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ANALYSIS OF SCIENTIFIC LITERACY APPLICATION OF BIOLOGY STUDENT IN MINI RESEARCH ACTIVITY

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ABSTRACT
This study aims to analyze the application of scientific literacy of Biology students in the mini research activities using descriptive research method. The study was conducted at Biology students of 4th semester taking Plant Physiology courses at UPI. Analysis of the application of scientific literacy in mini research activities used a rubric including the dimensions of scientific literacy. The results show that the application of scientific literacy in mini research planning is classified into poor category with the percentage of 56.25%. The application of scientific literacy in the implementation of mini research is classified into very good category with the percentage of 93.93%. The application of scientific literacy in mini research reporting is classified into good categories with the percentage of 76.79%. Based on the research result, we can conclude that Biology college students are able to apply scientific literacy in mini research activities well.

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1. INTRODUCTION
All citizens need scientific literacy, including students in college. As set forth in Law No. 22 of 1961 subsection 2 of the objectives of the establishment of these colleges is to prepare qualified personnel to assume the office that require higher education and an accomplished stand-alone in maintaining and advancing science. In addition, other universities purpose is to conduct research and business advances in the field of science, culture and social life. This objective is in line with the needs in the era of globalization that requires human resource of independent, creative and innovative ways to advance the state in all areas so as not to fall behind the developed countries and other developing. Human resources as students must master broad science literacy and be able to think scientifically and apply them in daily life both in the context of personal, social, and global.

Referring to the syllabus in the Singapore Curriculum Framework for Science (Science Curriculum Framework) which is derived from the Policy Framework for Learning and Teaching Science Activity (The Policy Framework for Teaching and Learning of Science), the framework encourages the advancement of science education in Singapore to prepare students became quite proficient as an effective community, so it can be useful and instrumental in the development of ever-increasing technological world (Curriculum Planning & Development Division, 2008). This syllabus shows that their approach to learning is inquiry approach, as with science lessons that are supposed to use the inquiry approach. In line with the National Education Standards (2006) which formulates that the Natural Sciences (IPA), deals with a way of knowing (inquiry) about the systematic nature, so that science is not just a mastery of knowledge in the form of a collection of facts, concepts or principles course, but also a process of discovery.

Biology as one of the courses at University of Education Indonesia (UPI) has been using the inquiry approach in lectures, especially in Plant Physiology. It is seen from Plant Physiology course syllabus that one form of task is to make a mini research students in groups. Mini research is a form of free inquiry laboratory, where students free to choose the desired theme of mini research and according to the course undertaken. On free inquiry laboratory, lecturer acts as facilitator, and the students themselves who determine the problem and solve the problem. As part of the inquiry, mini stage
research to follow the stages of inquiry which starts from the formulation of the problem to draw conclusions.

Inquiry-based learning as a mini research assignment is perfect for student science literacy skills training. Comprising scientific literacy competencies and attitudes towards science are unconsciously applied in conducting student research mini. Formulation of the problem in this research is how the ability of students to apply scientific literacy Biology based mini research activities? The purpose of this study was to analyze the ability of Biology students in applying scientific literacy in mini research activities.

2. METHOD

The method used in this research is descriptive method, which held no manipulation or alteration of independent variables, but it describes a real condition (Sukmadinata, 2012). The population in this study was student of Biology UPL. The sample in this study is Biology student of 4th semester, who contracted Plant Physiology courses in the academic year 2012-2013. The sample in this study amounted to 12 people who were taken by using purposive sampling, where the sample is allowing students to observe a mini research activities from planning, implementation to reporting. Collection techniques observation data using the application of scientific literacy rubrics in the mini-research activities consisting of planning, implementation, and reporting the results of a mini research. In this study, the students drafted a mini research and then implement it and make a mini research report activities that have been carried out. Researchers only collect the data collected from the design, implementation and mini research reports. Once the researchers will describe the data collected into an information (Sugiyono, 2010).

3. RESULT AND ANALYSIS

Mini research as one of Biology college student task, can be a means of providing space to conduct experiments and one of the learning activities that can develop scientific literacy of students. As a form of free inquiry laboratory, mini research provides an opportunity for students to fully and independently do the inquiry, starting from designing, implementing, and reporting the results of mini research. The mini research was conducted in groups and each group consists of 4 people. In this study there were three groups observed. The following are titles of each mini research group:

<table>
<thead>
<tr>
<th>Group</th>
<th>Title of Mini Research</th>
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<tbody>
<tr>
<td>1</td>
<td>Effect of different concentrations of inoculum Azotobacter growth and chlorophyll content of mustard greens (Brassica rapa)</td>
</tr>
<tr>
<td>2</td>
<td>Analysis comparative of chlorophyll leaves of toothless gum (Artocarpus altilis)</td>
</tr>
<tr>
<td>3</td>
<td>Effect of altitude on the content chlorophyll in the leaves Carica papaya</td>
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The research data is in form of scientific literacy application percentage in the planning, implementation and reporting of mini research results. The application of scientific literacy consists of three aspects of science competencies (identifying scientific problems, explaining phenomena scientifically, and using scientific evidences), and attitudes toward science (interest in science and responsibility on the environmental and natural resources). The results of scientific literacy application of all groups at every stage of the mini research can be seen in Figure 1.
Mini research planning stage of all groups achieves poor category, implementing stage of mini research achieves very good category, and reporting stage of mini research achieves good category. The low percentage in the planning stage of mini research due to less rigorous students in designing the mini research. The designs made do not meet points of research proposals, such as not to include the formulation of problems, research objectives, action steps, make repetitions, and how to analyze the data. Allen (1973) defines planning by determining a set of actions to achieve the desired results (Abbas, 2009). It is supported by Anggraeni (2012), whose research stated that there were 38% of college students had difficulties in planning experiments. Planning in any activities, in this case is the mini research, is very important because by planning we can determine objectives, procedures, ways, or effective implementation guidelines in achieving the mini research objectives. Nevertheless, although not included in the design/proposal of the mini research, these things can be seen in the implementation and reporting of the mini research. For application of scientific literacy in the dimensions of science competency and attitudes towards science, all of these are applied by Biology students with achievement percentages as shown in Figure 2.

Figure 2 shows dimensions of scientific literacy that have been applied by college students of Biology in their mini research activities. The application of scientific literacy in science competency dimensions, the aspect of scientific problem identification obtains the lowest percentage compared to other aspects, that is 45.83%. According to categories by Purwanto (2009), this percentage belongs to
very poor category. The very good aspect implemented is using scientific evidences with the percentage reaching 91.67% and the aspect of explaining phenomena scientifically with the percentage of 87.5%. In general, these results indicate that Biology college students are good in implementing scientific literacy in their mini research activities. It cannot be separated from the attitudes of students towards science, because the scientific literacy of students is influenced by factors of attitudes toward science (Kusuma, 2012), as well as its application. Attitudes toward science in this research consist of interests in science and responsibility towards environmental and natural resources. Interests of students in science are classified into good categories with the percentage of 83.33%, and the students also have a great responsibility towards the environmental and natural resources when conducting the mini research.

3.1 Application of Scientific Literacy in Mini Research Planning

The application of scientific literacy dimension in mini research planning on this study involves science competency dimension, scientific problem identification aspect, and explaining phenomena scientifically. The aspect of scientific problem identification achieves lower percentages than the aspect of explaining phenomena scientifically, that is 40.48% with very poor category. While the aspect explaining phenomena scientifically reaches 83.33% with good category. Percentage comparison of these two aspects can be seen in Figure 3.

The aspect of scientific problem identification in this study includes the formulation of problems possibly to be investigated scientifically, formulating research objectives, defining variables, preparing work steps, making repetition, determining how to collect the data and analyzing the data. As explained earlier that the low achievement of percentage in this aspect is due to less conscientious students in designing the mini research. There are some important points in the design of mini research not included in the design. Figure 4 shows the percentage of group in applying the aspect of scientific problem identification in mini research design.

![Figure 3. Percentage of Scientific Literacy Application in Mini Research Planning](image-url)
Figure 4 shows that the whole groups have already determined research variables, whether independent, dependent, or control variable. However, all groups do not formulate research objectives in the design of mini research. 66.67% or as many as two groups have made a formulation of problems that can be investigated scientifically. While the other one group does not include the formulation of problems. The rest is only 1 group alone or as many as 33.33% preparing work steps, making repetition, determining how collect data, and how to analyze the data. Figure 4 also shows that the whole groups have already made titles describing information on scientific phenomena and formulated hypotheses. However, there is only one group which makes hypotheses stated precisely, specifically, and identifying variables. For instance, "H1: altitude can affect the concentration of chlorophyll of papaya; H0: altitude does not affect the concentration of papaya leaf chlorophyll". Hypothesis not formulated well is such as "chlorophyll contains in older leaves".

3.2 Application of Scientific Literacy in the Implementation of Mini Research

The application of scientific literacy dimension in the implementation of mini research in this study includes science competency dimension, aspect of explaining phenomena scientifically and attitudes toward science, which are interests in science and responsibilities towards environmental and natural resources. Both of these aspects are very well applied in the implementation of mini research. It can be seen in Figure 5 showing the percentage of all aspects are classified into very good category. The aspect of explaining phenomena scientifically reaches 93.33%, interests in science reach 88.89%, and responsibilities for environment and natural resources reach 100%.

The aspects of explaining phenomena scientifically in the implementation of mini research in this study include using tools and materials neatly and not scattered, using materials as needed, operating tools in accordance with procedures, using tools and materials adjusted to specific situations, and using technology in recording the data. Interests in science include focusing attention on research, being actively involved in research activities, and observing the results carefully. Responsibilities toward environmental and natural resources consist of cleaning tools that have been used, protecting the environment from hazardous materials, and keeping the environmental hygiene from the rest of materials used.
In general, the whole groups have been applying all, but a few things need to notice, there are groups still poor in the application. For example, when using tools and materials, there are still groups doing it less neatly and a bit scattered, as shown in Figure 6. In addition, there are several groups also less focused at the time of mini research. These groups are talking about things outside the research, for example about on other lecturing. Finally, less actively involved, because there are personnel in this group not directly involved in this mini research. It is because the group shares the task in finishing the group task. These absent personnel are doing other tasks of which the process is in conjunction with the implementation of this mini research. These students state that at that time they are busy and is preoccupied with many tasks, so that the work of this mini research seems in haste or being chased by time.

3.3 Application of Scientific Literacy in Mini Research Reporting

The application of scientific literacy dimension in mini research reporting on this study includes science competency dimensions, aspect of scientific problem identification, explaining phenomena scientifically, and using scientific evidences, as well as attitudes toward science, they are interests in science. Figure 7 shows a comparison of scientific literacy application percentage in the mini research reporting.
Based on Figure 7, the lowest application in this reporting stage is the aspect of explaining phenomena scientifically with the percentage of 66.67% and classified into fair category. The highest application is in aspect of using scientific evidences with the percentage of 91.67% and classified into very good category. While the aspect of scientific problem identification reaches 83.33% with good category. Interest in science is classified into good category, with the percentage of 75%.

The aspect of scientific problem identification at this stage is such as the theoretical basis of containing keywords of scientific information. The point is that the theoretical basis contains information concerning the variables studied. There are two groups or 66.67% that have compiled the theoretical basis well, while for one group the theoretical basis does not meet the criteria, that is not providing information on *Brassica rapa*. In the aspect of explaining phenomena scientifically, 66.67% of groups have made research backgrounds describing scientific phenomena, and 33.33% of groups do not make the background. This illustrates that a group of students in this study still has not implemented the method of writing scientific papers properly.

The aspect of the using scientific evidences, including the observations results of answering scientific problems, presenting the data in systematically and communicatively, making conclusions appropriate to the observation results, and communicating the results by providing explanations behind the research results. On this aspect, there is one group not presenting the data in form of chart, but only in the form of tables which are less communicative. Other than those points, all groups have applied this aspects well. Students interests in science are also seen in the preparation of reports. The use of several sources in the preparation of theoretical basis supporting the research results shows that the students have high interests in finding out more of what are being investigated. However, the use of a number of sources to support research results is only done by one group, other groups use only one source, while the other groups do not use any sources other than the research results obtained.

4. CONCLUSION

Based on the research results and discussion, it can be concluded that the application of scientific literacy in the implementation stage of the mini research is the best application with the percentage of 93.93%. While the poor application is at the time of planning the mini research with the percentage of 56.25%. The application of scientific literacy when reporting mini research is classified into good category, with the percentage of 76.79%. The application of science competence dimension in the aspect of scientific problems identification is the aspect whose application is very poor with the percentage of 45.83%. However, in general the science competency in mini research activities have been applied well by Biology college students. It cannot be separated from very good attitudes toward science that have been demonstrated by the students during the mini research activities.
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