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Integration of Peer Instruction in the Guided Inquiry Learning Model: Practicing Science Literacy through Scratch

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Abstract

The study is to determine the scientific literacy skills of students by using the peer-instruction integration learning model in guided inquiry through scratch media. The study was conducted at SMAN 14 Semarang in class x on circular motion material, and the research technique used was random sampling. The method used is an experiment with a one-shot case study design. The instrument used was an essay test to determine students' scientific literacy skills. The results show that the scientific literacy ability of students in the aspects of science as the body of knowledge is 30.3% with a low category, science as a way of thinking gets results that are 46.4% with a low category, science as a way to investigate obtaining results is 78.7% with enough category. The interaction between science technology and society gets results that are 50.5% with a low category. It can be concluded that overall the ability of scientific literacy has not been well trained, while the ability of scientific literacy in the scientific aspects as a way to investigate has been sufficiently trained.

Keywords: science literacy ability, scratch

INTRODUCTION

Science and technology are developing rapidly in the 21st century that requires global citizens to be able to think critically, understand scientific ideas, and respond to important issues related to the use of knowledge and technology (Muftianah & Widodo, 2018). Indonesian education is still low, especially education with a low level of achievement in scientific literacy in the PISA (Program for International Student Assessment), which always scores below the average score (Rusilawati et al., 2016). Based on the survey results from the PISA (Program for International Student Assessment) in 2015, Indonesia ranked 64 out of 72 countries with an average score of 403 students' scientific literacy ability (OECD, 2016). Science learning will become more meaningful if students have good scientific literacy skills (Perwitasari et al., 2016).

Physics is the knowledge that studies physical events that include steps, collection of scientific knowledge and attitudes that are cyclic, interrelated and explain how natural phenomena can be measured through observation and research (Yuliani et al., 2012). Physics learning can be seen directly through the human senses and media that can help in the learning process both in the classroom and outside the classroom. Media is used as a tool in the learning process so that physics material that is abstract and considered difficult by students can be easily understood. One of the media that can practice the ability of scientific literacy in explaining concepts, laws, theoretical physics is scratch.

Scratch is a code block-based visual programming language designed by the Kindergarten Lifelong Learning Group at MIT to introduce the basic concepts of programming in interactive and fun topics

(Hardyanto, 2014). The involvement of students in computational thinking can build problem-solving skills possessed by students and this is the goal of the 21st century (Lye & Koh, 2018). This will make it easier for students to apply learning material that is considered difficult to understand.

There are some relevant studies according to Iswatun et al., (2017) explaining that the application of guided inquiry learning models can improve science process skills and cognitive learning outcomes of students. Sorensen et al., (2012) explain that the proposed model can integrate the views of medical health and public health literacy. The model used has the function as a basis for developing health literacy improvement interventions, providing a conceptual basis for developing, validating measuring instruments, capturing various dimensions of health literacy regulation, preventing disease, and promoting health.

Edwards et al., (2018) explained that by adopting a simple and linear method, physical literacy cannot be measured or assessed traditionally or conventionally, besides that systematically, the concept cannot be measured or assessed. This systematic review has identified the advantages and disadvantages of both qualitative and quantitative approaches to measuring or assessing physical literacy relating to age groups, and the environment. Rohmawati, et al., (2018) explained that the learning process in the context of Socio-Scientific Issues by using the help of weblog media can train students' scientific literacy skills.

Imawati & Subchan (2018) explained that the use of scratch applications as a learning medium proved to be effective in helping students to understand mathematics subject matter. Based on this research, the researcher tries to apply the guided inquiry learning model to measure the scientific literacy ability of students through scratch media in circular motion material.

Inquiry learning is a series of learning activities that involve the maximum ability of all students to search and investigate systematically, critically, logically, analytically, so students can formulate their own findings with confidence (Trianto, 2007). The previous research shows that the implementation of inquiry can enhance various learning outcomes (Fitri et al. 2015, Anis et al. 2016, Malik et al. 2017, Utami et al. 2019, Saputri et al., 2016). One method applied is peer instruction. Peer instruction is learning that has the potential to develop the activeness of students in learning (Kurniawati et al., 2014). From some of the studies above, researchers try to combine the guided inquiry learning model that integrates peer instruction.

Based on preliminary observations at SMA Negeri 14 Semarang, there were some students whose seats behind did not pay attention to the explanation from the teacher. Students are busy with the activities they do. Based on that, this study aims to implement the integration of peer instruction in guided inquiry to practice the ability of scientific literacy through scratch media.

METHODS

This study uses an experimental research method with a one-shot case study design. Sugiyono (2010) explains that the one-shot case study method is that there is a group given treatment and then the results are observed. This research was conducted at Semarang State High School 14 SMA X IPA 1 in 2018/2019 with the number of students at 33. The research sample using random sampling techniques and learning material is circular motion.

This research instrument is to use the ability of 4 scientific essay test questions essay. The aspects of scientific literacy skills that can be analyzed can be seen in TABLE 1.

TABLE 1. The aspect of Literacy Ability According to Chiapetta (Munawaroh 2018)

No.	Science Literacy Aspect	Indicator
1	Science as a body of knowledge	Explain or mention the knowledge or information that has been obtained
2	Science as a way of thinking	Describes how a scientist conducts experiments

3	Science as a way of investigating	Involves experimental activities or thinking activities
4	Interaction of science, technology, and society	Describe the use of science and technology for society

The percentage of mastery of scientific literacy based on the opinion of Mardapi (2012) obtained by students is then interpreted in TABLE 2.

TABEL 2. Interpretation of The Percentage of Mastery of Scientific Literacy

No.	Percentage	Category
1	$90\% \leq Y \leq 100\%$	Very good
2	$80\% \leq Y < 90\%$	Well
3	$70\% \leq Y < 80\%$	Enough
4	$0\% \leq Y < 70\%$	Less

The steps in this research are applying the guided inquiry learning model integrated using peer instruction. Then in the learning process, the teacher shows scratch media to explain the movement of the circular motion of an object. After the learning process is complete, a post-test is conducted to determine the students' scientific literacy skills. The scratch media used in circular motion material can be seen in FIGURE 1.

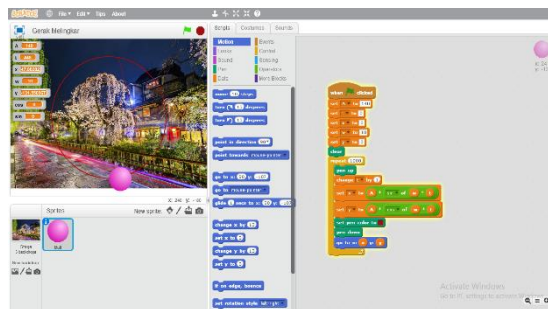


FIGURE 1. Display media scratch circular motion

RESULTS AND DISCUSSION

This research is a method of integration of peer instruction in the guided inquiry into activities in learning activities and assisted by scratch media to train students' scientific literacy skills. After learning, a science literacy ability test is carried out with 4 essay test questions according to the scientific literacy aspects. The data of the scientific literacy ability test results are then analyzed based on the percentage of scientific literacy mastery categories consisting of 4 categories: very good, good, sufficient and lacking. The results of the research on students' scientific literacy ability can be seen in TABLE 3.

TABLE 3. Result of Analysis of The Aspects of Science Literacy Ability

Aspect	Percentage (%)	Category
Science as a body of knowledge	30,3	Less
Science as way of thinking	46,4	Less
Science as way of investigating	78,7	Enough
Interaction of science, technology, and society	50,5	Less

Based on the description of the data in TABLE 3 obtained information that the value of students' scientific literacy ability in the aspects of science as the body of knowledge obtained value of 30.3% with fewer categories. This can occur because students do not understand the concept of normal force in a circular motion. This is in line with research conducted by Rohman (2017) that science as the body of knowledge has the smallest percentage because there is an error in the concept of material received by students in the learning process.

Science as a way of thinking obtained a value that is 46.4% with fewer categories. This can occur because students have not understood the whole about centripetal acceleration. Every student has the ability to think. Puwarni et al., (2018) which states that the scientific literacy ability is low, 23.49% and 28.55%. Science as a way to investigate the value obtained is 78.7% with enough categories. This can happen because during the discussion, the students work together to solve the questions contained in the worksheet.

The interaction of science, technology, and society obtained a value of 50.5% with fewer categories. This can happen because students lack knowledge of science, technology and society. This is in line with previous research, namely the lack of classroom learning processes that involve the process of science. This can also affect the low scientific literacy of students (Meylinda & Widodo 2018).

The overall result of scientific literacy ability using scratch media on average students is 51.5% with a low category. This is in line with previous research Cakiroglu et al., (2018) explains that scratch is interesting and useful in the learning process, but there are some parts of scratch that have problems to complete the task of programming. Scratch media can be used to search for answers such as the period and angular velocity so that it will make it easier for students when working on problems.

Another important factor that can affect the ability of scientific literacy is the attitude of students towards science. PISA 2006 explains the attitude of students towards science, including support for science, self-confidence, interest in science, and responsibility for the environment. Students who have high self-confidence and motivation will get a score of high scientific literacy abilities. This tends to have a more positive attitude towards science (Usmeldi, 2016). Conversely, if students have less self-confidence and motivation, they will get a low score of scientific literacy ability, it tends to have a negative attitude towards science.

SUMMARY

Based on research that has been done at SMA Negeri 14 Semarang, it can be concluded that the application of guided inquiry learning model integration of peer instruction through scratch media results show that the overall scientific literacy ability of students is 51.5% with the category still low. This is influenced by several factors in learning one of the students have not mastered the concept of circular motion. Therefore, students in answering questions about science literacy ability have difficulty. Overall, aspects of the ability of literacy science have not been trained properly, but in the aspect of science as a way to investigate has been sufficiently trained. This research needs to be followed up in learning because the ability of scientific literacy is very important for students to have. Inquiry learning requires students to master physics subject matter more deeply. Suggestions for further research are to further develop scratch media as a tool to explain learning material to students. Scratch media can be used in physical material apart from circular motion.

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