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A Development of Biodiversity Module Based on Socioscientific Issues and Local Potential for Department Students of IKIP PGRI Pontianak

Eka Trisianawati [1*], Ivan Eldes Dafrita [2*], Handi Darmawan [3*]
[1] Biology Education Department, IKIP PGRI Pontianak
Email : [1.] trisianawatieka@gmail.com ,
[2.] ivaneldesdafrita@ikippgriptk.ac.id ,
[3.] handidarmawan@ikippgriptk.ac.id

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***Corresponding Author**
Eka Trisianawati
Biology Education Department,
IKIP PGRI Pontianak,
Indonesia
Email:
trisianawatieka@gmail.com

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Abstract

This study aims to investigate: (1) The feasibility of biodiversity module based on Socioscientific issues and local potential according to the expert of material and the expert of media; (2) The students learning outcomes or achievements after using the biodiversity module based on Socioscientific issues and local potential. The method used in this study is a research and development (R & D) method with Hannafin and Peck's model. The subject of this study is the third-semester students of Mathematics Education Department of IKIP PGRI Pontianak who take the General Biology lesson in the academic year 2018/2019 that consist of one class. The technique of collecting data used in this study is an indirect communication technique with the data collection instrument in the form of a validation questionnaire and a test to gain the data of students learning achievement. The result of this study are: (1) The biodiversity module based on Socioscientific issues and local potential that is developed and feasible to be used with the indexed percentage of 75.91%; (2) Students learning achievement after using the biodiversity module based on Socioscientific issues and local potential that is developed is increasing with the normalized gain value of 0.6 that belongs to the medium category.

1. INTRODUCTION

As we all know, science is growing rapidly in line with the development of technology as a form of science application. The development of science and technology is adapted to the complexity of human needs globally (Santoso in Mumpuni, 2015). Besides, the development of science and technology is not only contributing positive values to society, but also resulting various negative activities such as excessive exploration of natural resource, free use of forest, the hunt of protected animals, and many others. Therefore, students need knowledge and good attitude in following the development of science and technology. Moreover, they need to care much of the sustainability of the environment.

As scientists, we are accustomed to operating in a professional culture of evidence. Evidence is employed in the public discourse of science to support new ideas within a field and refute old ones. We can refer to this form of evidence— thorough, detailed, extensively reproduced and analyzed—as a summative form of scientific evidence (Tanner, K., & Allen, D. (2004).

The complexity of science application and the development of technology needs to be balanced with the conservation of local potential in Indonesia and character building. It is reflected in Indonesian Law No. 20 in 2003 about National Education System article 37 paragraph (1), which: the study of sciences (including biology) is the surrounding environment that is explored through the development of knowledge and understanding. Therefore, the problem which is studied in biology can be focused more on the biological environment. Moreover, learning biology is emphasized on the understanding of the concept and the process skill that is done at once. Thus, the understanding of the concept is obtained from the process skill.

Biology learning competence includes the importance of process skill. It is reflected in Minister of National Education Regulation No. 22 in 2006 related to the competence of biology, which provides a variety of learning experiences to understand the

concept and science process, where not only cognitive aspect but also affective and psychomotor aspects are necessary in responding to the times. Besides, the same idea is stated by Rustaman et. al. (2005), who say that the constitution of biology is an aspect of the science process (hands-on), the science product (minds-on), and the science attitude (hearts-on). However, the fact shows that learning biology does not focus on hands-on and hearts-on and only leads to the achievement of minds-on. Though, the process and the product become the characters of learning science to be collaborated in constructing knowledge through direct experience. Many students are still not able to link the concept they get in learning at school with real event that occurs around them.

One of the solutions to overcome this problem is to place direct experience in learning biology based on Socioscientific issues (SSI), local potential, and character. Learning with Socioscientific issues plays an important role in finding the contextuality of learning science. SSI is a strategy that aims to stimulate the development of intellectual, moral, attitude, and awareness about the relation between science and social life. Moreover, by focusing on SSI, students are encouraged to try to link the science concept that they get in a class with the social cases around them. It encourages students to easily understand the material because it is directly related to daily life (Susilo, 2001), which finally is potential to achieve biology learning goals.

Besides SSI, in having a learning application based on real experience, especially on the material about biodiversity, the local potential can be used. Based on the result of a research related to the implementation of biology learning in the curriculum namely Kurikulum Tingkat Satuan Pendidikan (KTSP) or 2006 Curriculum (Suratsih, 2010) shows that: a) the local potential of the school is not optimally utilized yet in biology learning activities, while the utilization of school potential is one of the Characteristics of 2006 Curriculum or Kurikulum Tingkat Satuan Pendidikan (KTSP); b) the organization of biology learning does not reflect the characteristics of the education unit in each school yet; c) the biology learning process still uses the references which are developed in the forum of MGMP; d) the biology teachers have not worked much to develop the learning modules or biology worksheets based on local potential or students' characteristics; e) some teachers still use a lot of learning resources and worksheets which are available widely in the markets that actually do not match with the condition/ potential of the school or with the students' characteristics. Thus, some adjustments need to be done; f) almost all schools do not provide/have biology learning modules based on social issues and local potential. The available modules generally contain general material which has been widely developed in some textbooks.

According to Mumpuni (2013), a form of integrating learning material that is by following with environmental issues can provide convenience for students in solving some problems in their environment. Moreover, the accuracy in the analysis of local potential studies can equip life skills for students by following with their regional characteristics and daily life experiences. Somehow, it is very important to note the needs and interests of students toward the development of students' competencies.

According to Peniati, E. (2012) Modules are components that have an important role in the learning process. The availability of modules can help students obtain information about learning material. Aulia, F et al. (2014) the module provides opportunities for students to learn according to the way each uses differenttechniques to solve certain problem problems, based on the background of their respective knowledge and habits. According to Nurhidayah, 2015 It takes a learning materials which can make students study independently in addition to learning in the classroom. Independent learning can be achieved by using a module. It is evident from the research of Novianty, I et al (2013) that the effectiveness of the use of modules can improve learning outcomes, seen from the average value of the experimental class (78.57) and control class (71.38). The average value of learning outcomes shows the level of student mastery of the learning material provided.

According to Howard and Miskowski, (2005). We sought to overhaul the laboratory, keeping in mind that any course renovation had to work within the confines of obstacles such as large class size, modest budget, and the unavailability of the laboratory space outside of scheduled class time. In revising the course, our goals were as follows: 1) Increase student interest in this required course. 2) Intellectually engage students in the lab. 3) Expose students to current and relevant techniques. 4) Require students to analyze data in depth and draw accurate conclusions. 5) Help students see the ''big picture'' and make connections between concepts. 6) Enhance students' ability to effectively communicate their findings. 7) Provide an experience more like that in a research lab. 8) Relate to lecture, but go beyond verification of lecture material.

Based on the explanation above, the researchers are interested to develop a biodiversity module based on Socioscientific issues and local potential for the department students of IKIP PGRI Pontianak.

2. RESULTS AND DISCUSSION

The method used in this research is a Research and Development (R & D) Method. Sugiyono (2014: 407) argues that Research and Development method is a research method used to produce a certain product and to test the effectiveness of the product.

According to Sugiyono (2016: 32), Research and Development is divided into four levels. There are:

1) Research and Development at level 1 (the lowest level). It deals with the researcher that conducts research to produce a design but do not proceed with making product and testing them.
2) Research and Development at level 2. It deals with the researcher that does not conduct research but directly tests the existing product.
3) Research and Development at level 3. It deals with the researcher that conducts research to develop the existing product, make a product, and test the effectiveness of that product.
4) Research and Development at level 4. It deals with the researcher that conducts research to create and result in a new product and test the effectiveness of that product.

Based on the explanation above, the researchers decide to take the second level or Level 2 where does not conduct research, but directly tests the existing product. Research and Development (R&D) level 2 is research that does not make a product design through research, but only validates or tests the effectiveness and efficiency of the existing product.

The subject of this study is the third-semester students of Mathematics education department in the academic year 2018/2019. The technique of collecting data used in this study is an indirect communication technique and test. Besides, the data collection tools used are as follows:

1) Validation questionnaire by the expert is used to collect the validation data by the expert related to the module design that is developed. The validation questionnaire consists of a validated questionnaire for the expert of material and the expert of media based on the Likert scale.
2) The test result is used to collect the students learning outcomes data before and after using the module. The test is made in the form of essays.

The data obtained in this study is processed and analyzed by following with the problems and objectives that have been formulated. Firstly, the technique of percentage eligibility is used to answer the first problem about how is the feasibility of the media based on the assessment from the expert of media and the expert of material. The data is analyzed descriptively by using the percentage eligibility technique. The score obtained is converted to be valued by using the equation below.

"K" is the percentage of eligibility, "F" is the total number of the answer from respondents, "N" is the highest score in the questionnaire, "I" is the number of questions in the questionnaire, and "R" is the number of respondents. After knowing the calculation of the result of feasibility percentage, it can be concluded that the biodiversity material module is feasible or not to be used can be known by interpreting it based on the Table 1 below.

Table 1. The Criteria of Validator Ratings Interpretation

Percentage	Criteria
0 %- 20%	Very ineligible
21%-40%	Inadequate
41%-60%	Enough
61%-80%	Feasible
81%-100%	Very feasible

To find out the improvement of the students learning outcomes after using the module, the formula used in analyzing data is the N-gain formula (Hake, 1999).

To find out the teacher's response toward the inquiry-based science practicum module, an analysis of the response questionnaire will be conducted. After that, the percentage that is obtained from the response questionnaire is interpreted into the N-gain criteria Hake (1999). It is presented in the Table 2 below.

Table 2. N-gain Criteria

Percentage	Criteria
N-gain > 0,7	High
0,3 N-gain 0,7	Medium
N-gain<0,3	Low

The biodiversity module based on Socioscientific issues and local potential is created by presenting local problems in the form of discourse. The problems presented are in the form of some problems related to everyday life. It aims to have students to think about Socioscientific issues that occur around them and further, they are able to find the solution to overcome those issues. The validation process is carried out by 3 validators in order to determine the validity of the module that is developed. The result of the validation is used to revise or improve the module that is developed before being trialled or tested. At this stage, the researchers give validation sheets to the three validators to assess the instruments and the module that is made and to refine the instruments and the module based on the inputs and advice from the validators. After having revision and improvement, the researchers do a consultation with the validators about the instruments and the module revision in order to determine the accuracy of the result of the revision. Besides, the result of validation by the three validators can be seen in the Table 3 below.

Table 3. The result of validation

Instrument	Validators (%)		Average (%)		Criteria
	I	II	III		
The Expert of Material	-	63,89	76.85	70,37	Feasible
The Expert of Media	81,45		-	81,45	Very Feasible
pretest	96	- 92	92	93,33	Very Feasible
posttest	80	94	94	89,33	Very Feasible

Table 3 above shows that the average percentage of the result of the validation of the expert of material on the developed product is 70.37% with "Feasible" criteria. The average percentage of the result of the validation of the expert of media on the developed product is 81.45% with "Very Feasible" criteria. The average percentage of the result of pretest validation is 93.33% with "Very Feasible" criteria. Last, the average percentage of the result of posttest validation is 89.33% with "Very Feasible" criteria.

After the module has been validated and revised, the next step is conducting a limited trial to the sample group. There are 26 students of Mathematics education department class A afternoon as the sample. This trial aims to investigate the improvement in students learning outcomes after using the module that is developed. This limited trial is conducted in two - week lecturing. The improvement of students learning outcomes is known by calculating the value of normalized gain from the pretest and posttest score. Moreover, the value of normalized gain calculation result shows an improvement of 0.6 which belongs to the medium category.

The development of biodiversity module based on Socioscientific issues and local potential for department students of IKIP PGRI Pontianak uses Hannafin and Peck development model (Tegeh et al., 2014). It consists of need assessment, design, development and implementation, and evaluation and revision. The need assessment phase aims to define the needs in the field (factual needs) so that the researchers know what problems are being faced and so the solution. The design phase aims to make the initial design of the product that will be developed by following the needs in the field. The development and implementation phase aims to develop the revised product based on the inputs and advice from the expert and limited trials. The evaluation and revision phase is done after obtaining the result of the limited trial to evaluate the deficiencies that are found and to do a revision in order to produce a product that is ready to be used in the actual learning process.

This study aims to determine the validity of the module that is developed. Besides, an analysis of students learning outcomes on the biodiversity material is also carried out in order to investigate whether the use of the module that is developed has an impact on improving students learning outcomes or not.

The validity of the module is known through the validation stage by the expert of material and the expert of media by using the Likert scale and the score range by 60% -80% (feasible criteria) and 81% -100% (very feasible criteria) indicating the very good criteria. The module, dealing with the material aspect is classified as feasible with an indexed percentage of 70.37%, while the media aspect is classified as very feasible with an indexed percentage of 81.45%. Thus, the average validity percentage is 75.6%. It can be concluded that the module is feasible or feasible to be used as a learning media.

The result of the validation by three validators is in the form of comments and suggestions that are used by the researchers to revise and improve the developed module as well as the instrument that is used in this study. The revision is an improvement of the product that is developed and an assessment instrument based on inputs, suggestions, advice, and comments from the validators. This is intended so that the module and the instrument can be used for research purposes and can be used as the learning media in the learning process in the classroom. In this study, the validators validate the modules and the instrument which include pretest and posttest questions.

The use of the developed module is expected to give an impact on students learning outcomes. In order to find out an improvement of the learning outcomes, pretest and posttest were conducted for the students. The test was given to 26 students of Mathematics education department class A afternoon of IKIP PGRI Pontianak. The result shows that the pretest average score is 40.69 which belongs to the failure category. After using the module, an improvement can be known from the posttest score. It is 76.11 which belongs to the good category. Moreover, after gaining the pretest and posttest scores, the analysis of normalized gain is done in order to determine the improvement of students learning outcomes. After having the analysis, it is found that the normalized gain value of 0.6 belongs to the medium category.

The result of this study is in line with what is stated and concluded by Lasmiyati and Harta in their research which is developing a learning module in order to improve the understanding of the concepts and interests of junior high school students (Lasmiyati and Harta, 2014). It shows that the use of module can improve the ability of concept understanding which can have a positive impact on the learning outcomes.

The use of biodiversity module based on Socioscientific issues and local potential aims to stimulate students' foresight in analyzing the concepts of diversity which they learn and relate to the real events that occur around them. According to Anagün and Özden (2010), Socioscientific issues are a conceptual representation of some issues or problems in life which are closely related to science and having a relative or uncertain solution or answer. Somehow, this kind of answer encourages students to be able to analyze the situation and find the most appropriate or best solution. The level of analysis of biodiversity can be classified in a nested way from genes via populations to species and ultimately to ecosystems. Indicators of environmental impacts are on the genetic (e.g. hybridisation due to cross-breeding with invasive species), populations or species (e. g. decline of species numbers or abundance), and ecosystem level (e.g. change in species composition and community structure and functioning)

The students' views toward some issues in their environment are expected to make them easier to remember and understand the concepts of biodiversity. Moreover, the discourses and questions contained in the developed module can make students being encouraged to look at their environment through the framework of material they learn and not just something that they experience. This is by following with one of the natures of science that is as a dimension of a way of thinking which is a fundamental substance in the development of scientific process and the formation of students' mindsets.

3. CONCLUSIONS AND RECOMMENDATIONS

From the result of the analysis of research data and the discussion, it can be concluded that:

1. The biodiversity module based on Socioscientific issues and local potential that is developed is feasible or suitable to be used with an indexed percentage of 75.91%.
2. The students learning outcomes after using the biodiversity module based on Socioscientific issues and local potential that is developed is increasing with a normalized gain value of 0.6 which belongs to the medium category.

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