

# The Dynamics of Scientific Literacy Skills of Biology Students in Histology Lectures Using Scientific Literacy-Based Worksheet

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**Abstract**—Scientific literacy skills are essential for students, as it related to how students can understand their environment and their various life problems. The purpose of this research was to study the dynamics of scientific literacy skills of biology students in histology lectures. This research used a descriptive method with a quantitative approach based on the test results. Scientific literacy instrument which used was essay questionnaire that refers to scientific literacy indicators according to Gormally (2012), which was limited only for inquiry and article review skills. Results showed that students' scientific literacy skill on inquiry aspect before being trained using test instrument were obtained results with the skills of formulating problems of 50%; make a research design of 50%; analyze data of 37.5%; answer questions of 37.5%; make conclusions of 40%. On the article, review aspect gained a score of 30%. While students' scientific literacy skills after practising using Student Worksheets were obtained the results with the skills of formulate problems of 90%; make research designs of 100%, analyze data of 80%, answer questions of 70%, make conclusions of 90%. On the aspect, article review gained a score of 80%. From those results, it can conclude that students' scientific literacy skills have increased and achieved classical completeness in all aspects.

**Keywords**— *scientific literacy, biology student, histology lectures*

## I. INTRODUCTION

Biology is the study of nature and its environment. Studying biological material requires the ability to assess and observe natural phenomena. Biology is scientific learning (IPA) based on discovery, which involves students in using science as a tool to answer real-world phenomena. Learning through discovery and literacy overlap in using reading, writing and oral language skills to answer questions about the content of science, and build capacity to engage in scientific reasoning [1].

Scientific literacy is defined as the ability to use scientific knowledge, identify questions, draw conclusions based on evidence, in an effort to understand and make decisions regarding nature and it all changes due to human activities. Someone who has the ability of scientific and technological literacy is a person who is able to solve problems using scientific concepts which obtained through learning [2]. Scientific literacy according to PISA (2010) is the ability to use scientific knowledge, identify questions and draw

evidence to be able to understand and make conclusions about nature and it all changes due to human actions [3].

Scientific literacy term has long been discussed in the world of education. This is a fact that science and scientific process are undeniable and important roles for the life of individuals and society. Various scientific literacy studies have been carried out, involve research which is related to the content of scientific concept disclosure [4], other studies examining different teaching approaches on reflecting scientific issues [5], and other studies related to the study of scientific literacy skills [6].

There are four dimensions of scientific literacy [7, 8], such as a) The context of science, b) the content of science, c) scientific competence, and d) scientific attitudes. In the scientific literacy assessment, PISA determines three sub-categories of scientific competence [4], such as a) Identify scientific problems, b) explains phenomena scientifically, and c) uses scientific evidence.

Measuring students' scientific literacy skills is important to know students' understanding of scientific knowledge, understanding various aspects of the scientific process, and the ability to apply knowledge and scientific processes. This study was aimed to examine the ability of scientific literacy of students' in histology lectures.

## II. METHOD

This research used a quantitative descriptive study. Sample of this research were all students who took part in Histology lecture. Scientific literacy then measured using assessment instruments [9] which includes the skills of scientific inquiry and explain phenomena scientifically based on studies in journal articles. The scientific inquiry skills included: a) compiling the formulation of the problem, b) designing the experiment, c) analysing the data, d) answering questions, and e) drawing conclusions. The students' scientific literacy skills were measured before and after getting trained using a scientific literacy-based worksheet while carrying out the histology practice.

As to determine the completeness of the test results was by using the completeness percentage formula of learning

outcomes. The percentage of completeness of student learning outcomes can be formulated as follows.

A. Individual Completeness:

$$\text{Completeness Percentage Formula} = \frac{\text{Jumlah Skor Diperoleh}}{\text{Jumlah Skor Maksimal}} \times 100\% = \frac{\text{Jumlah Skor Diperoleh}}{\text{Jumlah Skor Maksimal}} \times 100\% \times \frac{\text{Total Score were Obtained}}{\text{Maximum Score}} \times 100\%$$

B. Classical Completeness:

$$\text{Completeness Percentage Formula} = \frac{\text{Jumlah Skor Diperoleh}}{\text{Jumlah Skor Maksimal}} \times 100\% = \frac{\text{Jumlah Skor Diperoleh}}{\text{Jumlah Skor Maksimal}} \times 100\% \times \frac{\text{Total Students Who Passed}}{\text{Total of All Students}} \times 100\%$$

Data then interpreted using qualitative method to determine how far the level of test results completeness using a literacy scale as follows.

TABLE I. CRITERIA FOR COMPLETENESS OF TEST RESULT

Percentage	Category
T≥80%	Very Well
70%≤T<80%	Good
60%≤T<70%	Quite Good
50%≤T<60%	Less
T<50%	Very Less

Source [9]

### III. RESULT AND DISCUSSION

The results of students' scientific literacy skills included test results before and after being trained with the scientific literacy-based worksheet. The dynamics of scientific literacy skills before being trained with a scientific literacy-based worksheet. Scientific literacy skills included the inquiry skill and articles review skill.

#### A. Inquiry Skill Test Result

Students' scientific literacy skill on inquiry aspect before and after getting trained based on scientific literacy on histology material, can be seen in **Figure 1**.

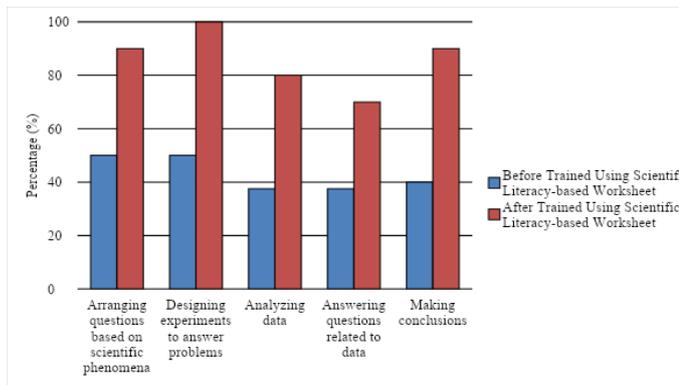


Fig. 1. Chart of scientific literacy skills dynamics on inquiry aspect, before and after getting trained using the scientific literacy-based worksheet

Based on Figure 1, it can be seen that scientific literacy competence in inquiry aspect has increased after getting trained using a scientific literacy-based worksheet. The lack of scientific literacy competence on inquiry aspect which needs to be improved is the ability to answer questions related to data.

#### B. Article Review Skill Test Result

The skill to review articles was tested by answering questions developed from research articles related to histological problems and published in certain journals. The

results of the test of the skill to review the article can be seen in Figure 2.

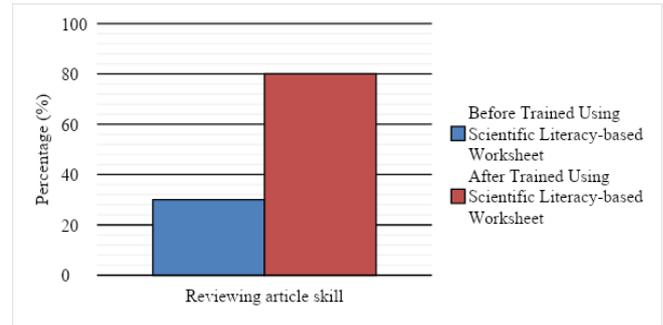


Fig. 2. Chart of scientific literacy skills dynamics on article review aspect, before and after getting trained using scientific literacy-based worksheet

Based on Figure 2, it can be seen that scientific literacy competence in article review aspect has increased after getting trained using a scientific literacy-based worksheet.

The test results of scientific literacy skills on inquiry aspect showed improvements in all aspects. Students' scientific literacy skills before being trained using the scientific literacy-based worksheet on the five aspects of inquiry showed only a few (less than 50%) students have good scientific literacy skills. This indicates that most of students still have low ability at the beginning of histology lectures in terms of the ability to formulate problems based on scientific phenomena from reading, including reading ability which related to the phenomena of muscle tissue damage that causes difficulty in making movements, the ability to design experiments to answer questions, the ability to analyse data, the ability to answer questions from the results of data analysis, and the ability to draw conclusions based on the results of data analysis. Those abilities were still largely low before being trained using the scientific literacy-based worksheet. The low ability of scientific literacy at the beginning of lectures can be caused by the lack of training on scientific-literacy skill. Students were not accustomed to reading and study scientific phenomena from the information in a reading, the ability then continued by compiling a question. Reading from the journal was the result of research that contains data related to various treatments that can affect the structure of histology, which in order to understand the information contained in the reading must be able to search for keywords starting from the introduction, why the research was done, what was the purpose of research, methods for retrieving data, and being able to read and analyse data on research results. Based on the results of the study showed that students were still low in the ability to read and analyse journals before getting practice from student worksheets. This showed that students were still not used to analysing research journals related to various experiments that affect the structure of histology.

Increased of scientific literacy skills occur after students get exercises on student worksheets. Histology material worksheet was trained on students. On the initial, these worksheets containing scientific information that was relevant to the topic of the material being studied, and in the next section, students must compile questions related to the scientific phenomena were given. If the ability to arrange these questions was not trained, then students have difficulty

in compiling questions in accordance with existing phenomena. If students have often been trained, then they will not have any difficulties. Besides exercising the ability to compile scientific questions, this training will increase the critical thinking skill of students. Scientific literacy [10] will train students to recognize real problems in their life, and how to solve those problems, as well as help for decision making. The application of scientific knowledge and processes will accustom students to overcome problems related to biological actions that bring positive and beneficial impacts on humans and the environment. The scientific literacy skills of students [11] can be improved by getting students used to doing experiments, observing, applying inquiry-based learning so as to increase student knowledge and also influence students' scientific ethics and scientific thinking.

#### IV. CONCLUSION

Based on the research that has been done, it can be concluded that the dynamics of students' scientific literacy skills in histology lectures were varied in different scientific literacy components. The ability of students' scientific literacy has improved after getting trained using the scientific literacy-based worksheet. Based on the results of the study it was necessary to further study whether students were able to think at a high level after having the ability to analyse the research journals related to histological phenomena after receiving treatment.

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