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Analysis of Needs for the Development of Genetic Module Oriented Problem Solving Approach for STKIP PGRI Student Biology Education West Sumatera

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***Abstract* –This preliminary study aims to describe the process of genetic learning, the availability of teaching materials for learning and problems in genetic learning in biology education students STKIP PGRI West Sumatra. The type of this research is descriptive research. The object of research is lecturer of genetic subjects, students of biology education STKIP PGRI West Sumatra and syllabus and teaching materials of genetic subjects. Instruments to collect data in the form of interview guides, syllabus documents and teaching materials and student cognitive test sheets. Data of research result is analyzed by using descriptive statistical analysis. Based on the data analysis, it can be stated that: (1) the students have difficulties in understanding the teaching materials especially those who speak foreign languages, (2) the students are less active in the learning activities, (3) the students are not able to solve the problems related to mathematics, (4) in the form of problem solving oriented module (problem solving).**

Keywords – Module; Genetic; Problem Solving Approach.

I. INTRODUCTION

The learning process and the genetic learning outcomes up to now are still a problem in various educational institutes of teaching force (LPTK). Many students are weak in understanding the concepts of genetics, seen from the low student learning outcomes in the genetic lessons. This reinforces the notion that genetics is a difficult science. Genetics is a subject that has a high degree of difficulty in biology education students of University of Muhammadiyah Malang (UMM), this is because students have learning culture is memorizing (Mahmudati, 2015: 504). Many students are weak in mastering the concept of genetics because they only learn from the notes during lectures only, students are not able to solve the problems given lecturers because these subjects tend to discuss math problems (Megahati et al., 2015: 59). During the student's genetic learning process is inactive, few give opinions or ask questions. Students are difficult to solve the problems of crossing and weak in understanding and finding the concepts of genetics (Darmawati et al., 2011: 29), Student learning outcomes biology education STKIP PGRI West Sumatra can be seen in Figure 1.

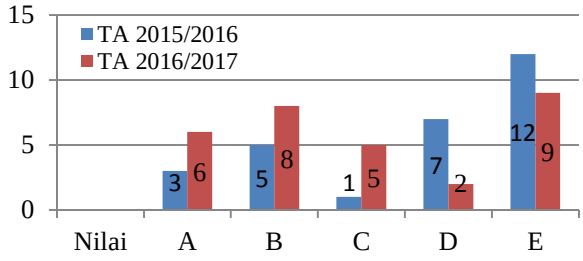

Figure 1. Distribution of Genetic Value of STKIP PGRI Students West Sumatra.

Based on Figure 1, it is known that the average learning outcomes of genetic subjects of biology education students STKIP PGRI West Sumatra are in grade C- to C +. It illustrates the need for efforts to improve the learning outcomes of genetic subjects in biology education students STKIP PGRI West Sumatra.

The causes of learning difficulties include the teaching materials that do not provide enough information related to

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the material that can understand the students. Efforts to overcome the limitations of conceptual understanding in genetic learning can be done by providing teaching materials that can stimulate interest and thinking ability and can be studied independently so that students are more focused in accordance with the learning objectives (Nusantari and Aryati, 2013: 1). Teaching material is a set of subject matter that is compiled based on curriculum (Lestari, 2013: 2). One type of instructional material is a module. Modules are teaching materials that are arranged systematically based on the topic of discussion and competence to be achieved in learning. Learning by using modules is self-learning that provides an opportunity for students to manage their study time and understand the lecture material independently (Ardiansyah et al., 2016: 751).The advantages gained from learning with the application of modules are as follows: 1) increase the motivation of learners because every time doing the lesson task is clearly defined according to ability; 2) after the evaluation, educators and learners know in the module that learners have succeeded and in which modules they have not succeeded; 3) learners achieve results according to their abilities (Santyasa in Ardiansyah et al., 2016: 751).

Indicator of the success of science learning process so that learners have problem solving skills (problem solving) to be able to address the problems it faces, both in the form of problems and problems that come from everyday life. The problem-solving approach is an approach that directs or trains students to be able to solve problems in the field of science or the field of study being studied (Lufri, 2007: 28). The advantages of a learning process using problem solving approach include: (1) educating learners to think systematically, (2) able to find various ways out of a difficulty encountered, (3) learning to analyze a problem from various aspects, (4) educate students confidently themselves (Raharjo, 2011: 173).

Pointing to the background of the problems described, it can be argued that preliminary research to develop a genetically oriented approach to problem-solving approach needs to be done. The purpose of this research is to describe the process of genetic learning, the availability of teaching materials and problems encountered in genetic learning in biology education students STKIP PGRI West Sumatra.

II. REVIEW OF LITERATURE

Learning is basically an effort to direct the students into the learning process so that they can achieve learning objectives in accordance with what is expected. The process of learning in college, the students should be treated in accordance with the characteristics of adults. Adults are usually self-directed, have diverse experiences, and are ready to learn as a result of their needs, enter a program with high motivation and readiness to study, they like well-structured programs whose elements are clearly detailed. Students are individuals who have the potential to learn independently, either from written sources, mass media or the environment. Lecturers are more facilitating and create a conducive learning climate so that the potential can develop optimally. Therefore, in the learning process or lectures expected lecturers try to create a lecture environment system that allows students to learn from their knowledge and experience. (Hutabarat, 2015: 23-24)

Teaching materials are a set of materials that are organized systematically, both written and unwritten so as to create an environment or atmosphere that allows students to learn (Hamdani, 2011: 218). A module is a systematically arranged piece of material with language that is easily understood by learners according to their level of knowledge and age, so that they can learn independently with minimal assistance or guidance from educators. Then, with the module learners can also measure their own level of mastery over the material covered (Prastowo, 2011: 106). The advantages of learning by using the module, as follows: 1) the module focuses on the ability to work alone and more responsible for its actions; 2) the module provides control over learning outcomes through the use of competency standards in each module that learners must achieve; 3) the module has relevance to the curriculum that can be shown with the purpose and the way of achievement so that learners can know the relation between the learning and the result to be obtained (Mulyasa, 2006).

Problems can be defined as a situation where there is a gap between the realities faced today and the expected reality. Problems arise when an individual is in a condition different from the desired conditions and there is no clarity about the achievement of what he wants (Patnani, 2013: 131). According to Ormrod (2003), the problem can be divided into two types, namely: 1) Well defined problems (well defined problems), ie problems that have clarity or certainty in the desired goal, the information needed in solving the problem and the correct answer for the problem. Types of problems such as these are issues related to mathematical calculations, which have clear objectives and means of completion. Individuals who get a chance to go to school are usually trained enough to solve this type of problem, 2) ill-defined problems, i.e. problems that have

ambiguity or uncertainty in the desired goals, information needed to solve problems and has various possible answers to the problem. This type of problem is much experienced in relation to the personal and social life of an individual.

Problem solving approach is an approach that directs or trains students to be able to solve problems in the field of science or field studies are studied (Lufri, 2007:28). The purpose of learning problem solving as stated by Hudoyo in Raharjo (2011: 174) as follows: (1) learners become skilled in selecting relevant information then analyzing it and finally re-examining the result, (2) intellectual satisfaction will arise from within as intrinsic gift for learners, (3) the intellectual potential of learners increases, (4) learners learn how to do the discovery through the process of making the discovery.

III. METHODOLOGY

The research is categorized into the type of descriptive research. Descriptive research is a research method that tries to describe and interpret the object as it is. In general, descriptive research conducted has two main objectives is to systematically describe the facts and characteristics of the object studied appropriately (Sukardi, 2004).

In this preliminary study there are three objects investigated namely the lecturer of genetics, syllabus, genetics teaching materials and students of biology education. Interviews with two genetic lecturers to obtain information on the implementation of genetic learning in biology education courses. Syllabus and teaching materials are used to obtain information about learning achievements, indicators and genetic learning materials. Search for 20 biology education students to gain insight into difficulties in genetic learning process.

IV. DATA ANALYSIS

The data collection techniques used in this preliminary study consisted of three parts, namely interview, documentation and cognitive test of students. Interviews were used to obtain data on the implementation of genetic learning by genetic lecturers. The instrument used is an interview guide sheet. Documentation is used to gain information on learning achievements, indicators and genetic learning materials. Documents used include syllabus, genetic book and genetic practicum guide. Cognitive tests on students are used to get a picture of students' understanding of genetic material. The instrument used is a test sheet.

The data collected through the appropriate instrument is analyzed using a specific analytical technique. Data analysis technique used in this research is descriptive statistical analysis. Descriptive statistics are statistics that serve to describe the object under study through the sample data as is. In this descriptive statistic without doing analysis and make conclusions that apply to the public. There are several data presentations in descriptive statistics that can be used such as tables, frequency distributions, graphs and group data descriptions (Sugiyono, 2014).

V. RESULTS AND DISCUSSION

A. Research Results

The first result of this preliminary study is the implementation of genetic learning. Interviews were conducted with two lecturers of genetics of biology education program. Interview components consist of (1) implementation of genetic learning, (2) availability of genetic material, (3) problems encountered in genetic learning. The analysis of the results of the interviews obtained information that: (1) all the genetic lecturers do the learning of genetics varies, using lecture method, group discussion, assignment and practicum in accordance with indicator and learning achievement, (2) the lecturer recommend the genetic material which become the reference in the form of book text, national and international journals and other relevant references, lecturers also provide handouts to students, (3) problems encountered in learning according to lecturer genetics, among others: the lack of ability of students in understanding the teaching materials, especially those who speak foreign, less active students in the process learning so that at the time of discussion tends to passive and seem to rely on friends who are considered smart group, lack of skills to solve problems related to mathematical calculations.

The second outcome of this preliminary study is the interrelation between learning achievements, indicators and learning materials. Based on the researcher's analysis of the syllabus, textbook and practical guide, it is necessary to describe the learning indicator according to the learning achievement and the student’s ability stage in the cognitive, affective and psychomotor aspects. Preliminary research results on students conducted with interviews and test cognitive ability. Results of interviews with students related to the use of learning resources can be seen in Figure 2.

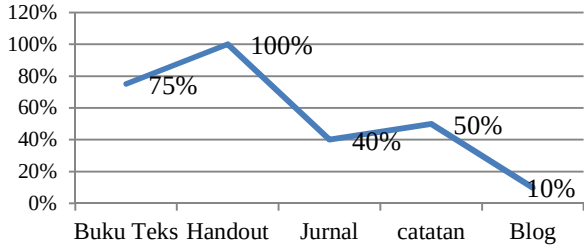

Figure 2. Use of learning resources in genetic learning

The results of the analysis of Fig. 2 can be disclosed that the use of learning resources is limited to textbooks, handouts, journals, notes and blogs with percentages of 75%, 100%, 40%, 15%, 50% and 10%, respectively. The percentage of handouts is more because it is obtained directly from the lecturer during the lecture.

Furthermore, the analysis of learning difficulties, 85% of students expressed difficulties to understand the material of genetic lectures for various reasons, namely, the delivery of material that is too fast, the material that uses a lot of calculations and mathematical formulas and materials that are abstract. Furthermore, the researchers conducted a deeper analysis found that the concept that is difficult to understand in genetic lectures, can be seen in Figure 3.

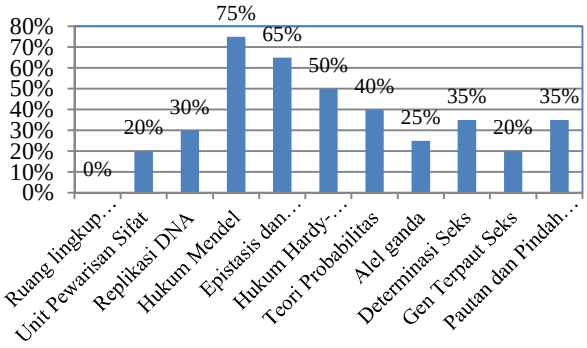

Figure 3. A difficult concept in genetic learning by students

Based on the results of data analysis in Figure 3 it can be stated that students are difficult to understand the material using mathematical calculations. This result is supported by the result of student ability test by using the instrument in the form of ability test sheet on legal matter Mendel. The distribution of the student's ability test results can be seen in Figure 4.

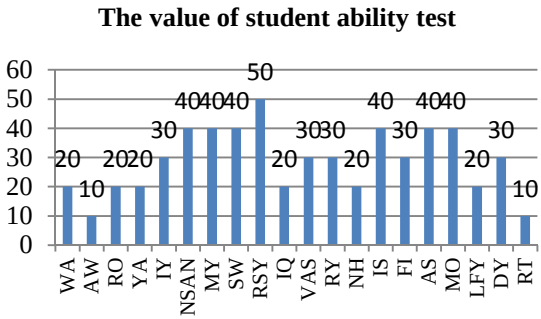

Figure 4. Results of student ability tests

Based on the results of analysis in Figure 4 it can be disclosed that the student ability test results are in the range of values of 20-50 or grade E and D with very low category.

B. Discussion

The results of this study can be used as a basis in the development of genetic module-oriented problem solving approach. Based on the results of interviews on lecturers can be identified that students have problems in understanding the available teaching materials, especially translation and foreign language, less active in learning and unable to solve mathematical problems. The problem of difficulty in learning is estimated related to the strategy applied include the objectives, processes and elements that affect the lecturing process. These elements include lecturer factor which plays an important role as learning manager, student factor as subject in learning interaction, facility factor and infrastructure that support directly to fluency of learning process and environmental factor in learning process (Sanjaya, 2010: 56). Another factor related to the difficulty in the learning process is the assumption from the students that the material of the genetic lecture is too theoretical, abstract, lacking the contextual example, the method of delivery is monotonous, less optimal use of media, interest, initial ability, and student needs are not accommodated. As a result, students' mastery and understanding of genetic concepts is relatively weak and very unlikely that all the material contained in the curriculum can be taught to students (Dikti, 2007).

Furthermore, the cause of learning difficulties is learning planning in the form of teaching materials that are not enough to provide information related materials that can understand students. Efforts to overcome the limitations of students understand the concept of genetic learning can be done by providing teaching materials that can stimulate students' interest and thinking ability and can be studied

independently so that students are more focused in accordance with the learning objectives (Nusantari and Aryati, 2013: 1). The elusive concept of genetics can be overcome by modules. Modules have many advantages over other forms and written materials, including systematically arranged modules and the ability to accommodate students 'or students' differing pace in dealing with the material (Nasution, 2010: 205). The learning system using the module will make learning more effective, efficient and relevant (Wena, 2009). Research conducted by Riyanto, (2014: 33) concluded that the use of interactive modules on genetic learning, improve learning outcomes and understanding of student concepts. The results of Wenno's research (2010: 186) concluded that the learning-based science module problem solving method is superior in improving students' science learning outcomes.

Alternative problem solving student activity that tends to passive in learning can be done with problem solving approach. The existence of the given problem will invite learners more active in learning, understanding the contents of learning, challenging the ability to think learners to overcome the problems it faces, find the right solution to the problems given. Application of problem solving approach can create a dynamic learning interaction of learners and cooperation among learners in groups and between groups better (Adnyana, 2009). The problem solving approach in learning can improve students' high cognitive abilities in the form of analytical, synthesis and evaluation skills and can increase student activity in learning (Pardjono and Wardaya, 2009: 268). Problem solving in learning will make the subject matter more applicable in the life of students or students outside the life of the class or situations that are not familiar, giving opportunities and can encourage students or students to discuss with students or other students when finding answers to problems and encourage and cultivate curiosity self-students or students to find answers to problems encountered (Nainggolan, 2009: 13). The problem-solving approach has a better effect than conventional learning for the students' cognitive thinking ability Khoirifah et al. (2013: 5).

The student's limitations in problem solving, especially mathematical problems, can be done by providing various examples as well as solving the relevant and contextual problems, the mathematical problem solving skills will be obtained by the students by doing many exercises with different forms and different level of problems, high-order thinking in students. Problem solving approach is more effective in terms of achievement of basic competence, mathematical method and mathematical attitude of high school students (Nasrullah and Marsigit, 2016: 134). The results of Warimun's research (2012: 112-113) through the application of problem solving learning on optical materials showed improvement in the mastery of physics concepts and learning outcomes in physics education students.

VI. CONCLUSION

From the analysis of data that has been done can be expressed the results of this preliminary research. (2) Students are less active in learning activities, (3) students are not able to solve problems related to mathematical calculations, (4) need to be developed teaching materials in the form of problem-oriented module.

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