INTERACTIVE LEARNING MEDIA DEVELOPMENT AS THE BASIC ENGINEERING SUBJECTS SUPPORTING METAL FABRICATION IN CLASS XI IN SMK NEGERI 2 BANDUNG

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ABSTRACT

Basic metal fabrication techniques is one of the subjects of Class XI in metal fabrication engineering at SMK Negeri 2 Bandung, Based on the results of the interview with Mr. Farnaz S.T as teachers of subjects the basic techniques of fabrication, suggested that means a tool or workshop available has not been sufficient which results in teaching and learning activities become obstructed, so that students have difficulty in understanding the material and do the implementation practice of the design, and operate basic engineering metal tools. Its effects are still many students who have not been able to reach criteria to complete a minimum set by the school. Learning the basic techniques of media applications metal fabrication is an application that is built using methods of interactive learning CAI (Computer Assisted Instruction), with the development of the software used is taken from the method of Luther sutopo, in order to finish problems occurred in the process of learning which is still the conventional. CAI model used consists of three models, namely, Tutorial, Simulation, and Drills and Practice. Some of the features that are available in the application, consisting of material, details of components, simulation, and evaluation. From the results of the interview against the basic techniques of teachers States that an application that was built was able to assist teachers in delivering learning, in particular within the goals of design and operation of basic tools metal fabrication. Then from the results of a pretest and posttest against 29 students of Class XI pretest and posttest results with results presentation increases the value of an average of 13%

Key Words: *Metal Fabrication Techniques, Computer Assisted Instructions, Media Of Learning, Multimedia, Mechanical Engineering*.

1. PRELIMINARY

1.1 Background

SMK Negeri 2 Bandung stood on August 1, 1951 which at that time still named STM Negeri 1 Bandung and berlokasikan on JL. Dr. Wahidin No. 2 then the campus transferred and assigned to JL. Bandung Area No. 4 in 1980. SMK Negeri 2 Bandung has two vocational areas, one of which is mechanical engineering who has four majors, namely Machining Techniques, Image Engineering machinery, Welding, Engineering and metal fabrication Techniques. On the course of engineering metal fabrication, there are subjects of basic metal fabrication Technique for Class XI.

The purpose of learning the basic techniques of this metal fabrication is so that students can understand the workings of the component tools, and the use of which will be devoted to practice the use of stage hand tooling, tooling, the operation of powered tools the hot plasma cutting cutter oxy and acetylene, the use of a measuring instrument, and light fabrication. Gadget powered tool that is frequently used is the tool and digunaknan for the purposes of the work of which namely portable drill (hand drill) and Grinding. Hot cutting tools i.e. tools used to cut thin plate or both plates plate thick hot cutting tools, there are two types namely hot cutter plasma and heat cutter oxy acetylene. Gauge is a device used to measure a plane or surface. Light fabrication is the process of forming plate according to the needs with roll machine with manual. According to the results of the interview with Mr. Farnaz S.T. engineering study program as the head of metal fabrication at SMK Negeri 2 Bandung said that at the time of delivering the processed theory teacher shows only an illustration using a projector and give a little explanation, but you can't saw the basic tools metal fabrication because of the workshop contained in SMK Negeri 2 Bandung is still owned by the Department of welding techniques. While the study of practices in the props workshop is limited. Due to the way conventional still learning so students can not understand how it works and how to use these tools, then the students often have difficulty at the time of the operation against the tools.

Based on the data values that have been processed so it can be inferred that 72.4% of the 29 students have not completely meet the criteria applied by the schools at least IE 75. Besides collecting the data is also perpetrated by giving questionnaires to 29 students in the class XI obtained the conclusion that 67.3% of students in the Department still had

difficulty in understanding the material, either in learning or in the operation of any tool. Then the obtained conclusions that in the matter of learning students are still less.

To resolve the issue is to provide a solution that is using a multimedia interactive learning in order to provide illustrations of the original situation of seusuai every stage of the way of working and operation of metal fabrication tools. So as to improve the understanding of students towards learning the basic techniques of material metal fabrication. Therefore the authors conducted a study with the title "interactive learning Media Development As the basic Engineering Subjects Supporting metal fabrication In Class XI in SMK Negeri 2 Bandung".

1.2 Purpose

Based on the background of the problems that have been described, then the problem is obtained as follows:

1. In understanding the material students are still experiencing difficulties due to the method of teaching the teachers just give an illustration and a little teacher giving explanation materials.
2. Students often have difficulty in operating metal fabrication tools.
3. Students are still many who have not reached the minimum criteria and comprehensively applied by schools on subjects of basic metal fabrication techniques.

1.3 Objection

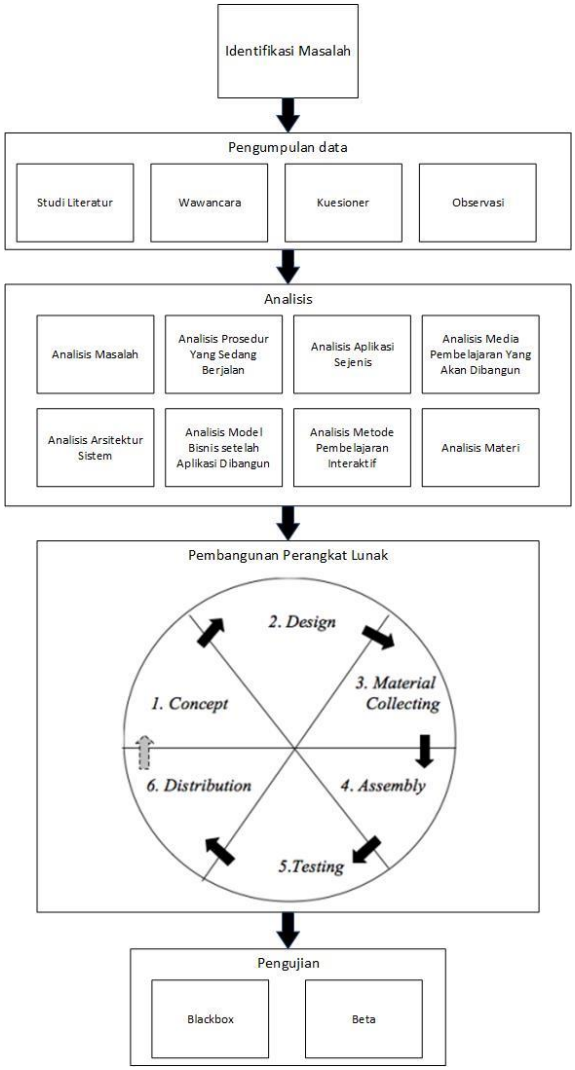
Based on the problems that have been described above, then the author of this research intends to build a multimedia application interaction supporting interactive learning media as subjects of basic metal fabrication techniques in class XI in SMK Negeri 2 Bandung.

The goal will be achieved in this research are is :

1. Simulate basic metal fabrication tools into digital form and provide the material.
2. Reduce the difficulty students in the use of metal fabrication tools.
3. To assist students in improving the understanding of the material and the value in the eyes of the basic techniques of metal fabrication.

1.4 Research Methodology

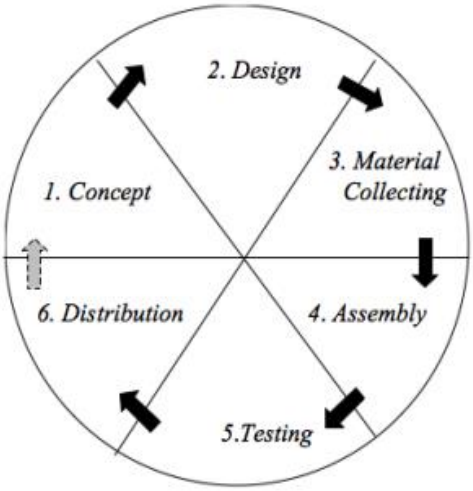
Methodology of the research done on the research intends to support the implementation of a research data is required. Here is the research methodology used in this study is shown in Gambar 1.1.



Gambar 1. Research methodology

1.5 Construction Software

The method used in software development is a method of Luther-Sutopo. According to Luther stages with multimedia development methodology does not need to be sequential. These six steps can exchange positions in accordance with the requirements but still starts with the first concept stage and ends with the distribution stage. Sutopo adopted the method of Luther by modifying the stages. Just as Luther Sutopo also argues that the stages of software development should start from the concept and ending with distribution, whereas at the stage of collecting material can be done in parallel with the stages of assembly [1].



Gambar 1. Multimedia Application Development Method Luther Sutopo

2. RESEARCH OF CONTENTS

2.1 Multimedia

The theory associated with the learning media development basic metal fabrication techniques, namely multimedia. Multimedia is the use of computers to present and combine text, sound, images, animation, audio and video tools (tool) and connection (link) so that users can navigate, interact, work and communicate. Multimedia is often used in the world of Informatics. Apart from the world of Informatics, multimedia was also adopted by the gaming world, and also to create a website.

Multimedia be utilized also in the world of education and business. In the world of education, multimedia is used as a medium of teaching, whether in the classroom or in singly or self-taught. In the business world, multimedia is used as media company profiles, product profiles, even as media information and training in the e-learning system [2].

2.2 Learning Media

One of the new innovations that can be created as a learning tool that is media interactive learning utilizing computer technology as a means of devices to use it. Interactive learning media can feel effective in conveying the material to students because students were active in running the interactive learning media to obtain information that is in it. In addition, the interactive learning media can be made in the form of an interesting animation so that students do not feel bored in receiving material.

Media learning in which there is an interactive multimedia elements can be used as a means of supporting teaching and learning in the process. interactive multimedia is a new technology with great potential to change how to learn, how to get information and how to entertain. The use of multimedia technologies towards the learning process is one of the interactive to help address the problem of student learning, as with the use of multimedia technologies (such as interactive CDS), students are able to learn independently, more easy, convenient, and learning in accordance with their ability without external constraints [3].

2.3 Computer-Assisted Learning

Computer-based learning media, or commonly called computer-assisted learning Computer-Assisted Instructional (CAI), is one of the very interesting learning media and was able to increase the motivation of learning to the learners. The use of the computer as a medium of interactive learning can be manifested in many forms, including programs of Computer Assisted Learning (CAL), the Conference of the computer, and the computer multimedia, later called multimedia learning interactive [4].

Computer-assisted learning program utilizes the entire computer capability, consisting of almost the entire media, i.e.: text, graphics, images, photos, audio, video, and animation. The entire media is converging will support each other and merged into one incredible ability media. One of the hallmarks of this computer media that is not owned by a variety of other media, is its ability to facilitate interactive learners with learning resources (content) that is on the computer (man and machine interactivity).

2.4 Problem Analisys

In this section will be explained about the issues that arise at the time of the study in SMK Negeri 2 Bandung, before building the application media learning techniques in metal fabrication. Based on the background that has been discussed, there are a few problems, namely:

1. In understanding the workings of the metal fabrication tools, because the students are given only an illustration and a little teacher giving explanation.

   The material taught to students still use static illustrations scheme by way of exposing an image projector using the tool to the Board and then explain it, also the material presented to the students still have not detailed how use every tool.
2. Props are supposed to be in the show at the time of the theory cannot be brought into the classroom, because several dimensional props are big enough and the availability of props only one.

   Due to the large and limited tool then the tool can not shown processed, students find it difficult to understand because the students do not get to see the original form of the tool to be used. The workshop which is still owned by the welding engineering is considered sufficient to inhibit the operations of the teaching and learning process, due to the schedule of the

workshop which has been established by the school then every class has its time each student also still confused in operating tools fabrication.

3. Students still have difficulties to meet the criteria of minimum provisions set forth by the school.

Due to porses the granting of material still conventional then students still do not understand how the operation of any tool.

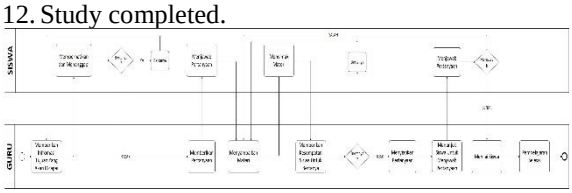
2.5 Analysis Of Its Ongoing

The analysis procedures are analyzing every step of work and documents used in each step of the. From the analysis that has been done there are three procedures related to the study of the learning procedure, namely the procedure practical, and evaluation procedures.

2.5.1 The Learning Procedure

Ongoing learning procedure described in the form of BPMN in Gambar 3.1. Activities conducted at the learning procedure includes:

1. Initial activities teachers provide information regarding the objectives that will be achieved in the implementation of learning.
2. Students heed, respond, and ask about the goal that will be achieved.
3. Apabila tidak ada pertanyaan, guru memberikan pertanyaan untuk mengukur pengetahuan siswa mengenai materi yang akan disampaikan.
4. Students answer the question given the teacher.
5. After it goes into core activities, teacher delivered the material to the students in class.
6. At the time the material is submitted, students are allowed to ask.
7. If no one asked, then teacher resume delivery of the material until it is finished.
8. After the material is complete then go into the final activities where teachers will devise exercises reserved in accordance with the material being taught.
9. Then the teacher held a practice reserved by way of appointing some students directly and then give questions.
10. Students answer the question correctly then the teacher will assess the students ' understanding.
11. If students haven't quite understood, then the teacher will explain the matter back.
12. Study completed.

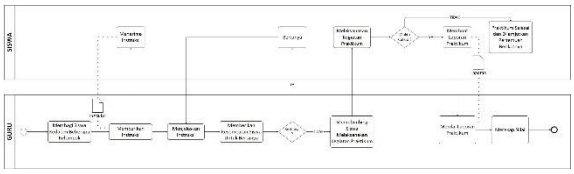


Gambar 3. The Procedure Of Learning Activities

2.5.2 Practical Implementation Procedure

Once students understand the subject matter then the students will continue their learning by doing practical work. As for the practical activities of the procedures described in the BPMN in Gambar 4. Activities conducted on procedure teaching activities, namely:

1. The teacher divided the students into several groups with a random method.
2. Then the teacher gives instruction that will be carried out by students, and explain the instructions.
3. Then give the opportunity ask students questions, if no then the teacher guides the students carry out practical work.
4. Students carry out practical work according the instructions given.
5. After all students have finished teaching then students create reports the results of practice and provide a report to the teacher teaching.
6. Teachers create learning material end conclusion.
7. Then the teacher gives the student practical value in the report and recap the value, combining with other practical value

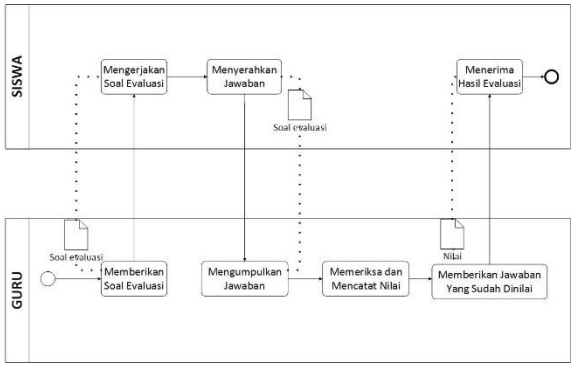


Gambar 4. Practical Implementation Procedure

2.5.3 Evaluation Of The Implementation Of The Procedure

Evaluation of implementation of the procedure described in the form of BPMN in Gambar 5. As for the evaluation of the implementation of the procedures include:

1. After completion of the learning material and the time the teacher will give evaluation to students to find out the capabilities of the students.
2. Students working on the question of the evaluation given by the teacher.
3. After answering all reserved student gives an answer of the question of the evaluation to the teache.
4. The teacher conducts the inspection and provide value against the answers given to question the evaluation of students.
5. When you are finished checking the answers from students, teachers return back an answer to students to students.
6. Sheet the value saved for the student evaluation results are combined with the results of the evaluation of the other.

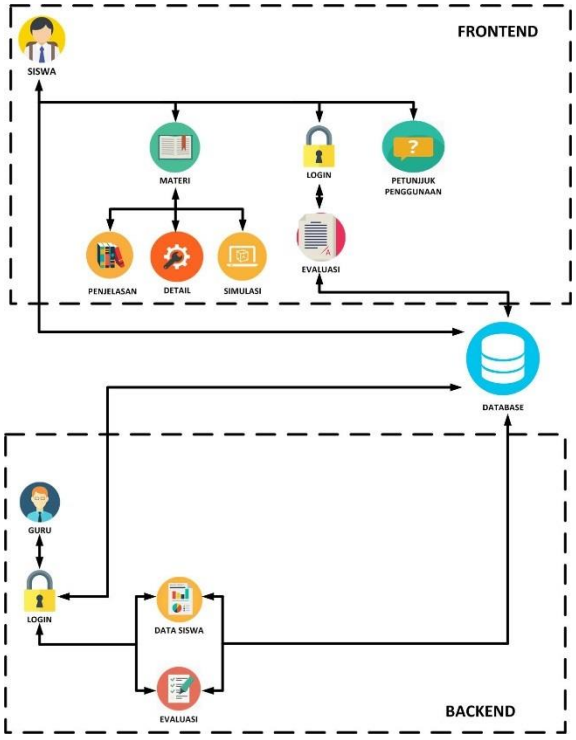


Gambar 5. Evaluation Procedure

2.5 Analysis Of The Application Of Learning Are Built

Analysis of the application that is being built is the learning media applications which includes learning the basic techniques of material metal fabrication in class XI in SMK Negeri 2 Bandung. The main purpose of this multimedia application is to help students understanding of the details of the component, how to assemble, and operation of basic metal fabrication tools.

the system is built to have two applications, namely the frontend and backend in one system. The following is an overview of the application system of the media learning the basic techniques of metal fabrication will be built.

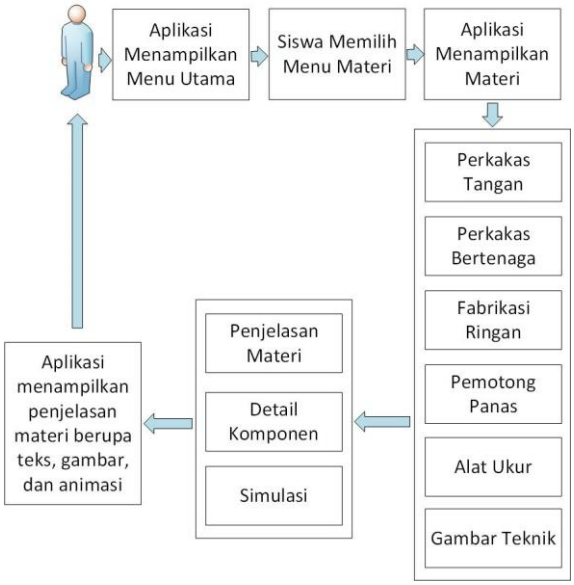


Gambar 6. Application System Architecture

2.6 Analysis Of Interactive Learning Method

Learning methods used will affect the learning process, with the support of the media, in order to get the achievement on the learning objectives. The development of these learning media application authors using the method of CAI (Computer Assisted Instruction). The concepts applied in the application of learning this metal fabrication is a concept Tutorial, Drill and practice, and Simulation.

2.6.1 Tutorial Model

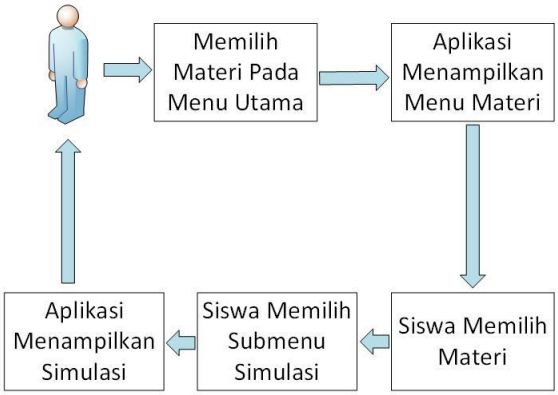


Gambar 7. Tutorial Model

From Gambar 7, the flow of material delivery of learning media applications is as follows: 1. On the application of multimedia techniques in metal fabrication system showing the main menu.:

1. On the application of multimedia techniques in metal fabrication system showing the main menu
2. then students choose material.
3. The application will display 6 menu material that is hand tooling, tooling, fabrication, light-powered, hot cutters, measuring tools, and engineering drawings..
4. then students choose one of the chapter material.
5. application displays a description of the material, details of components, and simulation. explanation of material includes a description of the material that is appropriate in the chapter material will be chosen before of text and images. Details of components sub menu contains a detailed description of the components and the object in accordance with the chapter material will be chosen before the form of pictures and text.
6. The application will display the contents of the selected sub menu

2.6.2 Simulation Model

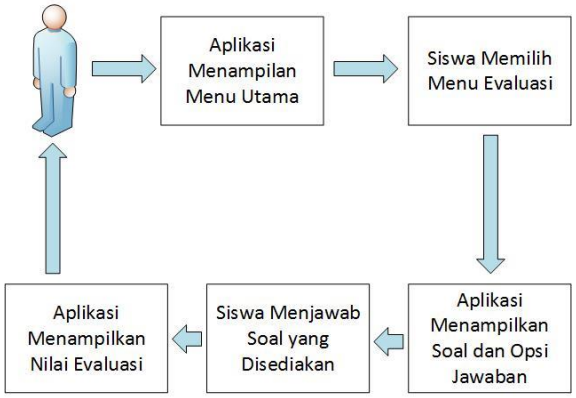


Gambar 8. Model Simulasi

From the Gambar 3.19 media applications of learning is as follows:

1. On the main menu of the application techniques of metal fabrication students choose material..
2. The application will display 6 menu material that is hand tooling, tooling, fabrication, light-powered, hot cutters, measuring tools, and engineering drawings.
3. Then students choose material that contains an explanation.
4. Then students choose sub menu simulation.
5. The application will display for the simulation, simulation concepts will be explained on the storyboard.

2.6.3 *Drill and Practice* Models



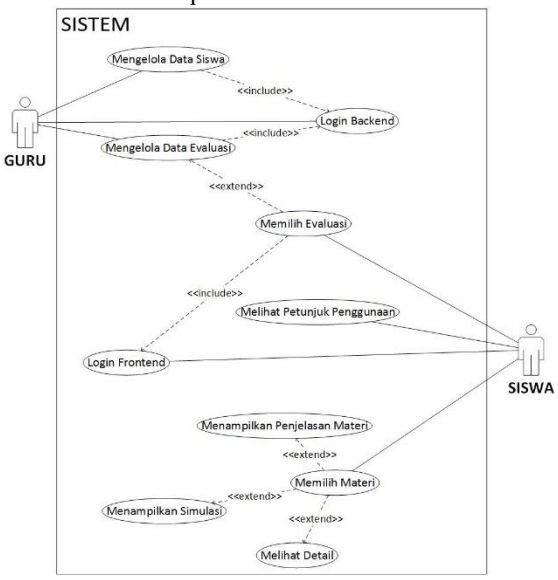
Gambar 9. Model Drill and Practice

From the Gambar 3.20 evaluation of learning media applications is as follows:

1. On the main menu of the application displays the main menu.
2. Then students choose the evaluation menu.
3. The application displays a question and answer option evaluation in the form of multiple choice.
4. Then the students answered all the question of the evaluation of a given.
5. If the student has already answered all the question of evaluation, the application will provide a validation against the suitability between the question and the answers of the students. Assessment-shaped score will be shown after answering the given question.

2.7 Use Case Diagram

Use case diagram illustrates the process of each procedure goes on learning the basic techniques of media applications metal fabrication. Use case diagram application media learning basic metal fabrication technique can be seen in Gambar 10.



Gambar 10. Use Case Diagram

2.8 Testing The System

Testing phases where the system is a series of tests performed in order to test the system that has been developed which aims to find the mistakes or shortcomings in the system that has been built. Testing methods used in the applications of multimedia learning the basic techniques of metal fabrication is functionally testing methods. Methods used in the black box testing focuses on the functional requirements of the system that has been built and is in beta stage carried out an assessment of the users against software.

2.8.1 Blackbox Testing

Black box testing is testing that focuses on the functional requirements of the software. Black box testing is done on the application is divided into three parts, i.e. scenario testing, case and test results, and the conclusion of testing.

Tabel 1 The Results Of Testing Material

Functionality	Test Case	Expected Results	Test Results
Menu Materi	Select button "perkakas tangan"	Displays the specified chapter	[√]successfully [ ] unsuccessfull
	Select button "Back"	Displays the specified chapter	[√]successfully [ ] unsuccessfu

			ll

Tabel 2 The Results Of The Test Petunjuk Penggunaan

Functionality	Test Case	Expected Results	Test Results
Petunjuk Penggunaan	Select button "petunjuk penggunaan"	Displays the specified chapter	[√]successfully [ ] unsuccessfull
	Select button "back"	Displays the specified chapter	[√]successfully [ ] unsuccessfull

Tabel 3 The Results Of The Test Login Backend

Functionality	Input data	Expected Results	Test Results
Login	Select button "Login"	Displays the specified chapter	[√]successfully [ ] unsuccessfull

Tabel 4 Hasil Pengujian Beranda

Functionality	Input data	Expected Results	Test Results
Beranda	Select button "beranda"	Displays the specified chapter	[√]successfully [ ] unsuccessfull

Based on the results of the black box testing has been carried out, indicate that the application was built already meet the functional requirements. However, in the process does not cover the possibility of errors can occur. In functional system that has been built in accordance with the expected.

2.8.2 Beta Testing

Beta testing is the testing that was done objectively done which made directly onto the field, i.e. to the teachers and students of SMK Negeri 2 Bandung with the purpose to find out the extent to which the quality of the systems that have been built. This testing is done through the three techniques, namely through the pretest and posttest, questionnaires and interviews.

2.8.3 Pretest and Posttest

Pretest and Posttest is a test given to students of Class XI — 2 Bandung city to gauge the level of success of learning media that have built up as supporting students in improving the understanding of the material presented. Samples taken as many as 29 people from 1st class. Pretest and posttest on testing, the material foundation of the problem in the test is a matter of competence of 1 to 10.

The results of a pretest and posttest for test classes can be seen in Tabel 5.

Tabel 5. Test Results Kelas Uji

Class	Average *pretest*	Average *posttest*	Hasil (%)
XI TFL	73,31	86,55	13.24 %

2.8.4 UAT Testing Questionnaire

Testing is done by spreading the now to the students of Class XI course Basic metal fabrication Techniques to try out the system that has made and find out whether the system meets the goals as expected. On this test now given to 29 respondents.

The questionnaire consists of 8 questions representing the number 1 destination. On a likert scale questionnaire used calculation criteria score that can be seen in table 6.

Tabel 6 Scale Questionnaire Answers

Answer	Score	Presentase
SS (Sangat Setuju)	5	100% - 80%
S (Setuju)	4	79% - 60%
RR (Ragu-ragu)	3	59 – 40%
TS (Tidak Setuju)	2	39 – 20%
STS (Sangat Tidak Setuju)	1	19 – 0%

Here is the scenario questions asked to the respondents :

1. Whether the application can already visualize how to assemble and operate basic techniques compared to the module?
2. Whether the material presented on the application more easily understood compared with material that is in a module?
3. What is the detail component applications represent an existing tool in the workshop?
4. If the simulation is presented is in compliance with the actual tools?
5. What is the usage instructions make it easier to use the application?
6. What is the use of language in this application easy to understand?
7. Does the navigation buttons on the application easy to understand?
8. Does the design look of the application, the selection of letters, and the color is clear and compelling?

These are respectively the calculation result of the answers that have already been counted.

Tabel 7. Result Kuesioner

Question	Percentage
1	86.20%
2	84.13%
3	88.89%
4	79.31%
5	76.55%
6	84.83%
7	86.89%
8	83.44%

2.8.5 Testing UAT Interviews

Testing conducted by questioning against the target user in this case teachers subjects are Basic metal fabrication Techniques to find out whether the system has been built in accordance with the objectives of.

Tabel 8. Testing Results Interviews

No	Goal	Question	Answer
2	troubleshooting	1. Whether the	1. This

No	Goal	Question	Answer
	questions means a limited tool by using interactive learning media	application is able to assist in the implementation of learning?	application can already help teaching and learning activities, because this application can display the previous simulation we can not do.
		2. Does this application simulation is in compliance with the actual tools?	2. For the simulation itself, is enough in accordance with what is the repair shop.
		3. Whether the delivery of the materials in this application easy to understand for students?	3. The submission of material in the application are already easy to use, ranging from students or teachers as I did not find any difficulty in using this application.
		4. Whether the look on this application is easy to understand and use?	It's been quite interesting and make students become familiar in following the teaching and learning activities.

3. CLOSING

3.1 Conclusion

Based on the results of implementation and testing has been done on the research titled "development of interactive learning Media As Supporting subjects, Basic metal fabrication Techniques In Class XI in SMK Negeri 2 Bandung", then it can summed up as follows:

1. Can help students understand the basic techniques of learning material metal fabrication in class XI in SMK Negeri 2 Bandung with computer media are applied on the lab multimedia available in other words alternate with the learning media utilizing information technology.
2. Using interactive learning media penunjuang as a means to address the problem of the limitations of the tool material also.
3. Help students to be able to reach the value of complete minimal criteria set by the school, by increasing understanding of student learning material on basic metal fabrication techniques

3.2 Advice

In the development of interactive learning Media Development Media As Supporting subjects, Basic metal fabrication Techniques In Class XI in SMK Negeri 2 Bandung is still far from perfect and there are still many shortcomings. Therefore, the need for further development in order to meet the needs of the user. As for the suggestions towards the development of this learning media applications for the future are as follows:

1. It is recommended to teachers in order to instruct students to learn independently with the use of these learning media applications.
2. Development of simulation in every subject.

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