

Analysis of Needs for the Development of Microbiology Teaching Books Based on Science Technology Society (STM) on Microorganism Classification Materials for Padang University Biology Students

Putri Islami Suci¹, Dwi Hilda Putri²

¹Student of Master Degree Program of Biologi Education,
Faculty of Mathematics and Natural Sciences,
State University of Padang

²Lecturer of Biology Department,
Faculty of Mathematics and Natural Sciences,
State University of Padang



Abstract - Curriculum in Higher Education is set by equalization of the Indonesian National Qualification Framework (KKNI). Educational Process, especially in higher education, should run well to fulfill the targets in the KKNI. Microbiology is a subject in Biologi Department of FMIPA UNP. Based on the Biology Department of FMIPA UNP curriculum, it is known that Microbiology is a prerequisite to take other compulsory or optional subjects. Based on result of questionnaires and interviews to students, it is revealed that there are many students who still have problem in understanding microbiology concepts and principles. Purpose of the research was to analyze the need of developing STM based microbiology learning book in microorganism classification material for Biology students in State University of Padang. The subjects were 72 Biology students. Techniques of data collection were interviewing and giving questionnaire about analysis of students' problems, analysis of microbiology syllabus, and analysis of microbiology learning book. Findings of the research reveals that (1) microbiology learning has not been optimal yet because learning indicators are not achieved, (2) the used learning books are not sufficient for students to understand microbiology learning material and its implementation in daily life, (3) there is no learning book to increase conceptual understanding and novelty in science, and (4) material presentation in learning books has not integrated STM. In conclusion, based on the finding above, it needs to develop STM based microbiology learning book in microorganism classification material for Biology students in State University of Padang.

Keywords - Learning Book, Microbiology, Science Technology Society (Stm), Microorganism Classification.

I. INTRODUCTION

Higher education is an institution which is expected to be able to produce graduates who have academic competences and able to apply it in the real life. Curriculum in Higher Education is set and adapted to every department

according to equalization of the Indonesian National Qualification Framework (KKNI).

According to Peraturan Presiden No 8 Year 2012, The Indonesian National Qualification Framework (KKNI) is a competence qualification framework which is able to equalize in educational sector. The sector equalization in

KKNI can be achieved by qualified learning outcomes for a certain educational level.

The learning outcomes of higher education in undergraduate program are equal to level 6. in the KKNI, it is established learning outcome parameters, in which performance for level 6 is generally established to be able to apply, analyze, design, use science and technology (IPTEK) and overcome problems according to its field.

To fulfill the learning outcome targets established in KKNI, learning process, especially in higher education, should run well. In the higher education context, there are compulsory and optional subjects to take by students. One of the compulsory subjects in Biology Department of FMIPA UNP is microbiology.

Microbiology is a branch of biology which studies microorganisms. The microorganisms are very tiny organisms which can only be seen by using microscope. They include bacteria, virus, and fungi. According to curriculum in Biologi Department of FMIPA UNP, it is known that microbiology is a prerequisite subject for other compulsory or optional ones, such as biotechnology, food microbiology, medical microbiology, fermentation physiology, microbial genetics, soil microbiology and phytopathology.

Based on the result of interview, it is found that many students have difficulty in understanding the microbiology concepts and principles. It is obvious while they are studying biotechnology or other related subjects. Therefore, it needs learning materials which are appropriate with student needs.

The learning material which provide students to understand the concepts well is learning book. The learning book has an important role in learning process. So, a teacher/ lecturer is demanded to be able to arrange an interesting, innovative, contextual learning book. Beside that, it should be appropriate with student needs. Consequently, it can improve students' learning outcomes [1].

The appropriate learning book can trigger students to improve their intellectual capacity in learning [4]. The use of learning book can also facilitate the delivery of learning materials to students [6].

The learning books which can provide understanding of the concepts are the ones which use science technology society (STM) approach. The STM seeks to improve

learning outcomes and enhance students' knowledge [2]. Beside that, the STM is an innovative model by utilizing environmental issues in learning process, foster understanding of the concepts and improve creative and critical thinking.

Based on the explanation above, this research was about need analysis of science technology society (STM) based microbiology learning book development in microorganism classifications material for Biology students in State University of Padang.

II. RESEARCH METHOD

It was a descriptive research. Purpose of the reseach was to analyze the need of science technology society (STM) based microbiology learning book development in microorganism material for Biology students in State University of Padang. It was done in Faculty of Mathematics and Natural Sciences (FMIPA) State University of Padang (UNP) and Andalas University (UNAND). The subjects were 72 Biology students.

In this reseach, investigation stage was done to collect and analyze information, define problems, and analyze the used learning books.

a. Analysis of students' problems

It was to know the problems faced by students during microbiology learning process. It was done by giving questionnaire and interviewing students. The result was used as standard in designing and developing science technology society (STM) based microbiology learning book.

b. Analysis of microbiology syllabus

It was to see microbiology primary learning materials. The result was used as standard in developing the microbiology learning book.

c. Analysis of microbiology learning book

It was to know the content presentation of the learning book. The result was used as guidance in using the microbiology learning book.

III. FINDING AND DISCUSSION FINDING

Data of Biology students' need and problem analisis were obtained from a questionnaire. Need analysis data of learning book development can be seen in Table 1 below.

Table 1. Need Analysis Data of Biology Students' Learning Book

No	Questions	Total	%	Desc
1	Interest in microbiology a. Yes b. No	68 4	94 6	Choose one
2	Importance of learning microbiology a. Yes b. No	72 0	100 0	Choose one
3	Benefit of learning microbiology in life a. Yes b. No	72 0	100 0	Choose one
4	Implementation of microbiology learning a. Lecturing method b. Discussion c. Lecturing and discussion method d. Others...	5 16 56 3	6 22 77 4	Student can choose more than 1
5	The supporting references during learning a. Yes b. No What references are they? a. Learning book b. Module c. Jurnal d. Photocopy sheets e. Internet (web/blog) f. Others...	70 2 50 11 42 18 53 2	97 3 69 15 58 25 73 3	Choose one Student can choose more than 1

6	The references can be used to get in science a. Yes b. No	34 38	47 53	Choose one
7	The references are appropriate with topic and include microbiology indicator a. Yes b. No	30 42	41 59	Choose one
8	The references can help you apply microbiology knowledge in daily life a. Yes b. No	32 40	44 56	Choose one
9	The difficult microbiology material for student a. History development of microbiology b. Bacteria c. Virus	37 43 52	51 59 72	Choose one

Discussion

A. Analysis of students' problems

Based on the result of interview with Dr. Irdawati, M.Si. (Microbiology and biotechnology lecturer in Biology Department of FMIPA UNP) done on November 7th, 2018, it is known that many students still have difficulty to understand microbiology concepts and principles. The difficulty is obvious while learning process is running. In order to reach learning objectives of the subject, lecturer often rediscuss some topics to make students able to relate them to the new one to be learned.

Seen from students' mid-term exam score in microbiology subject, most of them got A-B (very good-good). According to Dr. Irdawati, M.Si., the different scores got by students might be caused by they only try to

memorize the materials but they do not really understand the principles.

The result of interview done on November 14th, 2018 to Dr. Linda Advinda, M.Kes., shows that microbiology learning uses lecturing and group discussion method in which students make a report and present it in front of the classroom according to the discussed topics. Dr. Linda Advinda, M.Kes., also adds that although it is suggested to use references like jurnal or textbook, most of students tend to use references from internet (web/blog). It is in line with finding of questionnaire which shows that 73% of students use references taken from internet (web/blog) which are not validated yet.

In addition, the result of interview to students revealed that they take some references from internet (web/blog) because it is easy to search and uses simple language. Beside that, they argue that validated references, like jurnal and textbook, are hard to find and they feel lazy to find or study english textbook.

B. Analysis of microbiology syllabus

Analysis of microbiology syllabus is to see the primary microbiology materials which is going to be developed in the learning book. Beside that, it is also useful to know the sequence and scope of the learning materials.

From the finding of questionnaire, given to 72 Biology students, it shows that there are some topics which are difficult to understand by students because they are large topics and have many concepts. They are History development of microbiology (51%), bacteria (59%) and virus (72%). Students also state that the topics are abstract so that they are difficult to study them.

So, based on the finding of questionnaire, the primary concepts which are going to develop are arranged sistematically and sequentially according to syllabus analysis and students' needs.

C. Analysis of microbiology learning book

The microbiology learning uses group discussion method in which students make a report based on the topic. However, the discussion is not optimal because students present shallow topic and do not reach learning indicators yet.

The finding of questionnaire about the use of references in microbiology learning process shows that 59% students state that the references used are not appropriate to the topic and do not reach microbiology learning indicators.

Moreover, 53% students state that the references used do not include novelty in science because they are from the books published long time ago.

Learning book is very important to help students increase their competences. Beside that, the use of the learning book can improve students' critical thinking, concept application in real life and high level of thinking abilities [6].

The writing of learning books is always based on students needs which include the needs of knowledge, skills, guidance, feedback, and exercises. According to Butler et al., there are ten steps to develop a learning tool, which are: 1) based on student needs, 2) goals and objectives, 3) test tasks, 4) language and skills, 5) sequence, 6) materials, 7) teaching, 8) reflection, 9) evaluation, and 10) revision [3].

Based on the analysis of microbiology learning book, it is found that there is no application of concepts in real life in the book. It is a very important thing to be understood by students in order to make them able to reach learning objectives established in the KKNL.

To make learning book has application of concepts in real life, Science Technology Society (STM) based learning book is developed. The STM gives meaningful learning for students. They can understand the concepts well because they construct the learned concepts by themselves [5].

IV. CONCLUSION

From data analysis above, findings of the preliminary research reveal that: First, microbiology learning has not been optimal yet because learning indicators are not achieved. Second, the used learning books are not sufficient for students to understand microbiology learning material and its implementation in daily life. Third, there is no learning book to increase conceptual understanding and novelty in science. Last, material presentation in learning books has not integrated science technology society (STM).

REFERENCE

- [1] Al Azri, R. H and Majid H. A. 2014. The Effect of Using Authentic Materials in Teaching. *International Journal of Scientific & Technology Research*, 3 (10), 249-254.
- [2] Arbi, Y. R. 2017. Pengembangan Modul Berorientasi Sains Teknologi Masyarakat Dilengkapi Asesmen Literasi Sains Untuk Siswa SMP Kelas VII Semester

- II. *Unpublished Thesis*. Padang: State University of Padang.
- [3] Butler, G. et al. 2015. A Ten-Step Proses for Developing Teaching Units. *English Teaching Forum*. americanenglish.state.gov/english-teaching-forum.
- [4] Ginting, R.U. 2012. Efektivitas Penggunaan Buku Ajar dan Belajar Mandiri dalam Rangka Peningkatan Hasil Belajar Termodinamika Dasar. *Jurnal Pendidikan Teknologi dan Kejuruan Fakultas Teknik Unimed*, 14 (1), 1-7.
- [5] Millah, E. S. et al. 2012 Pengembangan Buku Ajar Materi Bioteknologi di Kelas XII SMA IPIEMS Surabaya Berorientasi Sains, Teknologi, Lingkungan dan Masyarakat (SETS). *BioEdu*, 1 (1), 19-24.
- [6] Onasanya, S.A and E. O. Omosewo. 2011. Effect of Improvised and Standard Instructional Materials on Secondary School Students' Academic Performance in Physics in Ilorin Nigeria. *Singapore Journal of Scientific Research*, 1 (1), 68-76.
- [7] *Peraturan President Republik Indonesia Nomor 8 tahun 2012 Tentang Kerangka Kualifikasi Nasional Indonesia*.
- [8] Poedjiadi, A. 2005. *Sains Teknologi Masyarakat*. Bandung: PT Remaja Rosdakarya.