Needs analysis to development of biology module based on problem solving at topics of respiratory and excretory system to student of senior high school grade XI

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Abstract. Biology learning in general should consider the scientific process, where students must be able to build their own knowledge actively through meaningful learning processes. One way is to improve students ability to solve problems in accordance with one of the goals of applying the 2013 curriculum. This ability can be created with the help of teachers as facilitators and other facilities such as teaching materials. In high school students of class XI there is no official curriculum book 2013 issued minister of education. Books used by students in schools are private publications that have not been proven valid, practical and effective. Therefore, the researcher did a requirement analysis to 30 students of grade XI IPA in SMAN 7 Padang with the aim to see the need to develop biology materials based on problem solving about respiratory system and excretory system in high school student of SMA XI. Data collection using observation techniques, questionnaires and interviews with data analysis include front end analysis, students, needs and curriculum. From the analysis of data that has been done can be disclosed the results of this preliminary study are (1) teaching materials used by students still in the form of textbooks and teacher handouts that have not been proven valid, practical and effective, (2) teaching materials used not help students to improve ability solving problems, (3) teaching materials used are not in accordance with the contents of the curriculum standard of 2013, (4) students' competence in developing problem solving skills in non-trained learning, and (5) problem solving biology-based teaching materials not yet available. Based on this it is found that the need to develop a biology-based materials problem solving about respiratory system and excretory system material in high school students XI.

1. Introduction

The respiratory system and excretory system are one of the materials found in biology classes in even semester XI, namely in 3.7 and KD 3.8 in the 2013 curriculum. Based on the results of the author's interview with one of the teachers at SMAN 7 Padang, it is known that the learning outcomes students in these two materials are still relatively low.

One factor that causes low student learning outcomes is students' difficulties in understanding teaching materials. The selection of the right teaching materials can increase students' learning interest and support learning outcomes. The use of teaching materials in the learning process can generate new
desires and interests, generate motivation and stimulation of learning activities and even bring psychological influences on students [3].

At SMAN 7 Padang the teaching materials used by students are textbooks. This book is lent to students during the learning process and returned to the library after the learning hours are finished. The teacher also makes handouts to support the teaching materials provided in the school. However, the handouts given by the teacher are only photocopied so that the images presented to students become less clear.

In addition, teaching materials contained in schools have not facilitated students to be able to improve problem solving skills in accordance with one of the implementation of the 2013 curriculum. Problem solving skills in students can be trained continuously and directed [5]. One way is to apply problem solving models to teaching materials used by students.

Based on the problems that have been disclosed, a research on needs analysis for the development of problem solving based teaching materials about the material of the respiratory system and excretory system in class XI high school students.

2. Methods
This research is a descriptive study because this study aims to determine the needs of the development of problem solving based teaching materials about the material of the respiratory system and excretory system in class XI high school students. This research was conducted in the Faculty of Mathematics and Natural Sciences (FMIPA) Padang State University (UNP) and SMAN 7 Padang. The product test subjects of this study were 30 students of Class XI of SMAN 7 Padang. The object of this study is a textbook used in SMAN 7 Padang as teaching material.

2.1. Problems and needs analysis
This analysis is carried out with the aim of knowing what problems are encountered in the biology learning process and determining the characteristics of the learning modules favored by students who are the target users of the module to be developed, as well as determining the modules needed by the teacher as a tool in the learning process. Activities carried out at this stage are interviews with teachers and students. The results of this needs analysis are then taken into consideration in designing and developing modules.

2.2. Student analysis
Analysis is done to obtain the needs of students who are the target users of the developed modules. Activities carried out at this stage are interviews with students using the interview guidelines sheet. The results of student analysis are used as a consideration in designing and developing products in the form of learning modules.

2.3. Curriculum analysis
Analysis This analysis is carried out with the aim of determining the order and scope of the material needed in accordance with the existing basic competencies, seeing the logical sequence of material, identifying the material, presenting problems in the material related to daily life in accordance with the indicators and learning objectives. The results of this analysis are used as guidelines in developing learning modules.

2.4. Concept analysis
Analysis This analysis is carried out with the aim of identifying, detailing, and systematically drafting concepts needed and used as guidelines in the development of modules. The steps taken consist of identifying important concepts contained in the respiratory system material and the excretory system. The results of this analysis are used as guidelines in using the learning module.
3. Results and Discussion

3.1. Problems and needs analysis

The phases are preliminary research, development, and assessment. The instruments used in data collection includes pieces of observation/interviews, instrument self-evaluation, instruments validity [6][10]. Based on the results of the interview on April 23, 2018 with Mrs. Teti Andriati, S.Pd. Biology teacher at SMAN 7 Padang is known that one of the factors that causes low student learning outcomes is students' difficulties in understanding teaching materials. Whereas the selection of the right teaching materials can increase students' learning interest and support learning outcomes. At SMAN 7 Padang the teaching materials used by students are textbooks. This book is lent to students during the learning process and returned to the library after the learning hours are finished.

Based on the results of interviews with 20 students of class XI of SMAN 7 Padang on the same day it was known that 100% of them answered that they did not have other teaching materials as a support for learning. They only rely on books lent from the library and 15% of them answer photocopying the textbook for reading at home. SMAN 7 Padang has used the 2013 curriculum in its learning process. However, the textbook used is not in accordance with the 2013 curriculum requirements. For example in the KD 3.8 material about the respiratory system and KD 3.9 about the resistance system that has not yet linked the structure and function of organs to their processes and abnormalities. In the textbook is still separated between the discussion of structure and function at the beginning of the material with discussion of processes and abnormalities in the system at the end of the material. Discussion of abnormalities found in the book 90% only gives an understanding of a disorder that often occurs in the system. Explanation of this abnormality is not associated with structures that experience body problems and physiology which parts of the process are hampered.

Therefore, a teacher makes a handout to support the teaching materials provided in the school. However, the handouts given by the teacher are only photocopies. Based on the results of interviews with 20 students of class XI of SMAN 7 Padang, it was found that 85% of students stated that the images presented were less clear due to photocopies. In addition 85% of students also stated that the given handouts were less efficient because they were given per KD, so handouts were often scattered by students.

Teaching materials used in SMAN 7 Padang both textbooks and handouts have similarities which have not facilitated students in developing problem-solving skills. Problem solving (skills problem solving) can help students make the right, careful, systematic, logical decisions and consider various points of view [11]. The best way for students to learn science is to give them problems that challenge and inspire the mind [7]. One way to improve this ability is to use learning models problem solving. One way of applying learning models problem solving is to use teaching materials based on models problem solving.

3.2. Student analysis

Subjects used in this study were students of class XI of SMAN 7 Padang, based on biology learning modules Problem solving that will be developed are designed for high school students with ages between 16-18 years. Based on Piaget's (1980) learning theory, children aged 11-18 are in the formal operational stage. At this stage students are able to think abstractly, logically, draw conclusions, interpret and develop hypotheses [4]. The results of this analysis become the assumption that students of Class XI SMA who are included in the age range have been able to apply the steps in the model problem solving.

Application of the steps in the model is problem solving important for students because it can help students create and develop problem-solving abilities for each student [8]. The ability to solve problems is very influential for the lives of students in the future. Problem solving skills are basic skills that must be developed in each student [7]. When a student has been trained in solving problems in learning then he can also solve problems in his personal life because of the ability to see a problem from several points of view and trained to find the best solution to the problem. The application
of models problem solving also has a positive impact on students who have problems in communication disorders [9]. In addition, the use of models problem solving can also improve students’ critical thinking skills and emotional intelligence [12].

3.3. Curriculum analysis
Analysis This analysis is carried out with the aim of determining the order and scope of the material needed in accordance with the existing basic competencies, seeing the logical sequence of material, identifying the material, presenting problems in the material related to daily life in accordance with the indicators and learning objectives. In terms of cognitive, namely KD 3.8 and 3.9 regarding the respiratory system and resistance system, students are required to be able to link the structure and function of organs in each system with the processes and abnormalities that occur. While in terms of psychomotor namely KD 4.8 and KD 4.10 requires students to be able to present the results of the analysis of the abnormalities of each system and KD 4.9 students are required to be able to plan and carry out observations of the influence of air pollution and process information some negative risks of smoking in adolescents so that students can determine a decision on the attitude that must be taken in order to avoid air pollution and the danger of the claim. Appropriate curriculum analysis can help students fulfill the expected learning goals [2].

3.4. Concept analysis
Analysis This analysis is carried out with the aim of identifying, detailing, and systematically drafting concepts needed and used as guidelines in the development of modules. This analysis was conducted to identify the main concepts in the respiratory system material and excretory system. Researchers compile the main concepts that will be taught systematically and regulate the order of material and concepts of subject matter to be understood by students. The concept identified in the respiratory system material and excretory system is to link the structure and function of the organs of each system to the processes and abnormalities that occur in the system. After identifying the concepts in the respiratory system material and the excretory system, learning objectives were formulated which referred to indicators of learning that were in accordance with the 2013 Curriculum. The process of the concept formation is done by discussion method. The process of forming this concept will make students find the correct concept [1]. The method of discussion given to students must still be guided by the teacher. The teacher also has an obligation to justify the concept if there is a misconception during the discussion and emphasize the required part.

4. Conclusion
From the data analysis that had been done, the results of the preliminary research could be stated: first, the teaching materials used were still in the form of textbooks, and teacher handouts that have not been proven valid, practical and effective. Second, the teaching materials used have not helped students to improve problem-solving skills. Third, teaching materials used are not in accordance with the 2013 curriculum content standards. Fourth, students’ competence in developing problem solving skills in learning has not been trained and fifth, based biology teaching materials are problem solving not yet available.

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