



Student Responses in Biology Physics Courses Use Worksheets Based on Scientific Literacy

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Abstract

This article evaluates student responses in biology physics courses use worksheets based on scientific literacy. Student worksheets are seen as a product developed, and one of the aspects reviewed is the practicality in the context of the implementation of the worksheets in the classroom. Student responses will illustrate how practicality of the learning tool, namely the student worksheet used. The student responses were mined from the questionnaire, which featured the grade of very good, good, enough, poor, and not good. The responses were given by 30 students who took the Biology Physics course from the Physics Education Study Program at Lambung Mangkurat University. Results show that the Student Worksheet is very good for improving scientific literacy in Biology Physics courses and are suggested for widespread implementations, also for another courses.

Keywords: Student response; Student worksheet; Scientific literacy

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INTRODUCTION

The rapid development of technology and the dissemination of information result in the breadth of knowledge which affect a country's economic, cultural and political sectors. Rapid development of technology requires ones to master it and able to apply it in everyday life (Rosdiana, Nurita, & Sabtiawan, 2018). In accordance with the lives of individuals as members of society, scientific literacy is important to deal with questions in life that require scientific thinking (Nadhifatuazzahro & Suliyanah, 2019). Therefore, scientific literacy has been widely recognized as a benchmark for the quality of education (Ardianto & Rubini, 2016). The use of good literacy allows ones to do things intelligently (Anggraini & Afrizon, 2019), one of which is in terms of learning.

There are three components of scientific literacy that can be trained in the learning process, namely the content of science, the process of science and the context of science (Bahriah, 2015; El Islami, Nahadi, & Permanasari, 2015; Fazilla, 2016; Fitriani, Hairida, & Lestari, 2014; Sholihah & Indana, 2018). Science content refers to the key concepts needed to understand natural phenomena and the changes made to nature through human activities. Science processes refer to the mental processes involved when answering a question or solving a problem such as identifying and interpreting evidence and explaining conclusions. This includes knowing the types of questions that can and cannot be answered by science, knowing what evidence is needed in a science investigation, and recognizing conclusions in accordance with the available evidence. The context of science refers to situations in everyday life that are the land for the application of processes and understanding of scientific concepts (Nofiana, 2017). PISA divides the fields of application of science into three groups, namely life and health, earth and the environment, and technology.

Mastering science literacy is important because it offers personal abilities that can be shared with anyone. Moreover, the current situation requires scientific information and scientific thinking to make decisions (Rosdiana et al., 2018). Science literacy can develop several abilities themselves, such as being able to provide an explanation of natural phenomena and phenomena that occur based on concepts that have been understood (Wardani & Mitarlis, 2018). Students with low scientific literacy skills cannot handle even simple problems because they are unable to link the concepts of knowledge they have at school with problems that exist in daily life (Holbrook & Rannikmae, 2009).

Science literacy is considered very important in order to create meaningful learning (Bilal & Joko, 2019). Meaningful learning is a planned of learning that helps students achieve learning goals optimally and condition students to be productive in generating ideas (Rosdiana et al., 2018). Meaningful learning can be created through several elements, one of which is learning resources (Bilal & Joko, 2019). Thus, to improve scientific literacy through meaningful learning, a student worksheet is developed. Student worksheets are one of the lesson tools used as a guide for students in carrying out activities or work for both individual and group.

Biology Physics is an elective course that discusses the application of physical concepts to study biology (Dewantara, 2018). Because of its relevance to what exists in everyday life, lectures fulfil three dimensions of scientific literacy in this lesson, namely the context of science, the content of science, and the process of science. To our best knowledge, there is no student worksheet used for this subject. If there are tasks, only in the form of questions or quizzes without any special sheets.

The development of student worksheets in the biology physics course is needed to help students improve scientific literacy. Therefore, researchers developed student worksheets to improve science literacy in Biology Physics subjects. The components of the scientific literacy-based on student's worksheet are (a) Title; (b) Learning objectives; (c) Media (laboratory equipment/virtual laboratories); (d) Problem Identification, which contains discourse related to phenomena in everyday life and technology; (e) Exploration, consisting of planning an experiment, carrying out an experiment, reviewing reference sources; (f) Exploration; (g) Application: explaining other scientific phenomena, problem-solving, potential implications of scientific literacy in society; (h) Bibliography. All components in the student worksheet are the result of the elaboration of aspects of science content, science processes, and science context (Arifin & Sunarti, 2017; Nofiana, 2017).

Research on the development of student worksheets assesses the quality of results or product development including the validity, practicality, and effectiveness of the products developed (Nieveen, 2013). The practicality of a developed student worksheet can be evaluated from the response of students, i.e., via questionnaire (Annur, Wati, Wahyuni, & Dewantara, 2018). This student worksheet has been validated by experts and therefore requires actual implementation test. Practicality was be measured from the students' responses in learning so that aspects of students' responses to the developed worksheets could be explored. The objective of this study was to evaluate student responses in biology physics courses on the implementation of worksheets based on scientific literacy according to two aspects i.e benefits and performance.

METHOD

The quality of the developed student worksheets was assessed in three quality criteria: validity, practicality, and effectiveness (Nieveen, 2013). The worksheets were seen as a product developed, and one of the aspects reviewed was the practicality in the context of the classroom implementation. Student responses illustrated how practicality of the device, namely the student worksheet used (Annur et al., 2018; Dewantara, Febrianti, Wati, & Mastuang, 2019; Hartini, Dewantara, & Mahtari, 2016).

The student worksheet consisted of 8 subs, namely static fluid biomechanics, dynamic fluid biomechanics, bioacoustic, bio-thermic, bioelectric, geometric bio-optics, physical bio-

optics, and bio radiation. The components of the scientific literacy-based on student's worksheet are (a) Title; (b) Learning objectives; (c) Media (laboratory equipment/virtual laboratories); (d) Problem Identification, which contains discourse related to phenomena in everyday life and technology; (e) Exploration, consisting of planning an experiment, carrying out an experiment, reviewing reference sources; (f) Exploration; (g) Application: explaining other scientific phenomena, problem-solving, potential implications of scientific literacy in society; (h) Bibliography.

This research is a descriptive exploratory study. It explores student responses in biology physics courses on the implementation of worksheets based on scientific literacy. The response questionnaire consisted of two aspects: benefits and performance. The student responses were collected through questionnaire that provided with ranks of very good, good, enough, poor, and not good. Responses were given by 30 students who took the Biology Physics course in the Physics Education Study Program at the University of Lambung Mangkurat. The student responses were described in percentage based on each aspect, namely the benefits and performance.

Table 1. Resposn Category (Widoyoko, 2016)

No.	Interval	Category
1.	$4,2 < X \leq 5$	Very Good
2.	$3,4 < X \leq 4,2$	Good
3.	$2,6 < X \leq 3,4$	Enough
4.	$1,8 < X \leq 2,6$	Poor
5.	$1 < X \leq 1,8$	Not good

RESULTS AND DISCUSSION

Results in Figure 1 and Figure 2 show that the student worksheets increase the students scientific literacy and enhances their understanding of the scientific knowledge as also reported by others (Haristy, Enawaty, & Lestari, 2013).

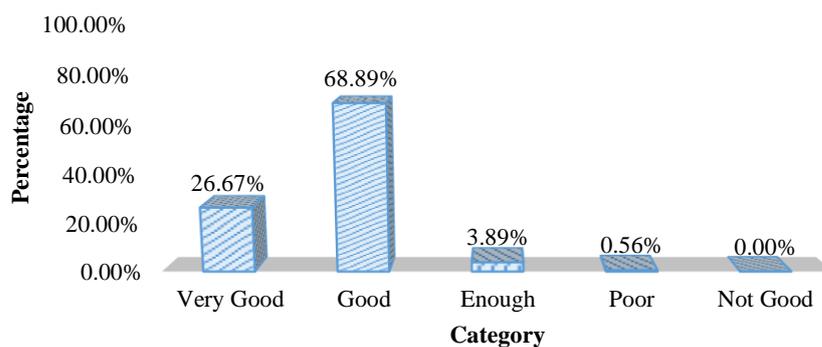


Figure 1 Student responses about the benefits of student worksheets

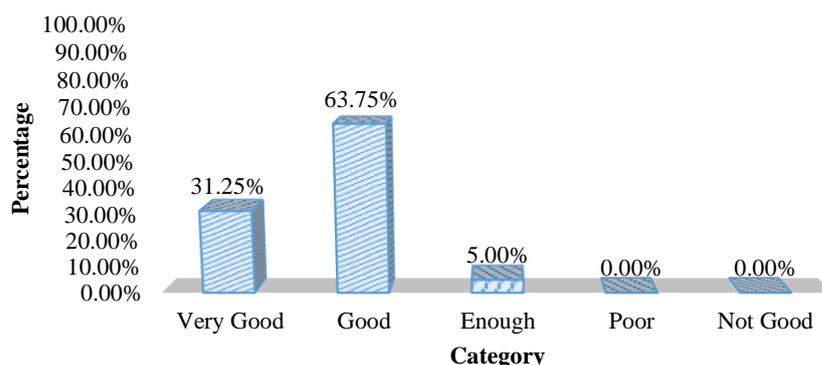


Figure 2 Student responses on the performance of student worksheets

In general, the response of students to the media developed was very good. A summary of the results of student responses to student worksheets can be seen in Table 2. It shows that the students' response to the student worksheet as a whole was very good.

Student responses viewed from the aspects of benefits and performance. In the aspect of benefits, student responses showed a very good category. The statements on the student's questionnaire about the benefits are as follows: (a) Using student worksheets makes it possible to complete assignments faster; (b) student worksheets improve student learning performance; (c) student worksheets can increase productivity in learning biological physics; (d) student worksheets are very useful in the learning process of biological biology; (e) Ease of using student worksheets; (f) Ease of practising scientific literacy; (g) student worksheets attracting students' attention in learning; (h) student worksheets allow students to get feedback faster; and (i) Students like to use student worksheets in learning. Most of the students (68.89% agreed with these statements. 26.67% of students strongly agreed with the statement so that according to them, the worksheets of biology physics students were very useful especially in increasing scientific literacy. Only small portions of students just agree (3.89%) and disagree (0.56%) on the statements about the benefits of Biology Physics student worksheets in improving student science literature.

The statement items on the student response questionnaire about performance are as follows: (a) The display of student worksheets is very clear and easy to understand; (b) By student worksheets, obtaining knowledge transfer processes in a flexible and independent manner; (c) student worksheets make it easy for me to practice science literacy; and (d) student worksheets can save time and money. The majority of students (63.75%) agreed with these statements. 31.25% of students strongly agreed suggesting the efficacy of the worksheets in increasing scientific literacy. A small percentage of students quite agree (5.00%) with a few statements about the performance of Biology Physics student worksheets in improving student science literature.

Table 2 Student responses to student worksheets

Aspect	Score	Category
Benefits	4,22	Very Good
Performance	4,26	Very Good
Average	4,23	Very Good

The use of student worksheets to increase scientific literacy enables students to understand scientific knowledge longer (Ariningtyas, Wardani, & Mahatmanti, 2017; Atiyah, Wahidin, & Roviati, 2016). Science literacy is important to master because understanding science offers personal fulfilment and joy to share with anyone (Rosdiana et al., 2018). Student worksheets are very helpful in increasing scientific literacy and getting positive responses from students (Mustofa, Kuswanti, & Hidayati, 2010; Nawangati & Dwiningsih, 2017; Vienurillah & Dwiningsih, 2016). The existence of student worksheets is one of the learning media that can help students in the teaching and learning process. In addition to the worksheets of students also facilitate teachers in the process of implementing learning (Wahyuningtias & Isnawati, 2019). In accordance with the lives of individuals as members of society, scientific literacy is important to deal with questions in life that require scientific thinking (Nadhifatuzzahro & Suliyanah, 2019)

CONCLUSION

The conclusion from the results of this study is that the Student Worksheet is very good for improving scientific literacy in Biology Physics courses. This can be seen from the very positive response of students after experiencing learning using the student worksheets. Thus, the implementation of physics biology lectures using the developed student worksheets can be continued.

RECOMMENDATION

Further research is needed to see the practicality of student worksheets from the other side, for example, the implementation of the lesson plan. Thus, this worksheet can be used because it is considered practical from various aspects and sides.

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