DEVELOPMENT OF BIOLOGY INTERACTIVE LEARNING APPLICATION FOR 10TH AND 11TH GRADERS IN MA NURUL IMAN

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ABSTRACT

Biology is the study of living things. [1] Biology subjects must be studied by all grade X and XI at MA Nurul Iman Bandung. Submission of biological material there only uses the lecture method, the use of lecture method only and the absence of direct practice causes students to be less able to understand the material presented and the teacher feels difficulty in providing illustrations of the material being taught.

Biology interactive learning application can be a solution to these problems, because students are not permitted to use smartphones in the school environment so client server based applications can be used in learning at school. The method used in this learning media is the Computer Assisted Instruction (CAI) method, which provides tutorial, simulation, and drill and practice features in the delivery of material.

Biology interactive learning application class X and XI at MA Nurul Iman Bandung can help students and teachers in learning biology by displaying material that uses interactive multimedia concepts. But in testing that has been done this application has not been able to help students get grades above KKM.

Keywords : Biology, Learning Application, Interactive, CAI

1. INTRODUCTION

MA Nurul Iman Bandung, established since 2006, is one of the educational institutions which is located at Jalan Cibaduyut Raya Blok TVRI III, Bandung City. This school uses the 2013 curriculum, and there are several subjects, including Biology. Biology is the study of living things, [1] in high school / MA level education biology is a subject that is quite important because students can know how organisms work. These subjects are compulsory subjects for all classes X and XI at MA Nurul Iman Bandung and are subjects that will be on USBN.

Based on the results of interviews with biology subject teachers at MA Nurul Iman Bandung that the delivery of biological material to students at MA Nurul Iman uses the lecture method. The lecture method is a learning method that is done by the teacher delivering the material directly to the students he teaches. The use of lecture methods alone in the learning system there often makes students less able to understand the material presented. The absence of direct practice of the material being taught causes the teacher to feel difficulty in providing illustrations of the material being taught.

Based on the results of the questionnaire and UTS score data from 90 students in grade X and XI as a measurement tool for learning biology. The average value of these students is 59.53 while the value needed to achieve KKM is 68, and of 90 students 67.78% of students quite like biology, while 80% of students find it quite difficult in learning biology.

Problem solving offered from these problems is by utilizing multimedia learning as a medium for students in learning biology. The learning media uses the Computer Assisted Instruction (CAI) method in the delivery of material and due to a rule that does not allow students to bring smartphones to the school area, applications are built based on client servers that will be used in the computer lab at MA Nurul Iman.

1.1. Purpose and Objectives

The purpose of this research is to build an interactive learning media application on biology classes X and XI based on client server at MA Nurul Iman Bandung and has the following objectives

1. Helping students in class X and XI in learning and understanding biology subjects.
2. Helping teachers manage learning material to be more interactive.

1.2. Research Methods

The research method used in this research is descriptive method. The flow of this research is as follows:

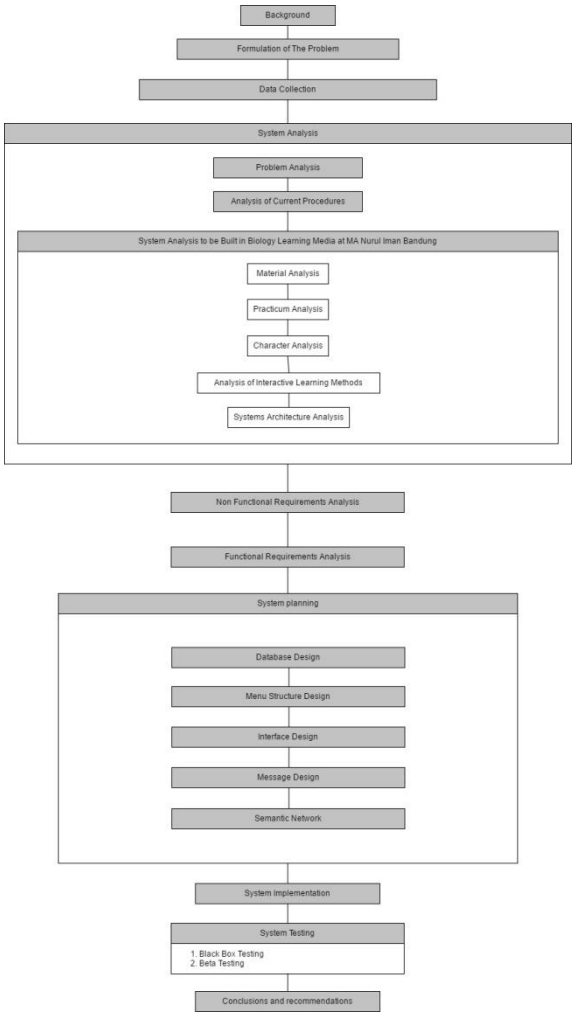


Figure 1 Research Flow

Based on the picture above, the flow of research in this study is divided into 10 stages, namely :

1. **Background**
   Stage of understanding and real conditions in a study.
2. **Formulation of The Problem**
   The problem formulation stage is to formulate the problem of how to build biology interactive learning media for class X and XI at MA Nurul Iman Bandung.
3. **Data Collection**
   The stage of collecting research supporting data, in this study the data collection methods used were interviews, questionnaires and literature studies.
4. **System Analysis and Design**
   This stage is done so that the learning media that are built are in accordance with the existing problems at MA Nurul Iman.
5. **Non Fungsional Requirements Analysis**
   This stage is done by analyzing a non-functional requirement with stages that include hardware analysis, software analysis, and user analysis.
6. **Functional Requirements Analysis**
   This stage is done by analyzing a functional need of biology learning problems at MA Nurul Iman.
7. **System Planning**
   This stage is carried out making a design of the system to be built.
8. **System Implementation**
   This stage is carried out system development based on the analysis that has been done.
9. **System Testing**
   This stage is tested on the system that has been built, to find out whether the system that was built there was an error and whether the system that was created can overcome the problems that occur at MA Nurul Iman Bandung.
10. **Conclusions**
    This stage is carried out drawing conclusions from the development of learning media that has been built and provide suggestions for further research development.

1.3. Multimedia

Multimedia is a combination of a medium / medium such as text, images, animation, sound, video and so on which are integrated in an integrated manner through electronic devices in order to achieve a certain goal. Multimedia elements are divided into 2 parts including discrete multimedia elements (not time-based) and continuous (time-based). Discrete multimedia elements include text and images and continuous multimedia elements including sound, animation and video. [2]

1.4. Computer Based Learning

Computer-based learning is a learning process about a certain material that is carried out using media in the form of a computer. [3]

Computer Assited Instruction (CAI) is one of the applications of computer-based learning. CAI can stimulate the user's thinking power to get information / material more easily because there are several features that support in a learning such as tutorials, simulations, and drill and practice. [4]

1.5. Interactive Learning Application

Interactive learning application is a computer-based learning application that is presented with multimedia elements where users can actively interact with learning that is on the computer. Users will get a feedback from an action taken in the learning application. [3]

1.6. Biology

Biology is a branch of natural science (IPA) that deals with living things. In this research, there will be discussed several topics in biology, including viruses, bacteria, plant world, animal world, cells, blood circulation, respiration, and digestion.. [5]

1.7. Adobe Flash

Adobe flash is a software built by Adobe and is used in several multimedia products including the creation of web and desktop animations, 2D and 3D graphics management, as well as the creation of an interactive multimedia application. Adobe flash is supported by the action script programming languages 1.0, 2.0 and 3.0. [3]

1.8. Blender

Blender is an application that can do modeling, rendering and 3D animation. Blender is commonly used in making 3D animations and making other 3D assets. [6]

1.9. Adobe Photoshop

Adobe Photoshop is a bitmap-based graphics processing application that was built and developed by Adobe. Photoshop is commonly used in photo editing, illustration making, web design, and so on. [7]

1.10. Action Script 3.0

ActionScript is a programming language that can be used in Adobe Flash and Adobe Air environments, ActionScript allows for interactivity, data handling, and much more that is presented in Flash, Flex and Air content and applications. [8]

1.11. MySQL

MySQL is a product of RDBMS (Relational Database Management System) and is a software used as a database manager. MySQL can be used as a database server.[9]

1.12. UML

Unified modeling language (UML) is a tool in the development of object-oriented systems. UML provides useful visualization in the development of object-oriented software and has become a standard in Object Oriented Analysis & Design (OOAD).[10]

2. RESEARCH CONTENTS

The application built has 3 main features, namely, a tutorial containing predetermined biology materials for class X and XI, simulation, and drill and practice which is done by giving questions to students.

The tutorial feature will display theories about biological material that will be applied and delivered interactively using images, text, and some animations, some innate material that will be created cannot be changed by student users or teachers. The teacher can only add new material and will be displayed as additional material.

The simulation feature will display a virtual practicum from several practicums based on predetermined material. This feature cannot be processed by student or teacher users, this feature is processed directly by the developer with an interactive display using Adobe Flash CS.5.5.

The drill and practice feature will feature a multiple choice quis feature that can be processed directly by the teacher. The teacher can process the questions in a quiz chapter or several chapters at once, the questions created by the teacher will become quis for students who later students will work on the questions in the quis feature. Students are required to login first before entering the quis feature.

2.1 System Architecture

The learning media that were built had 2 users namely biology teacher and Student at MA Nurul Iman Bandung. Teachers as users can manage student grade data, student user data, additional material data, and question data which will later become a quiz for students, all of that data can be processed after logging in first. Students as users can see the material provided, do simulations / lab work, and do quis, before doing quis students are required to log in beforehand, the quis results will be displayed immediately after the work is complete. Here is the system architecture of the application being built.

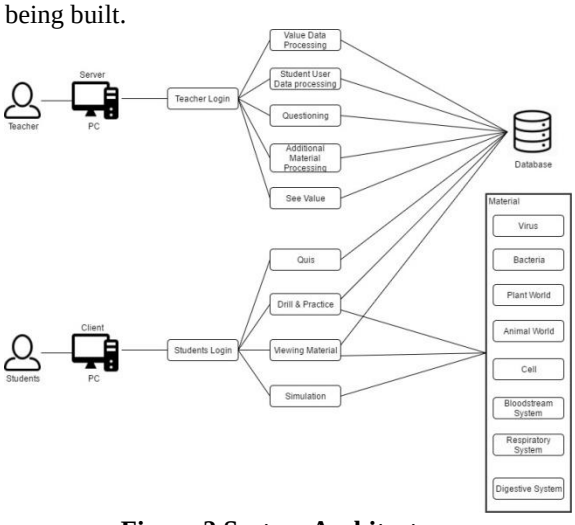


Figure 2 System Architecture

2.2. Tutorial

The tutorial feature presents material by displaying images, animations, and text in accordance with biological material in the 2013 curriculum. The type of tutorial used is a branched tutorial that gives users the freedom to choose available material. These features are used by students in learning about a subject matter. This feature will then become a material delivery feature, the following is the flow of material delivery.

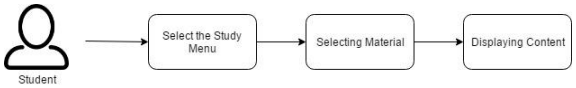


Figure 3 Flow of Submission of Material

2.3. Simulation

The simulation feature presents the material by performing digital simulations in accordance with the practicum in the 2013 curriculum. The simulation is carried out by providing animation accompanied by triggers to advance to the next step by clicking or drag and drop. This feature is done by students to increase understanding of the material being taught, here is the flow of the simulation.

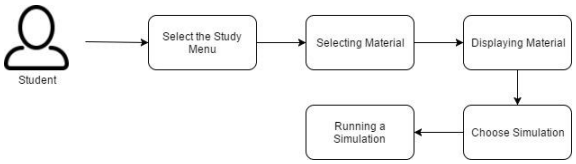


Figure 4 Simulation Flow

2.4. Drill & Practice

Drill and practice presents a multiple choice quis / test based on the material that has been submitted. Quiz questions can be processed by the teacher and will be done by students, at the end of the quis will display the results of the score / value of the answers given. Problems can be presented either in chapters or in more than one chapter depending on the teacher's provisions. This feature will then become a Quis feature, here is the quiz flow.

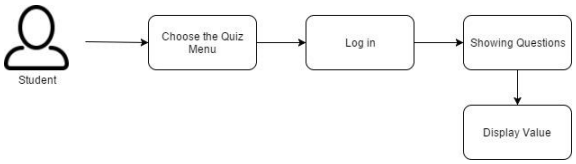
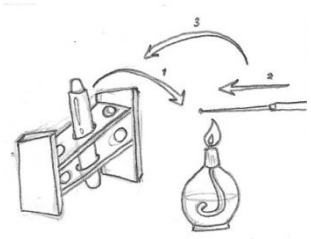
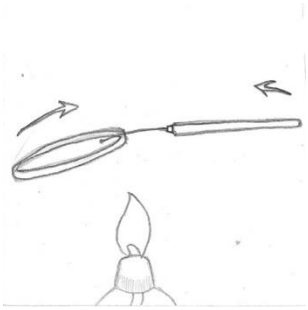
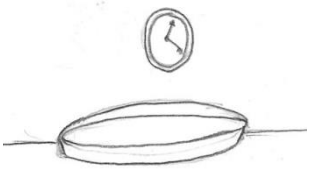


Figure 5 Quiz Flow

2.5. Simulation Storyboard

Simulation storyboard from biology interactive learning media class X and XI at MA Nurul Iman is as follows.

Table 1 Storyboard

Sequence	Board	Script
1		Open the culture bacteria above the flame, sterilize the ose needle, then take the bacteria using the ose needle
2		Inoculate bacteria in petri dishes over a flame
3		Bacteria culture

2.6. Use Case Diagram Backend

Use case backend diagram of the development of interactive biology learning media class X and XI at MA Nurul Iman is as follows.

Figure 6 Use Case Diagram Backend

2.7. Use Case Diagram Frontend

The use case frontend diagram of the construction of interactive biology learning media in class X and XI at MA Nurul Iman is as follows.

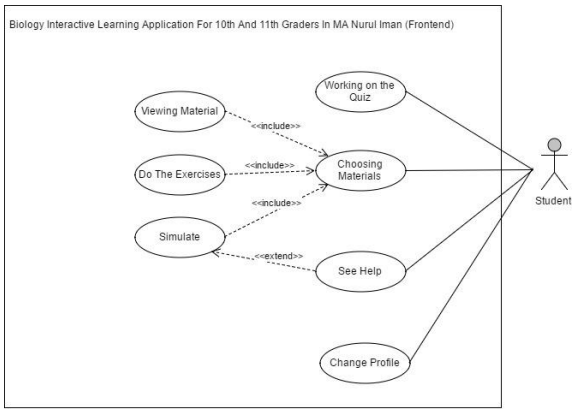


Figure 7 Use Case Diagram Frontend

2.8. Interface Design

The following is the main menu interface design of teachers from biology learning media class X and XI at MA Nurul Iman.

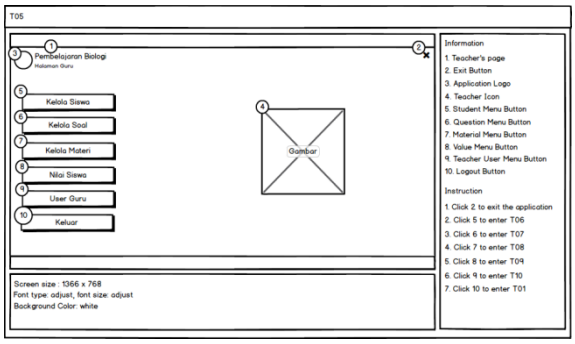


Figure 8 Interface Design Main Page Teacher

The following is the main menu interface design of students from biology learning media class X and XI at MA Nurul Iman.

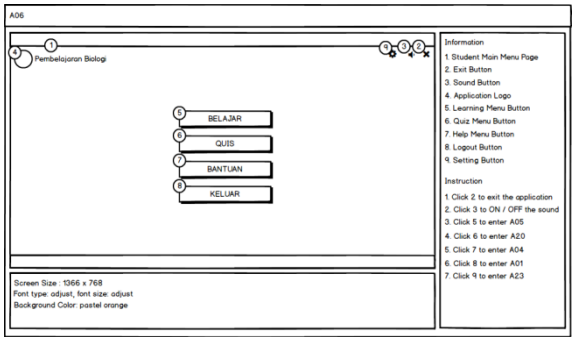


Figure 9 Interface Design Main Page Students

2.9. Implementation of Backend Interface

The backend interface implementation of this research is as follows

Table 2 Implementation of Backend Interface

No.	Interface Name	Information	Display Code
1	Teacher Main Page Interface	Displays the start page and start button that can be used by teacher users	T01
2	Teacher Login Interface	Displays the teacher login form	T02
3	Hostname Page Interface	Displays the ip address / hostname form	T03
4	Teacher Help Page Interface	Displays information pages for teacher users	T04

2.10. Frontend Interface Implementation

The implementation of the frontend interface of this research is as follows.

Table 3 Frontend Interface Implementation

No.	Interface Name	Information	Display Code
1	Student Main Page Interface	Displays the start page and start button that can be used by student users	A01
2	Student Login Interface	Displays the student login form	A02
3	Hostname Page Interface	Displays the ip address / hostname form	A03
4	Help Page Interface	Displays information pages for student users	A04

2.11. Display Interface

Following is the interface of the main menu page of the teacher.

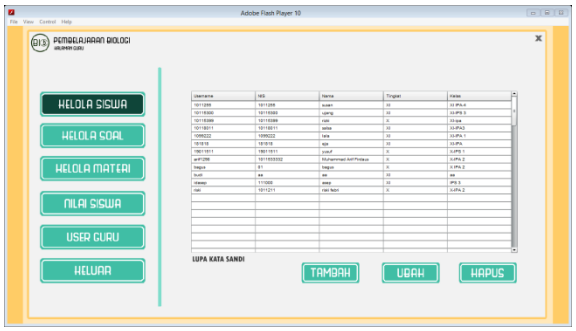


Figure 10 Display Interface Main Menu Home Teachers

Next is the interface of the main menu page for students.

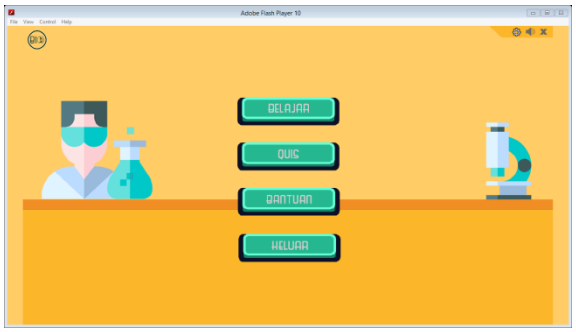


Figure 11 Display of Student's Main Menu Page Interface

2.12. Testing

Tests conducted on learning media biology class X and XI at MA Nurul Iman are alpha and beta testing. Alpha testing method used is black box testing that focuses on the functional requirements of the system. Beta testing is done by an assessment by the user of the learning media built. Here is a blackbox testing scenario.

Table 4 Black Box Testing Scenarios

No	Components Tested	Testing Scenarios	Type of Testing
1	Login	Choose button: login	*Black Box*
		Choose button: mulai	*Black Box*
		Choose button: keluar login	*Black Box*
		Login verifikation	*Black Box*
2	Working on the Quiz	Choose button: quis	*Black Box*
		Click button X	*Black Box*
		Click button XI	*Black Box*
		Choose button : opsi 1	*Black Box*
		Choose button : opsi 2	*Black Box*
		Choose button : opsi 3	*Black Box*
		Choose button : opsi 4	*Black Box*
		Choose button : opsi 5	*Black Box*
3	Choosing Materials	Choose button : belajar	*Black Box*
		Click button X	*Black Box*
		Click button XI	*Black Box*
		Choose button : virus	*Black Box*
		Choose button: bakteri	*Black Box*
		Choose button: tumbuhan	*Black Box*

No	Components Tested	Testing Scenarios	Type of Testing
		Choose button: hewan	*Black Box*
		Choose button: sel	*Black Box*
		Choose button: peredaran darah	*Black Box*
		Choose button : pernafasan	*Black Box*
		Choose button: pencernaan	*Black Box*
		Choose button: tambahan	*Black Box*
		Choose button: lihat	*Black Box*
		Choose button: keluar	*Black Box*
4	Viewing Material	Choose button: materi	*Black Box*
		Choose button: kembali	*Black Box*
		Choose button: home	*Black Box*

Based on the results of tests that have been carried out with sample cases that have been tested, it can be concluded that functionally, biology interactive learning media class X and XI at MA Nurul Iman Bandung has produced the expected output. But there are still errors in the appearance of the error message.

User acceptance testing (UAT) is done by using a questionnaire of 30 MA Nurul Iman Bandung students. Based on the results of a questionnaire that was conducted to 30 respondents with each statement there can be concluded that the interactive learning media biology class X and XI at MA Nurul Iman Bandung is easy to use and can help student users in the biology learning system there with the appearance and content of material that is in accordance with the needs of students there.

3. CLOSING

3.1. Conclusion

Based on the results of testing from research conducted in the preparation of this final project conclusions can be drawn as follows:

1. Biology interactive learning media for class X and Xi at MA Nurul Iman Bandung can help students in learning biology by displaying material that uses interactive multimedia concepts, this application can help students in understanding practicum without needing to be practiced significantly. But in testing that has been done this application has not been able to help students get grades above KKM.
2. Biology interactive learning media for class X and Xi at MA Nurul Iman Bandung can help teachers manage material that will be used in teaching and learning processes as well as daily quizzes.

3.2. Recommendation

Based on the results of this final assignment learning, some suggestions from the author so that the interactive learning media for biology class X and Xi at MA Nurul Iman Bandung can be better, following the advice given as follows :

1. Add biological material that does not yet exist in this study but is still in accordance with the existing syllabus.
2. Teaching material that is dynamic can display an image and animation entered by the teacher.
3. Add training features that allow students to work on essay and simulation questions that have many branches of possibility.

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