DEVELOPMENT OF INTERACTIVE LEARNING APPLICATION IN BIOLOGY LESSON XI AT BANDUNG 17 HIGH SCHOOL

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ABSTRACT

Biology is the study of all things related to living things and life [1]. One of the schools that teach biology is Bandung 17 High School. The teaching and learning activities in Bandung 17 High School use lecture method. With the method of lectures in the classroom learning often makes students become saturated and drowsy, then the unavailability of lab work because tools and materials practicum difficult to obtain. Based on the problems needed media aids learning to deliver learning materials, so that built the construction of interactive learning applications on the subjects of biology class XI in Bandung 17 High School. Development of interactive learning applications on the subjects of biology class XI in Bandung 17 High School is using the method of software luther sutopo. This application uses computer assisted instruction learning method (CAI). In data collection, an interview, questionnaire, literature study, and observation were conducted. Applications built using Object Oriented Program (OOP). The programming language used is Action Script 3. Based on the results of research, with the application of this 80% help students improve the understanding of the material on the subjects of biology class XI.

Key Word : Biology, Learning, Action Script, CAI

1. INTRODUCTION

Bandung 17 High School which was established in 1982 is one of the state high schools in Bandung which is located at Jalan Seventeen Caringin, Babakan Ciparay, Bandung. In this school there are some subjects, including Biology lesson. Biology is the study of all things related to living things and life [1]. In education in Indonesia, Biology is an important subject because with the subjects of Biology we can find out how organisms work. Biology subjects began to be studied when entering high school (SMA). One of the educational institutions that has taught Biology subjects to the students is SMA Negeri 17 Bandung.SMA Negeri 17 Bandung which was established in 1982 is one of the state high schools in Bandung which is located at Jalan Seventeen Caringin, Babakan Ciparay, Bandung. In this school there are some subjects, including Biology lesson. Biology is the study of all things related to living things and life [1]. In education in Indonesia, Biology is an important subject because with the subjects of Biology we can find out how organisms work. Biology subjects began to be studied when entering high school. One of the educational institutions that has taught

Biology subjects to the students is *Bandung 17 High School*. By conducting an interview to one of the teachers who teach biology lesson at *Bandung 17 High School* ms Irma, it is known that the delivery of Biology materials to students using lecture method. Lecture method is the method of delivering the material in front of the class by the teacher, directly to the students. The material presented comes from a biology book entitled "General Biology I" and in accordance with the 2013 curriculum. Each student is given a handbook that is Biology package book. In the interview session Ibu Irma explained that the lack of practical activities due to the limited tools of practice, then the damage to the tools of practice caused by carelessness of students, one tool that is damaged the practice of microscopes on the objective lens. In addition to practical tools, practical materials were difficult to obtain such as a replica of human organs, animal cells and plants, and many more materials needed. In the value section of students, there are still many students who have value under the KKM.

By using Slovin method got sample of 62 students from 165 students in *Bandung 17 High School* can be known by using questionnaires that many students love biology lesson, but 68% of 62 students hesitate in understanding biology materials and 85% of 62 students are bored with the method of lecturing in the delivery of biological materials. 86% of the 62 students expect the application of Biology Learning. Therefore, the students of *Bandung 17 High School* need a new material delivery method so as not to feel saturated.

In Sister Dwi Riastuti's research entitled "Development of Computer Assisted Instruction (CAI) for Biology Learning of SMA XI Class" has succeeded in increasing students' understanding on

Biology materials using CAI method. Computer Assisted Instruction (CAI) is a microposesor-based subject delivery system whose lessons are designed and programmed into the system. In this mode, the computer can display learning, using media types (text, images, sound, video), providing practice questions, and evaluating student answers [2]. Types for the learning process of CAI include Drill and practice, Tutorial, and Simulation. Computer Assisted Instruction (CAI). Drill and practice is to present an exercise of questions to be done by students, Tutorials that present materials that have been taught or new material to be learned, and Simulation is to provide students opportunities to practice that can not be done in the classroom. In addition, the method can increase interest in learning because it provides a different and more interesting way of learning with existing images, audio and video.

Based on the background of the problem, then the formulation of the problem is how to build biology learning applications as a medium of learning aids teachers and students in *Bandung 17 High School.*

1.1 Purpose and Objectives

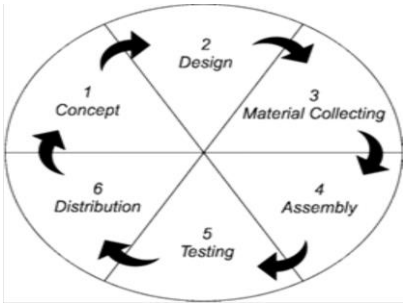
From the results of the research, the purpose and objectives are obtained. The purpose of this study is to build interactive learning applications on Biology subjects in *Bandung 17 High School*. The objectives to be achieved are To help students improve understanding in studying Biology subjects. And Make it easy for students to practice blood circulation, bone structure, and respiratory system in the class XI Biology lesson.

1.2 Research Method

The research method used is Quantitative research method that is research method based on philosophy of Positivism, used to research on population or certain semple [3].

1. Identification of Problem
   The phase of problem identification is the beginning stage to find out what happened in *Bandung 17 High School*.
2. Data Collection
   The collection of data and materials is done to obtain the information needed in order to achieve the research objectives. Data collection is divided into two parts:
   a. Primary data collection (Observation, Questionnaire, and Interview.
   b. Secondary Data Collection (literature study)
3. Problem Analysis
   At this stage, an analysis is made to the problems obtained so that the problem becomes more clear and can be seen anything factor causing the problem and can find a solution. At this stage, an analysis is made to the problems obtained so that the problem becomes more clear and can be seen anything factor causing the problem and can find a solution.
4. Method of Software Development
   Software Development Method used is luther sutopo method, following the steps of luther sutopo method [4]:
   a. Concept
   Determine who users are using the app and determine which type of app to create. In this case users are students majoring in science and teachers who teach biology lessons in *Bandung 17 High School*.
   b. Design
   Make specifications about the display and materials (images, audio, video etc) in the making of the application.
   c. Material Collecting
   Collecting materials needed multimedia learning such as images, backgrounds, audio and video with the appropriate theme to attract and make the students of *Bandung 17 High School* easy to understand the biological material.
   d. Assembly
   Stage of making the application in accordance with the concept, design and materials that have been collected.
   e. Testing
   Check whether the application that has been made there is still an error or not. Applications will be attempted until no errors are found in the application. The app is tested by the author or by an expert.
   f. Distribution
   Applications will be stored in a storage medium (flash disk, DVD-Rom, etc.) and duplicated for use on another board.
5. Application Testing
   At this stage, the application that has been created will be tested by the user by performing black box testing to know that the application made has fulfilled its intended purpose.
6. Conclusions and Recommendations
   At this stage a brief conclusion will be drawn about the results of the research that has been undertaken and take the shortcomings that will be used as

suggestions for further research development.



picture 1. Method Luther Sutopo

2. CONTENT OF THE STUDY

2.1 Learning

Learning is the process of interaction of learners with educators and learning resources in a learning environment. Learning is an aid provided by educators in order to occur the process of acquiring knowledge and knowledge, mastery of skills and character, and the formation of attitudes and beliefs in learners [5]. In other words, learning is a process to help learners to learn well.

2.2 Multimedia-Based Learning

Learning is the process of interaction of learners with educators and learning resources in a learning environment. Multimedia is the use of computers to present and combine text, images, animations, audio and video with tools and links to convey information. So multimedia-based learning is a learning activity that uses computers that combine text, images, audio and video by using links and tools that allow users to navigate, interact, create and communicate.

One of the methods used is CAI (Computer Assisted Instruction) is a system of delivery of computer-based lesson material whose lessons are designed and programmed into the system [6]. In this method, the computer can display learning using several types of media (text, images, audio, video), provide learning atmosphere activity, quiz or provide student interaction and evaluate student answers directly. There are five types of CAI used are:

a. *Drill and Practice*

This type of drill and practice presents lesson material for repeated learning. This type of program is suitable when the teacher presents the exercise questions with feedback.

b. *Tutorial*

This type of tutorial presents material that has been taught or presents new material to be learned. A good tutorial is to provide a help screen to provide further information or further illustrations. And also to explain all the information to present and how to present it.This type of tutorial presents material that has been taught or presents new material to be learned. A good tutorial is to provide a help screen to provide further information or further illustrations. And also to explain all the information to present and how to present it.

c. *Simulation*

This type of simulation provides an opportunity to test capabilities in real applications by creating situations that engage students to act on the situation.

d. *Problem Solving*

This type of problem solving presents students with problems to solve based on the abilities they have acquired.

e. *Educational Game*

This type is a program that creates capabilities in the game environment. Games are given as a means to motivate and get students to through the game procedures meticulously to develop their abilities.

2.3 *Client-Server*

Client Server comes from two words namely Client and Server, Client is system or process that do request data to server. While the Server is a system or process that provides data requested by the Client. So it can be concluded that Client-Server is a paradigm in information technology that refers to how to distribute applications between both parties, namely Client and server [7]



Picture 2. Client-Server

2.4 Problem Analysis

Problem analysis is to analyze any problems contained in *Bandung 17 High School*. Analysis of this problem aims to facilitate in the construction of this learning application. Here are the problems that exist in *Bandung 17 High School*include:

1. Submission of Biology materials to students using lecture method. Lecture method is the method of delivering the material in front of the class by the teacher, directly to the students. With the method of lecture students feel saturated so as to reduce understanding to students. In addition, objects in biology lessons are difficult to explain through lecture methods.
2. Difficulties in obtaining biological practicum materials such as replicas of human organs, animal and plant cells, and much more required materials. Therefore, there is no practicum in biology lesson in SMA Negeri 17 Bandung.

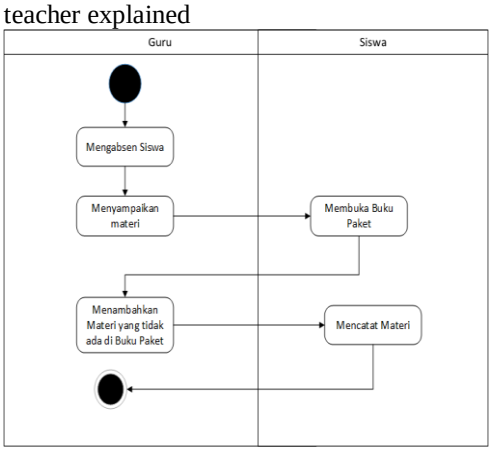
2.5 Analysis of The Running System

Analysis of this system describes the procedures of activity that runs during the learning process. Based on observations made in SMA Negeri 17 Bandung already has adequate infrastructure such as computer lab. Like school teachers usually deliver materials using whiteboards and students write them, when the teacher gives the students the question. The teaching and learning activities start at 07:00 am until 14:30, but the biology subject does not have the facilities to do the lab work.

2.5.1 Analysis Of Material Delivery Activities

The delivery of biological materials is done by the biology teacher in the class to the students, here is the process of delivering the material:

1. The teacher accepts students
2. Teachers deliver material according to syllabus
3. Students open the package book
4. The teacher adds material that is not in the package book
5. Students record additional material that the teacher explained

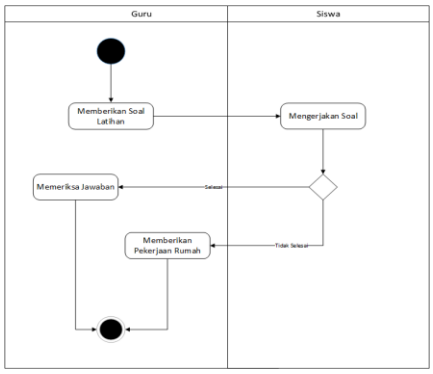


Picture 3. Analysis of Material Delivery Activities

2.5.2 Analysis of activities doing the exercise question

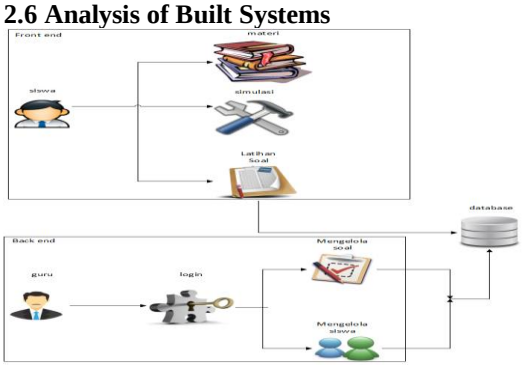
Activity of doing the exercises about the problem is the teacher gives exercise questions to test the ability of students in understanding the material, the exercise of this matter is done in the classroom. Here is the process of doing the exercise questions:

1. After finished with the material the teacher gives practice questions.
2. Students do the questions.
3. If the matter is done then it will be checked by the teacher, but if not finished then the Master gives the job of the house.



Picture 4. Analysis of Activities doing the exercise question

2.6 Analysis of Built Systems



Picture 5. Analysis of Built System

The picture above shows each stage that is in the system built. The stages are described in several points including:

1. Students are users on this system who can do some activities including: students can learn the material / Tutorial, students can do the simulation and students can work on drill and practice.
2. *Tutorial is one of the features contained in the front end, the tutorial will display material about Biology material through text, images, animation and video.*
3. Simulation is one of the features contained in the front end, simulation of the existing application of the simulation of blood flow in humans.

4. *Drill and practice is one of the features contained in the front end, drill and practice This displays a matter of the chapter and can be done by students. This feature can also display the value if the student has answered about the given problem.*
5. Teachers are users on this system that can perform some activities including: processing student data and processing data about.
6. *Login*
   Teacher login is intended for teachers, teachers simply enter a username and password in order to perform some activities contained in this system.
7. Processing student data is one of the useful features to process data from students of class XI SMA Negeri 17 Bandung, such as add, edit, and delete student data.
8. Processing data is one of the useful features to add questions, change the problem and delete the problem.
9. *Database in charge of storing student data*.

2.6.1 Analysis of Software Requrements

The software used in the construction of this application can be seen in the table below:

Table 1. Analysis of Software Requrements

No	Software	Spesification
1	Operation System	Microsoft Windows 8
2	Main Tools	Adobe Flash CS6
3	Support Tools	Adobe Photoshop
4	Support Tools	Wavepad Sound Editor
5	Support Tools	Macromedia Dreamweaver

2.6.2 Analysis of Hardware Requirements

The hardware used in the construction of this application can be seen in the table below:

Table 2. Analysis of Hardware Requirements

No	Perangkat	Spesifikasi
1	Monitor	LCD 14 INCH
2	CPU	Processor Intel® Celeron® CPU B800 @ 1.50GHz
3	RAM	2 GB
4	Hardisk	300 GB
5	VGA	VGA 512 GB

2.6.3 Analysis of User Needs

User needs analysis has a purpose to identify users who will use the application. Described in the table below:

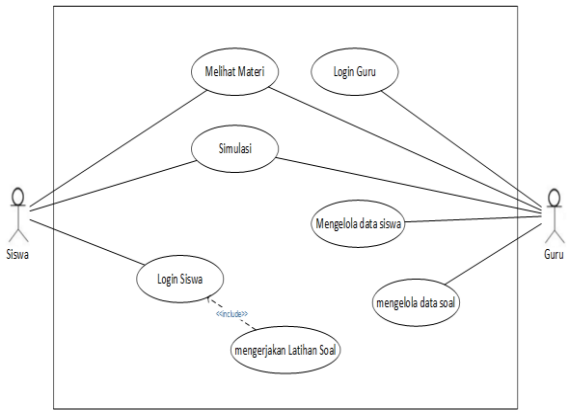
Table 3. Analysis of User Needs

Users	Access Rights	Skill Level	Experience using the Computer
Teacher	Do the processing on the data problem and student data	Can operate the computer and run the application	can operate the computer
Student	Acces to obtain material. Acces to fill practice questions. Do acces for simulation	Understand how to run the app	Can operate a computer

2.7 Functional Requirements

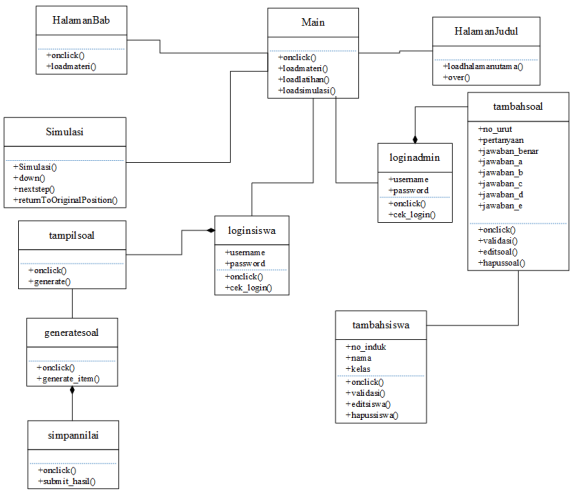
The functional requirements analysis describes what services are provided by the system, how the system responds to user input.

2.7.1 *Usecase* Diagram



Picture 6. *Usecase* Diagram

2.7.2 *Class* Diagram



Picture 7 *Class* Diagram

2.8 Testing Blackbox

Testing aims to determine whether or not there is an error on the system that has been made. The functions in the application will be tested whether they are correct or there is still an error. Blackbox testing is divided into two, namely testing the front end and back end. Here is the Blackbox testing table on the front end and back end:

Table 4 *Front End Blackbox Testing Scenario*

No	Components Tested	Test Details	Test Type
1	Menu Judul	Push Button masuk	*Black-box*
2	Menu utama	Push Button materi	*Black-box*
		Push Button Simulasi	
		Push Button latihan soal	
3	Menu materi	Push Button BAB 1	*Black-box*
		Push Button BAB 2	
		Push Button BAB 3	
		Push Button BAB 4	
		Push Button BAB 5	
		Push Button BAB 6	
		Push Button BAB 7	
		Push Button BAB 8	
		Push Button BAB 9	
4	Menu isi materi	press the desired material button	*Black-box*
5	Menu Simulasi	press the desired simulation button	*Black-box*
6	Menu simulasi golongan darah	Move the simulated object	*Black-box*
		Pressing the button is complete	
7	Menu simulasi merendam tulang dengan Hcl	Move the simulated object	*Black-box*
		Pressing the button is complete	
8	Menu simulasi bahaya merokok	Move the simulated object	*Black-box*
		Pressing the button is complete	
9	Menu latihan soal	Selects multiple choice answers	*Black-box*
		Pressing the correction button	

Table 5 *Back End Blackbox Testing Scenario*

No	Components Tested	Tested Scenario	Test Type
1	Menu login guru	Enter username	*Black-box*
		Enter a password	
		Pressing the login button	
2	Menu tambah data soal	Enter serial number	*Black-box*
		Enter a question	
		Entering answer options a	
		Enter the answer option b	
		Enter the answer option c	
		Entering answer options d	
		Enter the answer option e	
		Enter the correct option	
		Pressing the save button	
3	Menu ubah data soal	Memasukan no urut	*Black-box*
		Memasukan pertanyaan	
		Memasukan pilihan jawaban a	
		Memasukan pilihan jawaban b	
		Memasukan pilihan jawaban c	
		Memasukan pilihan jawaban d	
		Memasukan pilihan jawaban e	
		Memasukan pilihan benar	
		Pressing the save button	
4	Menu tambah data siswa	Enter a name	*Black-box*
		Memasukan no induk	
		Enter the class	
		Pressing the save button	
5	Menu ubah data siswa	Enter a name	*Black-box*
		Memasukan no induk	
		Enter the class	
		Enter a value	
		Menekan tombol	
		ok	

2.8.1 Blackbox Test Conclusion

Based on the results of testing black box that has been done with cases that have been tested, it can be concluded that the interactive biology learning applications can run well but there is still an error on the back end on the functional process.

2.9 Pengujian Pre Test dan Post Test

The test of pre test and post test in Bandung 17 High School is done to Science 1 class which is Science 6 class, Science 6 class will be given pre test (test of learning as usual) and post test (testing after using application).

2.9.1 Result of Research and Discussion

Enhancement of students' understanding of the material given after using the media of learning, can be seen based on the value obtained. The results of the calculation of pre test and post test in Science 6 class can be seen in the following figure:

Kelas IPA 6	Nilai *pre test*	Nilai *post test*
1.	70	90
2.	60	70
3.	70	80
4.	70	80
5.	70	70
6.	60	70
7.	70	80
8.	70	70
9.	70	80
10.	70	80
11.	70	80
12.	70	80
13.	70	80
14.	70	80
15.	70	70
16.	70	70
17.	70	80
18.	70	80
19.	70	80
20.	70	80
21.	70	90
22.	70	80
23.	70	80
24.	60	70
25.	70	80
26.	70	80
27.	70	80
28.	70	80
29.	70	80
30.	70	80
31.	70	80
32.	70	90
33.	70	90
34.	70	80
35.	70	70
36.	70	80
Rata-rata	69	79

Picture 7 Score Pre Test and Score Post Test

2.9.2 Test Conclusion Pre Test dan Post Test

Based on the picture above there is a change to the average value, there is a change in the average value of the previous 69 to 79 in the science 6 class . This shows, that there is an increase in students' understanding of biological material provided.

3. CLOSING

3.1 Conclusion

Based on the results of implementation and testing that have been done, then the conclusion of the final project entitled "Development of Interactive Learning Applications on the Subject of Biology class XI in Bandung 17 High School" as follows:

1. Application of interactive learning This biology can improve students' understanding in understanding the material on the subjects of Biology class XI.
2. This interactive learning application can facilitate students in performing simulation activities or practicum of blood circulation, bone structure, and respiratory system in the class XI biology lesson.

3.2 Suggestion

Development of Interactive Learning Applications on the Subject of Biology class XI in Bandung 17 High School is still there are many shortcomings, and is still far from perfect. Therefore it is necessary to develop the application for better than ever. The suggestions on the development of applications for kedepanya is as follows.

1. This app is developed more interactively by adding features such as video, animation and 3D display so that students better understand the shape of objects in the class XI biology material.
2. Adding simulations to each chapter so students can find out what simulations are in the class XI biology material.

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