

## Developing multimedia-assisted learning program in basic Biology course in Indonesia

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### ABSTRACT

This main objective of this research was to develop a learning program in Basic Biology course based on Curriculum 2013 by using multimedia. This research expected that it could develop a learning model for basic biology course that is innovative and relevant to the development of the three following aspects of students' standard competence: cognitive, skills, and attitudes. The model of learning covered three main subjects as follows: basic ecology, natural resources and their preservation, and climate change. The research was carried out using descriptive and observation method on students who took Basic Biology course. The steps taken in this research were as follows: identifying the problem, identifying the documents needed, and analyzing observation results. The observation results were then used as the basis for developing learning program, curriculum, and supporting instruments. The subjects of this research were the fresher of Mathematics Education, Nusantara Islamic University School of Education who took basic Biology course. The observation has successfully showed that there were several problems in the course including learning program, multimedia characteristics, structures and characteristics of the learning program, instruments (worksheets, evaluation rubric, pre-test and post-test, lesson plan, questionnaires, observation sheets, attitude sheets and their evaluation guidelines).

**Keywords:** *Learning, Multimedia, Inquiry, Scientific Work*

### INTRODUCTION

As a process, sciences have given tremendous contributions towards the development of scientific works, critical thinking, problem solving, and communication skills that are highly important for students to compete in the twenty-first century (Rustaman, 2010). Biology as part of science can facilitate students to have those skills. However, in high school level, Biology courses are given very limited credit hours, which have resulted in declining students' scores in biology in 2012/2013 from 7.7 in 2011/2012 to 3.65 in 2012/2013 (*Academi.edu*: 2013).

Students at mathematics education in college of education (FKIP) in Bandung must take Basic Biology courses for three credits. This course is designed to strengthen students' basic understanding about the subject. The basic biology courses cover living organism, energy, biodiversity, metabolism, ecology, conservation, and natural resources. Meanwhile, in 2013 Curriculum, all courses are obliged to contribute to the development of students' skills, attitudes, and knowledge, especially in classroom activities. Therefore, referring to this policy, the learning objectives are to improve students' capacity in knowledge, attitudes, and skills.

Lecturers are encouraged to design learning models that can facilitate the attainment of the objectives.

There are many factors supporting the attainment of learning objectives and the intended competence; one of them is learning media. Learning media plays significant role in explaining abstract concepts and discovering the hidden ones. Unclear and complicated learning materials enforce educators to develop learning media (Rotbain, 2007). In Basic Biology course, there are several learning concepts that need media in order to explain the difficulties and phenomenon such as cell structure, bacterial and virus outbreaks, blood system, and global warming. Those are some of the topics that many students find difficulties to understand. Therefore, a multimedia device may be helpful to assist students to understand them. In addition, the use of multimedia devices is also intended to attract students' interest and encourage them to have critical thinking and scientific attitudes. That is why, developing an innovative learning program using multimedia is critically important, especially in Basic Biology.

## **METHODOLOGY**

The objective of this research was to develop a learning program in Basic Biology course that can be used to improve the quality of learning process of the subject. This research employed descriptive qualitative method and involved the following activities: identifying document needed, analyzing the observation on students' activities, conducting discussions, developing materials, instruments, and multimedia devices for searching information that were needed to make the learning process complete.

## **RESULTS AND DISCUSSIONS**

Through observations, this research has successfully found that the students encountered difficulties in the course of Basic Biology. Their test scores indicated that in average the students' scores are 3.58 (in 1-4 scales). The students also encounter difficulties in the learning process due to the overloaded materials and contents. They also viewed that the tasks given to them were difficult to be completed in which the scores was 2.97. In addition, the way how the lecturer delivers the teaching and learning process were also considered to be poor by the students in which they gave scores of 2.89 for the lecturer. And lastly, students also employed difficult learning strategy to comprehend in which 2.75 of them said that they felt difficulties. The situations were getting worse due to limited learning support system including libraries (Cahyani, 2013). Specifically, lesson plan for the course of Basic Biology covers three chapters as follows: Basic Ecology, Natural Resources and their Preservation, and Climate Change. Meanwhile, the flow of the plan is showed in the following tables:

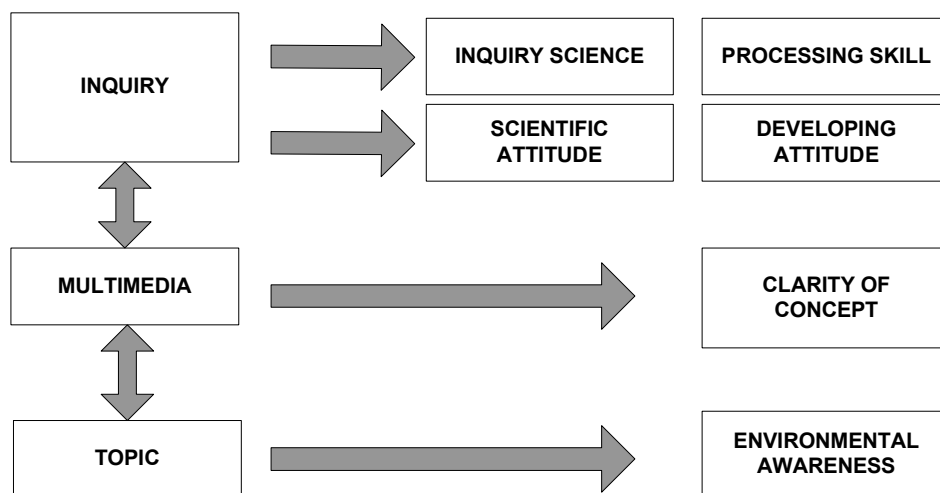


Figure 1. The Flow of the plan programme of Basic Biology

Characteristic of Multimedia:

1. The materials or sub-chapters selection must be based on the learning model to be;
2. The contents of multimedia is in accordance with the learning materials;
3. The contents of multimedia consist of indicators that will be observed;
4. Multimedia can be the answer to the problem given in the learning process.

**Table 1** Learning materials and research instruments for three main materials.

A. Learning Materials		Descriptions
1.	Syllabus	Revising the current syllabus to make it in accordance with the objectives of the research.
2.	Highlights of learning topics	Arranging the questions based on the skills tested.
3.	Developing multimedia-based lesson plan	Identifying topics that are in accordance with the learning model, formulizing objectives, developing learning procedures, and identifying strategy of learning and evaluation.
4.	Multimedia assisted learning	Developing multimedia assisted learning with the duration of 10 to 15 minutes.
B. Research Instrument		Description
1.	Test of concept understanding	A multiple-choice test designed to identify students' understanding of learning indicator. There are two tests: pre-test and post-test.
2.	Students' worksheet (LKM) of scientific works with the rubrics needed.	The worksheets were used as tools for measuring students' scientific works based on the principles of inquiry learning. The worksheets consist of the tasks the students need to work on before watching the multimedia, the tasks after watching multimedia, problems and questions. The worksheets were distributed in every session

A. Learning Materials		Descriptions
		including discussions during the research process and the report about it. The worksheets were graded based on the rubrics with certain criterions.
3.	Scientific attitude observation sheets	The observation sheets are intended to record students' attitude towards the learning process using multimedia.
4.	Observation sheets	They consist of guidelines about how to records students and lecturer's activities.
5	Questionnaires	It is intended to measure students' responses towards the learning process.
6	Evaluation rubrics	Guidelines for evaluating scientific works of the students during the learning process.
7	Field notes	Research notes by the observer about all activities during the research process.

The indicators of scientific works and cognitive skills are as follows: (1) utilizing data, (2) formulizing problems, (3) formulizing hypotheses, (4) identifying variables, (5) mathematical calculations, (6) developing table/graphics, (7) making predictions, (8) drawing conclusions, and (9) communicating (NRC, 2000., BSNP, 2006). The indicators of scientific attitudes are as follows: (1) having curiosity, (2) expressing ideas, (3) cooperative works, (4) diligent, (5) honest, (6) responsibility, (7) creativity, (8) open, and (9) caring to surrounding environment (Azwar, 2011) and (LeBlanc & Gallavan,2006)

Table 2 Plan of structure and characteristics of inquiry based learning program using multimedia on the course of basic Biology that covers three main subjects.

Structures	Characteristics
Preparation	<ul style="list-style-type: none"> <li>a. Reanalyze the multimedia that will be used.</li> <li>b. Preparing students' worksheet based on inquiry principles intended to dig students' scientific works.</li> <li>c. Preparing the facilities for multimedia.</li> <li>d. Developing pre-test for evaluating students' initial understanding.</li> <li>e. Developing observation sheets of students and lecturers' activities.</li> <li>f. Developing observation sheets of students' scientific attitudes.</li> <li>g. Identifying people to become observers</li> </ul>
Orientation	<ul style="list-style-type: none"> <li>a. Informing the learning model that will be used.</li> <li>b. Explaining the main steps of learning activities.</li> <li>c. Explaining the tasks the students need to do during the learning process.</li> <li>d. Forming groups and explaining briefly about the importance of developing scientific works and attitudes.</li> <li>e. Motivating students and explaining the objectives of the</li> </ul>

Structures	Characteristics
	learning.
Distributing Students' Worksheets	a. Distributing the worksheets. b. Providing students with opportunities to understand the worksheets.
Multimedia Use	a. Showing the multimedia. b. Showing the pause tools for certain shows. c. Students are collecting information/data based on the shows.
Discussions	a. Encouraging students to discuss and exchange ideas. b. Acting as facilitator in scientific works. c. Observers carefully observe students' attitudes. d. Observers carefully observe students and lecturer's activities.
Reporting	a. Collecting the worksheets b. Grading the worksheets based on the rubrics
Reflection	Reflections of learning activities.

## CONCLUSION

After completing all the stages and referring to the problem identified during the observation process in the Basic Biology Course, this research comes to the final arrangement of the multimedia-assisted learning program in Basic Biology for the 2013 curriculum as follows:

1. The learning program consists of three main subjects as follows: Basic Ecology, Natural Resources and their Preservation, and Climate Change. By referring to inquiry learning strategy, the multimedia devices play as tools for searching new information about the topics;
2. The observed aspects of the three chapters of learning materials include scientific works, cognitive skills, and scientific attitudes.
3. The indicators of scientific works and cognitive skills are as follows: (1) utilizing data, (2) formulizing problems, (3) formulizing hypotheses, (4) identifying variables, (5) mathematical calculations, (6) developing table/graphics, (7) making predictions, (8) drawing conclusions, and (9) communicating.
4. The indicators of scientific attitudes are as follows: (1) having curiosity, (2) expressing ideas, (3) cooperative works, (4) diligent, (5) honest, (6) responsibility, (7) creativity, (8) open, and (9) caring to surrounding environment.
5. The characteristics of multimedia are as follows: it has contents reliable to learning materials and it can provide better solutions to research problems.
6. The characteristics of learning program are as follows: preparation, orientation, students' worksheet, multimedia utilization, discussions, report of activities, and reflection.

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