoor*	*[√] received [ ] rejected*

Tabel 9 Pengujian Simulasi AC Outdoor

Cases and Test Results			
Data Input	***Expected results***	***Observation***	***Conclusion***
Click Menu Simulation AC Outdoor	*Display appears Outdoor AC components are ready to be assembled*	*Can Go to Menu Simulation AC Outdoor*	*[√] received [ ] rejected*
Doing Drag Component	*Can Components In Drag and Listed On Positions Appropriated*	*Can Perform Drag Component*	*[√] received [ ] rejected*

Tabel 10 Pengujian Pemasangan AC

Cases and Test Results			
Data Input	***Expected results***	***Observation***	***Conclusion***
Click Menu Installation of Air Conditioning	*Installation of air conditioning appear ready assembled Views*	*Can Go to Menu Installation AC*	*[√] received [ ] rejected*
Doing Drag AC AC Indoor and	*AC Indoor and Outdoor AC to In Drag*	*Can Perform Drag AC AC Indoor and Outdoor*	*[√] received [ ] rejected*

Outdoor			

Tabel 11 Pengujian Evaluasi

Cases and Test Results			
Data Input	**Expected results**	**Observation**	**Conclusion**
click Evaluation	Display Appears Evaluation	Can Show Display Evaluation	[√] received [ ] rejected
Doing Drag Component	Can Components In Drag and Listed On Positions Appropriated to Perform Drag Component	Can Perform Drag Component	[√] received [ ] rejected

2.10. Hasil Pengujian

Rate observers to the user to know the results of this study, has been named in the format of a questionnaire to the respondents by the target users and the calculation then searched percentage of each answer by using Likert scale.

Tabel 12 Point Penilaian

Questions Positive		Negative Question	
Answer	**Point Assessment**	**Answer**	**Point Rate**
Strongly agree	5	Sangat Setuju	1
Agree	4	Setuju	2
Doubtful	3	Ragu-Ragu	3
Disagree	2	Tidak Setuju	4
Strongly Disagree	1	Sangat Tidak Setuju	5

Tabel 13 Hasil Skor Item Pertanyaan Setiap Responden

Respondents	Item Questions			
	1	2	3	4
1	4	4	4	3
2	4	3	4	3
3	5	4	4	4
4	4	4	4	5
5	4	4	4	4
6	5	3	4	5
7	4	4	4	4
8	5	3	4	4
9	4	3	4	4
10	5	3	4	3
11	4	5	4	4
12	5	5	5	5
13	4	5	4	5
14	3	3	3	3
15	4	5	5	4
16	5	4	3	4
17	4	3	3	3
18	3	3	4	4
19	4	4	4	4
20	4	2	4	4
21	5	4	5	4
22	4	4	4	4
23	4	5	5	5
24	4	5	4	4
25	5	5	5	5
26	3	3	4	4
27	4	2	4	4
28	4	4	3	4
29	4	4	4	3
30	4	3	4	5
31	5	4	3	3
32	4	5	4	5
33	5	4	4	4
34	4	4	4	4
35	4	4	4	3
36	4	5	5	4
37	5	4	5	5
38	4	4	4	4
39	4	4	5	5
40	5	5	4	4
41	5	5	5	5
42	4	5	4	4
43	4	5	4	4
44	5	3	4	4
45	5	4	3	4
46	5	5	5	5
47	4	4	4	4
48	4	4	3	4
49	4	3	4	3
50	4	5	4	4

Respondents	Item Questions			
	1	2	3	4
51	5	4	4	4
52	4	4	4	5
53	4	4	5	5
54	4	5	4	4
55	4	5	5	4
56	4	4	5	4
57	4	3	4	4
58	4	5	4	5
59	5	4	5	4
60	4	4	4	4
61	4	3	4	5
62	5	4	4	3
63	4	5	4	4
64	3	3	4	5
65	5	4	4	4

66	4	4	4	4
67	5	4	5	5
68	3	4	4	4
69	5	4	4	4
70	4	2	4	4
71	4	3	3	3

Based on these data, the steps that can be taken to determine how each responeden attitude towards learning media application systems and installation of air are:

1. Determine the maximum score, the maximum score obtained by each respondent multiplied by many of the respondents.

5 x 71 = 355

2. Determine the minimum score, the minimum score obtained by each respondent multiplied by many respondents.

1 x 71 = 71

3. Determine the median value, ie the sum total of the maximum score with a minimum score divided by two.

(355 + 71): 2 = 213

4. Determining the value of Quartile 1, which is the sum of the median total score of at least halved.

(71 + 213): 2 = 142

5. Determine niali Quartile 3, which is the sum of the maximum score with a median split in two.

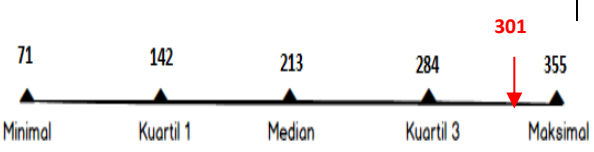
(355 + 213): 2 = 284

Tabel 14 Range Skor

Very Positive Attitude	*Kuartil 3 ≤ x ≤ Skor Maksimal*	*284 ≤ x ≤ 355*
Positive attitude	*Median ≤ x < Kuartil 3*	*213 ≤ x ≤ 284*
Negative attitude	*Kuartil 1 ≤ x < Median*	*142 ≤ x ≤ 213*
Very negative attitude	*Skor Minimal ≤ x < Kuartil 1*	*71 ≤ x ≤ 142*

Tabel 15 Hasil Skor Pertanyaan No.1

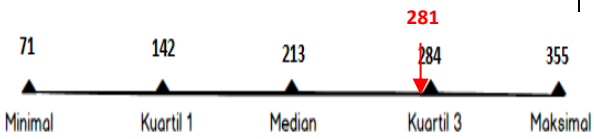
Pertanyaan	*1. Do you think this application can be used to study the materials and the installation of air conditioning systems?*
Total Skor No.1	*301*



Based on the above steps the overall attitude of respondents in the category of a positive attitude. This is evidenced by the total score of respondents were located between a score of 284 (Quartile 3) to 355 (maximum), which is the limit score in the category of positive attitude.

Tabel 16 Hasil Skor Pertanyaan No.2

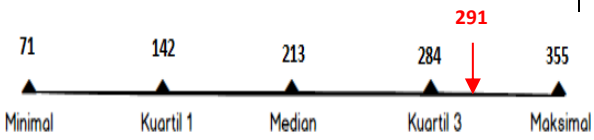
Pertanyaan	*2. Does this application can be a tool to support the practical limitations of equipment and installation of air conditioning systems?*
Total Skor No.2	*281*



Based on the above steps the overall attitude of respondents in the category of a positive attitude. This is evidenced by the total score of respondents were located between a score of 213 (Median) with 284 (Quartile 3), which is the limit score in the category of positive attitude.

Tabel 17 Hasil Pertanyaan No3

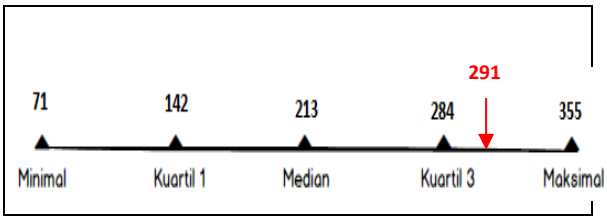
Pertanyaan	*3. Is this application provides an overview lab equipment components visually?*
Total Skor No.3	*291*



Based on the above steps the overall attitude of respondents in the category of a positive attitude. This is evidenced by the total score of respondents were located between a score of 284 (Quartile 3) to 355 (maximum), which is the limit score in the category of a positive attitude.

Tabel 18 Hasil Pertanyaan No.4

Pertanyaan	*4. Does this application can be a tool to support the practical limitations of equipment and installation of air conditioning systems?*
Total Skor No.4	*291*



Based on the above steps the overall attitude of respondents in the category of a positive attitude. This is evidenced by the total score of respondents were located between a score of 284 (Quartile 3) to 355 (maximum), which is the limit score in the category of positive attitude.

2.11. Pengujian Pre Test dan Post Test

Value comparison testing performed to compare the students' understanding of the material and the installation of air conditioning systems is done by filling out the matter at the time before using the app and after using the application.

Tabel 19 Pengujian Pre Test dan Post Test XI TPTU A

Data	*KKM*	*average*
Value Before Using Applications	*70*	*66,19*
Value When Using Applications	*70*	*81,94*

Tabel 20 Pengujian Pre Test dan Post Test XI TPTU B

Data	*KKM*	*average*
Value Before Using Applications	*70*	*66,91*
Value When Using Applications	*70*	*80,57*

3. Conclusion

3.1. Conclusion

The results of the research that has been done in preparation of the thesis with the title "Media Learning Systems Application and Installation Tata Air" as well as referring to the purpose of research, it can be concluded.

1. This application can provide components virtual lab tools.
2. Application of this learning media making support tool in learning the material.
3. It can help increase the value of students through the evaluation made in the application.

3.2. Suggestion

Based on all of the results that have been achieved to date, that the Media Learning Systems Application and Installation Procedures This air is still far from perfect and there are still many shortcomings. Therefore, it is necessary for the development and further improvement in order to meet user needs. As for suggestions on the development of this application for the future are as follows:

1. Create a view that is much more interesting because the application is still very simple.
2. Features for updated material.

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