Improvement High School Students' Science Literacy through the Implementation of Blended Learning with SETS Vision

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Article Info	Abstract
	Blended learning is a learning model that combines face-to-face and online learning activities, so that in its implementation it can be combined with an appropriate approach, namely SETS as an effort to improve students' science literacy. This study aims to find out the improvement of students' science literacy by applying blended learning with SETS vision on environmental change learning materials. The research was conducted with quasi-experimental method with randomized pretest - posttest control group design. The subject of this research was all students of X MIPA at SMA Negeri 1 Gabus, with cluster random sampling technique, X MIPA 1 was obtained as the control group and X MIPA 3 as the experiment group. The results of the research were proven by statistical test analysis, specifically used the independent sample t-test, it showed a result of 3.10, The analysis figured out that there was a significant difference between the application of blended learning with SETS vision and conventional blended learning on increasing students' science literacy on lesson of environmental change. The results of this research can be concluded that the application of blended learning with SETS vision significantly increased students' science literacy meanwhile compared to the implementation of the learning model in the control group through conventional blended learning

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INTRODUCTION

The implementation of distance learning policies as an effort to overcome the impact of the spread of coronavirus disease (Covid-19) since the beginning of 2020 has caused various new problems. The problems faced include unpreparedness for a sudden change from a face-to-face learning environment in an active classroom to an online learning environment. The use of online learning media has been widely carried out to support the continuity of an adequate learning atmosphere to build an ideal learning environment for students even in different situations. Distance learning models such as blended learning are one of the alternative choices used to deal with this situation.

Blended learning is a type of learning that represents an opportunity to integrate learning activities that take advantage of online technological advances with the interaction of traditional learning activities in an innovative way (Thorne, 2003). The application of Blended learning has a positive impact on learning outcomes (Alsalhi et al., 2019) because students are easier in the process of receiving material to increase a sense of liking for these learning activities (Hubackova & Semradova, 2016). The use of blended learning models can be combined with other visions, for example problem-based learning with the vision of blended learning shows that it is able to optimize learning outcomes and increase student learning motivation in higher education (Setyoko & Indriaty, 2018).

Blended learning can be applied in learning in the post-pandemic new normal era, which until now continues to be echoed. The worst-case scenario in the process of learning activities must be provided as well as possible so that learning activities can be carried out in a conducive and effective situation. The selection of SETS as the basis for blended learning is based on the reason that the activities in the SETS approach are able to improve students' thinking power and creativity when learning takes place outside the classroom by making full use of communication technology. The implementation of SETS vision in learning activities is expected to be able to encourage students to improve skills, including science literacy.

Science literacy (SL) is the ability to use scientific knowledge and skills through the scientific process (Fakhriyah et al., 2017) to solve problems in order to have an attitude and sensitivity towards oneself and the environment when making decisions based on scientific considerations (Yulyanti, 2017). The results of the 2018 PISA survey show that science literacy with a score of 396 achieved by Indonesia is included in a relatively low ranking (OECD, 2019). The low level of understanding of science learning is seen as the cause of the lack of formation of science literacy in students because most students still rely on rote learning in learning science (Fakhriyah et al., 2017).

The result based on observations at SMA Negeri 1 Gabus shows that science literacy in this high school has not been measured, because based on the results of interviews with biology teachers at the school, it shows that: 1) The use of assessment instruments has not been able to measure science literacy. Written questions used as assessment instruments by teachers and schools have low science literacy content (Millah et al., 2021), thus causing the inability of students to solve problems related to science process skills which are an important part of science literacy (Ojda & Payu, 2014). Students who are not accustomed to solving problems with science literacy are also one of the causes of this low ability (Fuadi et al., 2020). 2) The use of textbooks that have not been able to support students in improving science literacy. The textbooks used by teachers mostly contain knowledge that contains facts, concepts, principles, laws, theories, and questions that are presented with answers related to these concepts, knowledge, and information (Wahyu et al., 2016). 3) Selection of inappropriate learning models and approaches to train students' science literacy. The models and approaches commonly used by teachers tend to be conventional models by applying teacher-centered learning, causing students not to be able to practice science literacy (Fuadi et al., 2020).

The purpose of this study is to analyze students' science literacy through the implementation of blended learning with SETS vision in the material on environmental change in senior high school. The benefits obtained based on the results of the research include obtaining

information related to the implementation of blended learning with SETS vision as a learning model that can be applied to learning in schools to improve the science literacy of high school students, especially on environmental change materials.

METHODS

This research used a quasi-experimental method with a randomized pretest-posttest control group design consisting of two groups, namely the experiment and the control group. In this study, the experiment group was given blended learning with SETS vision, while the control group was given conventional blended learning. The research design is shown in Table 1.

Table 1. Randomized Pretest-Posttest Control Group Design

Group	Pretest	Treatment	Posttest
Experiment	Pr 1	X1	Po 1
Control	Pr 2	X2	Po 2

The population of this research was all students of X MIPA at SMA Negeri 1 Gabus. The participants involved in this research were 178 students. The method was conducted by sample selection through cluster random sampling technique, X MIPA 1 was obtained as the control group totalling 36 students by applying conventional blended learning and X MIPA 3 as the experiment group totalling 36 students by applying blended learning with SETS vision. The instruments used to measure students' science literacy are written tests consisting of 15 multiple choice and 5 essay questions. The indicators for the assessment of science literacy include three aspects, namely content of science, process of science, and context of science. The results of the research were proven by statistical test analysis, specifically N-gain test and independent sample T-test. The N-Gain test is obtained by calculating the difference between the pretest and posttest values using formulas and criteria according to Sundayana (2016):

$$N - gain = \frac{posttest\ score - pretest\ score}{maximum\ score - pretest\ score}$$

Furthermore, the result of the N-gain test is matched with the criteria table as shown in Table 2.

Table 2. N-gain Criteria

N-gain Value	Criteria
g < 0.00	Very low
0.00 <g < 0.30	Low
0.31 <g < 070	Moderate
0.71 < g	High

The final analysis used an independent sample t-test through SPSS version 25 software.

RESULTS AND DISCUSSION

The research data obtained in increasing students' science literacy on environmental change material by applying blended learning with SETS vision consists of a written test of students' science literacy. Students' science literacy of experiment and control group students based on the results of the pretest and posttest are shown in Figure 1.
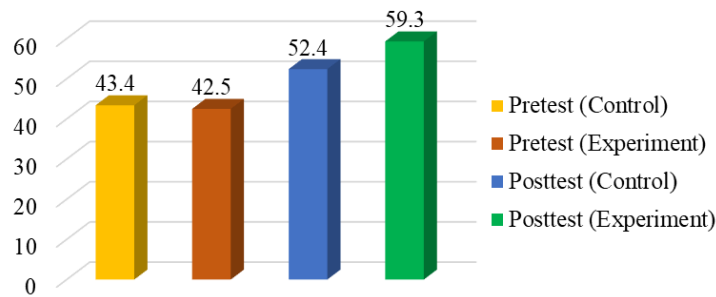

Figure 1. The Result of Students' Science Literacy

Based on Figure 1, it can be seen that there was an increase that occurred before and after the treatment was carried out in each control and experiment group. The average result shows that students who have been given learning by applying blended learning with SETS vision give higher average results when compared to the control group. The results of the pretest tend to show relatively low scores because students are not used to working on questions with science literacy content that are carried out in the early stages of learning during research. The pretest results obtained by each group aim to determine the initial abilities possessed by students before the implementation of a learning model. Referring to Figure 1 which shows that the pretest results of the control group have a higher average than the experiment group, it shows that the initial ability possessed by the control group is better than the experiment group. This is in accordance with the statement of Wulandari and Sholikin (2016) which states that students' initial abilities will affect the cognitive aspects of students' knowledge to identify scientific

problems that are always emphasized in SETS-vision learning.

The improvement that occurred in the posttest results as shown in Figure 1 occurred in both groups, both in the control group and the experiment group. The improvement in posttest scores in the experiment group was higher than the control group, although the initial ability of the control group was higher than that of the experiment group. This happened because, during the blended learning the SETS vision applied to the experiment group was able to increase student involvement in learning activities. Students become more active in participating in learning activities through discussion methods and short questions and answers during the learning process.

The improvement that occurred after giving blended learning with SETS vision and conventional blended learning in the experiment and control groups was followed by N-gain testing. The results of the N-gain test for the control and experiment group are shown in Figure 2.
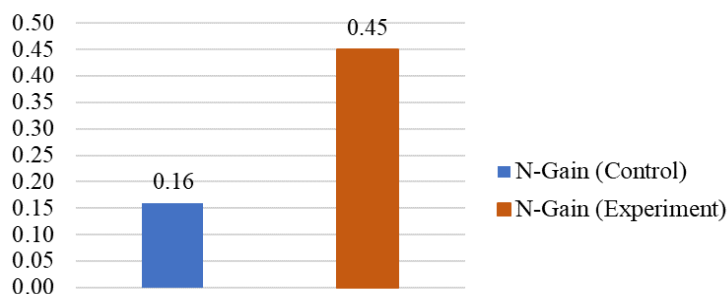
Figure 2. The Result of N-gain Test

The difference in the increase in the N-Gain value of learning outcomes scores before and after treatment in Figure 2 for the control group shows a result of 0.16 which is interpreted as a low gain index criteria. This shows that the application of conventional blended learning on environmental change material does not have a very good impact on increasing students' science literacy when compared to the experiment group which shows an N-gain result of 0.45 which is interpreted at a moderate gain index criteria. This shows that the application of blended learning with SETS vision on environmental change material, although it shows a higher gain index

than the control class, has not optimally increased students' science literacy.

The cause of the non-optimal achievement of science literacy when the treatment was carried out was because during the research, students used a handbook in the form of a package book that had been provided by the school and did not contain SETS content in it and students were not accustomed to working on questions with science literacy content in their daily lives. This is in line with the results of research conducted by Permanasari (2016) which states that the lack of students' ability to read and interpret the readings

contained in written questions causes students' science literacy to tend to be low.

The difference in the improvement of students' science literacy between the control and experiment groups was analyzed using an independent sample T-test through SPSS version 25 software, which showed a t_{count} of 3.10. This value is greater than the t_{table} value at the 0.05 level, which is 1.99. This can be interpreted that there is a significant difference in the improvement in science literacy after the implementation of blended learning with the SETS vision on environmental change material when compared with conventional blended learning implementation in schools.

The improvement in students' science literacy occurred because the learning model applied to the experiment group was able to increase the active role of students during the learning process. Active student involvement during learning activities through discussion and question and answer activities can trigger students' curiosity about a problem being discussed. Providing stimulation in the form of pictures and videos related to learning materials displayed during the learning process can train students in building knowledge to analyze a problem that occurs and provide solutions to problems based on scientific considerations. This is in accordance with the results of McCrae's (2011) which states that active learning involving current issues is highly recommended to be used during learning activities, so that students participate in learning through the issues that have been given. SETS vision is very close to learning with issues that develop in society so that students become more active in learning activities. In line with this, Salila (2015) also states that student involvement in learning activities with the SETS vision can effectively improve student learning outcomes and science process skills.

The implementation of blended learning with SETS vision supports students in practicing skills to continue to develop science literacy and from time to time, so that students' science literacy can continue to develop and improve. This is in accordance with the results of Wahyu (2016) also stated that applying a learning model with these characteristics, students are not only

given instant questions and answers that are available in student handbooks, but require students to build independent thinking skills, find, and turn it into information that is easy to understand, and new knowledge acquired in a predetermined manner. Efforts that can be made to achieve this are by continuing to learn students by providing questions that contain science literacy.

CONCLUSION

The application of blended learning with SETS vision on environmental change learning materials significantly increased high school students' science literacy meanwhile compared to the implementation of the learning model in the control group through conventional blended learning. This is evidenced by by the results of the analysis test using the independent sample t-test which shows the t_{count} result is 3.10 greater than t_{table} which is 1.9,, indicating a significant difference in the increase in students' science literacy in the experimental group using implementation blended learning with SETS vision on environmental change learning materials.

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