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Analysis of Development Needs of Sains Teknologi Masyarakat (STM) - Based Microbiology Textbook on Microbes' Nutrition, Growth and Metabolism Material for Biology Students at Universitas Negeri Padang

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Abstract Learning process in a college is often referred as lecturing. Lecturing is an active activity of students in building meaning and getting their own educational experiences. Universities have to equip their college students with competencies that would be useful in the future. The competence of college graduates is adjusted to Presidential Regulation Number 8 of 2012 concerning the Indonesian National Qualification Framework or KKNI (Kerangka Kualifikasi Nasional Indonesia). In order to achieve the target of learning achievement set by KKNI, the educational process have to run well, including the process of lecturing. Microbiology is a branch of biology that studies microorganisms. Microorganisms are very small living things that can only be seen with a microscope including bacteria, viruses, and fungi. At Universitas Negeri Padang, the college students tend to use the old version of Pelczar's books so that they did not get a renewal of knowledge. Therefore, the researcher conducted needs analysis of 72 students at Universitas Negeri Padang. It aimed to find out the need of developing microbiology textbooks. Data was collected by using observation technique, questionnaires and interviews. Data analysis was including problem analysis, syllabus analysis and textbook analysis. From the data analysis, it can be revealed that the results of this preliminary study were (1) the implementation of microbiology learning had not been optimal, it was seen from the learning outcomes that had not been achieved., (2) the old textbook was not enough for the college students to understand the microbiology material and its application in daily life., (3) There was still no textbooks that can increase students' understanding deal with concepts and the renewal of knowledge, (4) the presentation of material in the textbooks had no interaction with the community science technology-based or what will be called as Mikrobiologi Berbasis Sains Teknologi Masyarakat (STM).

Keywords - Sains Teknologi Masyarakat (STM), Microbes' Nutrition, Growth and Metabolism Material.

I. INTRODUCTION

Learning process in a college is often referred as lecturing. Lecturing is an active activity of students in building meaning and getting their own educational experiences. Universities have to equip their college students with competencies that would be useful in the future.

The curriculum of each study program in university is compiled and adjusted by Indonesian National Qualification Framework or Kerangka Kualifikasi Nasional Indonesia

(KKNI). According to Presidential Regulation Number 8 of 2012, KKNI is defined as a competency qualification framework that make the things equalize in the field of education. The equalization of KKNI can be achieved with the achievement of learning outcomes which have been qualified for a particular level of education.

Learning outcomes at university level is equivalent to the sixth level. In learning achievement parameters of KKNI, the sixth level have been established as the level where someone should be able to apply, study, design, utilize science and technology and solve problems according to their fields as general.

In order to achieve the target of learning achievement set by KKNI, the educational process have to run well, including the process of lecturing. There are mandatory class and elective class available in lecturing at university level. Microbiology is one of the mandatory classes in Biology department at FMIPA UNP.

Microorganisms are very small living things that can only be seen with a microscope including bacteria, viruses, and fungi. Based on the curriculum of Biology Study Program at FMIPA UNP, it is known that microbiology class is prerequisite class for several mandatory classes and elective classes such as biotechnology, food microbiology, medical microbiology, fermentation physiology, microbial genetics, soil microbiology and phytopathology.

Based on the interview, it was known that there were still many students who had difficulty in understanding the concepts and principles of microbiology. It was seen when biotechnology and other elective class were ongoing. In order to solve the problem, it was needed to provide the college students with suitable teaching materials.

Textbook is the teaching materials that can make students able to achieve a good understanding of material concept. It has an important role in the learning process. An educator should be able to compile a textbook according to students' need. It should be an interesting, innovative and contextual textbook.

Textbooks can improve learning outcomes [1]. It can trigger students in improving their intellectual abilities [3]. It can also smoothen and make the learning process become easier [4].

The textbook which give the students better understanding is the textbook with community technology science approach - based , or what will be called as sains teknologi masyarakat (STM) approach. STM has aims to improve students' learning achievement and to broaden students' knowledge [2]. STM is an innovative model. It uses environmental issues in the learning process. It is also fostering both students' understanding and students' thinking as creatively and critically.

Based on the problems above, the research of analysis of development needs of sains teknologi masyarakat (STM)-based microbiology textbook on microbes' nutrition, growth and metabolism material for biology students at Universitas Negeri Padang was conducted.

II. RESEARCH METHOD

The design of this research was a descriptive research. The purpose of this research was to find out the development needs of sains teknologi masyarakat (STM)-based microbiology textbook on microbes' nutrition, growth and metabolism material for biology students at Universitas Negeri Padang. This research was conducted in both Faculty of Mathematics and Natural Sciences (FMIPA) at Universitas Negeri Padang and Universitas Andalas (UNAND). The subjects of this research were 72 students of Biology Department.

The stages in this research were aimed to collect and analyze information, to define problems, and to review the textbooks used.

a. Analysis of students' problems

Analysis of students' problems and students' needs were aimed to determine the problems happened in microbiological learning process. Activities carried out by giving questionnaires and interviews to the college students. The results of this analysis were used as a benchmark in designing and developing microbiology textbooks with community science technology-based or STM.

b. Analysis of microbiology syllabus

The analysis of the microbiology syllabus was aimed to look at the main material of microbiology. The results of this analysis were used as a benchmark in developing microbiology textbooks.

c. Analysis of microbiology textbooks

The analysis of the microbiology textbook was conducted to find out the presentation of its contents. The results of this analysis were used as guidelines in using microbiology textbooks.

III. Results And Discussion Results

The data analysis of both students' needs and students' problems at Biology Department were obtained from the questionnaires. It can be seen in table 1.

Table 1. The data analysis of both students' needs and students' problems at Biology Department

No.	Question	total	%
1	Do you like the topic of microbes' nutritional, growth and metabolism? a. Yes b. No	 68 4	 94 6
2	Are the topic of microbes' nutritional, growth and metabolism difficult to understand? a. Yes b. No	 72 0	 100 0
3	Are there benefits of studying microbes' nutritional, growth and metabolism in your daily life? a. Yes b. No	 72 0	 100 0
4	What is the teaching method used by lecturer in teaching microbes' nutritional, growth and metabolism in the classroom? a. Lecturing method b. Discussion c. Lecturing and discussion methods d. Others ...	 5 16 56 3	 6 22 77 4
5	Are there any supporting references do you use while understanding the material of microbes' nutritional, growth and metabolism? a. Yes b. No What kind of supporting reference do you use? a. Textbooks b. Module c. Journal d. Photocopy sheet e. Web / blog (internet) f. Other, animated videos	 70 2 50 11 42 18 53 2	 97 3 69 15 58 25 73 3
6	How do you get the source of the reference? a. From lecturer b. From senior c. Find it by myself d. Others ...	 37 38 57 0	 51 52 79 0
7	Are references suitable with the material and also contain the indicators of microbes' nutritional, growth and metabolism? a. Yes b. No	 30 42	 41 59
8	Do the references help you to find the process-based concepts in material of microbes' nutritional, growth and metabolism? a. Yes b. No	 63 9	 87 12
9	Do the references help you to understand the abstract concept of microbiology? a. Yes b. No	 38 34	 52 48
10	Do the references have images that support material of microbes' nutritional, growth and metabolism? a. Yes b. No	 32 40	 44 56
11	Which one is the most difficult material? a. Microbes' Nutrition b. Microbes' Growth c. Microbes' Metabolism	 38 39 41	 52 54 56

Discussion

a. Analysis of students' problems

Based on the interview with Dr. Irdawati, M.Sc. as a lecturer in microbiology and biotechnology at Biology Department, FMIPA UNP on November 7th 2018, it was known that there were still many students who had difficulties in understanding the M.Kes. It was known that she used lecturing method and group discussions methods in teaching learning process. The students had to make papers and PPT according to the material. She stated that most of the students tend to use more references from the internet (web / blog) even though they had been suggested to use

textbooks and journals as the references. It was suitable with the result of the questionnaire which stating that 97% of students tend to use references taken from the internet (web/ blog) that had not been validated.

The results of the students' interview revealed the reason why the students took references from the internet (web / blog). It happened because they thought that the references from the internet were easy to find and beside it used simple language as well. Students argued that references such as journals and textbooks which have been validated were hard to find. They feel lazy to find and learn it because it was only available in English version.

b. Analysis of microbiology syllabus concept and principle of microbiology.

The difficulties of these students were seen during the biotechnology lecturing process and elective classes were ongoing. In order to achieve objectives learning of the class, most of the lecturer had to repeat and discuss several microbiological topics so that the students can relate it to the material will be given.

Based on students' mid semester test result of microbiology class, it was found that there were still many students who get C or C- scores. Dr.Irdawati,M.Sc., stated that the differences between students' score achievement and student's understanding existed because the students had only tried to memorize microbiology material without having a good understanding in the principles itself.

The result of the interview was conducted on November 14th, 2018 with Dr. Linda Advinda.

The analysis of the microbiology syllabus aimed to look at the basic material of microbiology that will be developed. Syllabus analysis also helps to see the order and scope of the material.

Based on the results of questionnaire which was given to 72 Biology students, it was known that the topic of the history of microbiological development (51%), bacteria (59%) and viruses (72%) were the difficult topic to master for students because there were many material and difficult concepts in those topics. Students also argue that the material was abstract so they have difficulty on learning it.

Based on the results of the questionnaire that had been given to students, the researcher composed the main concepts of the material that will be developed systematically and sequentially according to the syllabus analysis and the students' needs.

c. Analysis of microbiology textbooks

Microbiology class with group discussion methods by making papers was suitable with the material. The discussion process was not optimal since the students presented material without achieving the learning outcomes indicators.

Based on the results of Biology students' questionnaire at UNP and UNAND towards the use of references in the microbiology learning process, it found that 59% of students stated that the references were not suitable with the topic and did not include microbiological learning outcomes indicators, it also found that 53% of questionnaire revealed that the references used were not the renewal of knowledge since the references used were obtained from the book with a long published year.

Based on the results of the microbiology textbook analysis, it was found that there was no application of concepts in the daily life. This was an important thing to be understood by the students so that they will be able to achieve the target of learning achievement set by KKNI.

Textbooks are an important thing that helps improving students' abilities. By using textbooks, students' critical thinking skills, their ability in applying concepts in everyday life and high-level thinking skills are increased [6].

IV. CONCLUSION

Based on the data analysis, the results of the preliminary study can be revealed as (1) the implementation of microbiology learning had not been optimal, it was seen from the learning outcomes that had not been achieved., (2) the old textbook was not enough for the college students to understand the microbiology material and its application in daily life., (3) There was still no textbooks that can increase students' understanding deal with concepts and the renewal of knowledge, (4) the presentation of material in the textbooks had no interaction with Sains Teknologi Masyarakat (STM).

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