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The Effect of Online Discovery Learning in Google Classroom Environment on Students' Scientific Literacy Skills

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Abstract: This research aimed to determine the effect of the discovery learning models using a google classroom to develop the scientific literacy abilities. The sample of this research is tenth grade students of science 2 and science 3 groups which are selected through purposive sampling technique. The data are analyzed statistically with an independent sample t-test. The average results of the N-gain scientific literacy ability of the experimental class (0.45 ± 0.11) with medium category and the control class (0.29 ± 0.14) with low category. The average percentage for student presentations is 83.75%, while the learning implementation observation sheet has a 94.4%. The results showed that there is a significant effect of using online discovery learning in google classroom environment towards the improvement of scientific literacy skills of tenth graders students in ecosystems topics.

Keywords: discovery learning, scientific literacy, google classroom.

Abstrak: *Penelitian ini bertujuan untuk mengetahui pengaruh model online discovery learning menggunakan google classroom terhadap peningkatan kemampuan literasi sains siswa. Sampel penelitian ini adalah siswa kelas X IPA 2 dan X IPA 3 yang dipilih melalui teknik purposive sampling. Data dianalisis secara statistik dengan independent sample t-test. Rata-rata hasil N-gain kemampuan literasi sains kelas eksperimen (0,45 ± 0,11) dengan kategori sedang dan kelas kontrol (0,29 ± 0,14) dengan kategori rendah. Rata-rata persentase presentasi siswa sebesar 83,75%, sedangkan lembar observasi pelaksanaan pembelajaran sebesar 94,4%. Hasil penelitian menunjukkan bahwa terdapat pengaruh signifikan penggunaan pembelajaran discovery online dengan google classroom terhadap pengembangan kemampuan literasi sains siswa kelas X pada materi ekosistem.*

Kata kunci: *pembelajaran discovery, literasi sains, google classroom.*

▪ INTRODUCTION

The 21st century characterized by the rapid progress and development of information technology. The influence of technological advances also contributes to the development of education. The education sector is required to prepare students who can face the information era and face global economic competition. Referring to this statement, every individual needs to have abilities that can be used to face challenges in the 21st century. One of the skills needed in an effort to survive and adapt in the progress of the 21st century globalization era is scientific literacy skills. Scientific literacy is defined as an ability to combine issues related to science as well as scientific ideas (Juniati, 2020).

The ability of scientific literacy is needed by students to analyze problems and also relate them to various scientific facts. However, the scientific literacy ability of students in Indonesia is still quite low when compared to other countries. According to the Program for International Student Assessment (PISA) data organized by the Organization for Economic Cooperation and Development (OECD) in 2018, Indonesia was ranked 70th

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out of 79 participating countries. Indonesia only achived an average score of 396. Responding to this data, a concerted effort is needed more to identify and resolve the low achievement of scientific literacy in Indonesia so that later it can produce human resources that are able to compete with other countries.

One of the efforts to improve students' scientific literacy skills is through learning tools used during the learning process. This is in accordance with the opinion of Fraenkel and Wallen in Hassasiyah (2020) that teaching learning tools based on scientific literacy are also an important factor to improve students' scientific literacy skills. So far, the majority of educators still use conventional learning with the lecture method which causes scientific literacy skills and student learning outcomes to tend to be low due to lack of motivation, interest and intensity of learning during the teaching and learning process.

Based on preliminary research conducted by researchers on Monday, April 19, 2021, SMA Negeri 16 Bandar Lampung carried out distance learning because the Indonesian Ministry of Education and Culture issued the distance learning policy in the emergency period of the spread of Covid-19 through circular letter No. 4 of 2020 (Wardany, 2020). From the interview with one of the 10th grade biology teacher at SMA Negeri 16 Bandar Lampung, information was obtained that the teaching material and learning activities during distance learning was carried out only using the whatsapp group media with the question and answer method. When researchers asked about the achievement of scientific literacy skills, educators stated that scientific literacy skills had not been developed in schools because educators did not fully know about scientific literacy and the indicators contained in it. In addition, the learning and teaching process in the classroom is also not too student-centred so that the level of knowledge and concern of students towards phenomena in the surrounding environment is still low.

To overcome these problems, it is necessary to apply an attractive and student-centered learning model where students are directed to find a concept or principle to improve scientific literacy skills. The learning model that meets these criteria is the discovery learning model. The discovery learning model is a learning model that involves students in problem solving to develop knowledge and skills characterized by student activities to learn to recognize problems, solutions, seek relevant information, develop solution strategies and implement the chosen strategy so that it is expected to be able to develop scientific literacy (Effendi, 2012).

Based on this, blended learning using the discovery learning model is also able to provide direct experience so that students can understand science better and more scientifically. According to research conducted by Burhendi (2019) use the discovery learning model in the learning process is one of methode to to involve students directly. This is in line with Feriyanti's research (2014) that the discovery learning model is one of the learning models that can answer the needs of the 2013 education curriculum through a scientific approach. The discovery learning model allows students to be able to play an active role in the learning process by answering and solving problems to find meaningful concepts (Maarif, 2016)

Learning by finding a meaningful concept makes students have critical thinking skills. This is in line with Rudbiyani's research (2018: 51) which says that discovery learning mode can be used to train students in developing critical thinking skills. The stages in the discovery learning model are able to encourage students to find information and solve their own problems so that it makes students' critical thinking processes more

developed (Jayanti, 2021). This will also have an impact on student learning outcomes because the process in it involves students actively (Putriani & Raharyu, 2018). According to Syarif (2020) in his research, he said that discovery learning had a positive impact on increasing the scientific and cognitive attitudes of students which was marked by an increase in students' learning mastery in each cycle of stages. Innovative learning models such as discovery learning help students to appear creative, be more confident and improve their critical thinking (Shaheen et al., 2015)

The implementation of distance learning activities requires educators to be able to utilize appropriate media and learning resources so that learning activities become more effective in developing students' scientific literacy skills. This makes educators have to be more innovative and creative in delivering material through learning media so that the stages in the learning model can be implemented. One of the online -based learning media that can be used is google classroom . The application of discovery learning assisted by google classroom can contribute to constructivism and observational learning aspects which will allow students to expand their knowledge outside the classroom by conducting independent investigations because the main technical features of network learning consist of sharing, grouping, conversation and connectedness .

Research conducted by Yaumi (2017) also shows that the application of the discovery learning learning model has an influence on the results of increasing students' scientific literacy, including students who are trained to find concepts directly through experience so that several indicators of scientific literacy can be achieved. In line with this, research conducted by Rohmah (2021) also states that the discovery learning model can train students' skills in aspects of scientific literacy. This shows that scientific literacy skills at SMA Negeri 16 Bandar Lampung can be developed by involving the right learning process along with learning models and learning media that can support the process.

▪ METHOD

Population and Research Sample

This research took place at SMA Negeri 16 Bandar Lampung and was carried out in the even semester of the 2020/2021 academic year. The population used in this study was 10th grade students at SMA Negeri 16 Bandar Lampung as many as 104 students who were divided into three classes. Then, from the population, two classes were taken to be used as research samples. One class as an experimental class will be given treatment in the form of learning using the discovery learning learning model assisted by google classroom and the other as a control class. Sampling was done by using purposive sampling technique. In this study, two groups of samples were used with a total sample of 69 students, namely class X MIPA 2 as the control class and X MIPA 3 as the experimental class.

Research Design

This study using a quasi-experimental design. The design used in this study was a non-equivalent group pretest-posttest, by choosing classes with the same condition or condition. In this design, two classes were used, one class as the experimental class and one class as the control class.

Instruments

This research was conducted by giving treatment in the form of *pretest* and *posttest* on ecosystem material which contained questions related to aspects of scientific literacy competence according to PISA which consisted of 3 indicators, namely identifying scientific questions, explaining scientific phenomena and using scientific evidence. The *pretest* and *posttest* consisted of 20 reasoned multiple choice questions with a cognitive level of questions, namely C2 to C5. In addition, students in the experimental class were also given a response questionnaire regarding the use of *google classroom* during the learning process which will later be calculated the average percentage and then interpreted with descriptive percentage criteria to determine student responses to learning using *google classroom* as a learning medium.

Data analysis

The content validity test is carried out through validation by lecturers who have expertise in the field of biology to see the suitability of the standard content of the material contained in the test instrument. Meanwhile, to test the validity of the criteria, it is calculated using the product moment on SPSS 22.0 with a significant level of 5%. If $t_{count} > t_{table}$ then the item is declared valid. Instrument reliability was determined using the *Cronbach Alpha formula* obtained from the *SPSS* calculation by comparing r_{ii} and r_{table} with a significant level of 5%. If $r_{ii} > r_{Table}$ then it is declared reliable. The distribution of *pretest* and *posttest questions* is tested for difficulty level using the interpretation of Sudjiono (2018:372) which says that if the question gets an index of less than 0.30 then the question is too difficult, whereas if the question has an index of more than 0.70 then the question is declared too high. easy. The calculation of the differential power test was carried out using SPSS 22.0 with the discriminatory power interval between -1.00 to 1.00

Average *N-gain score is* calculated using the formula from Hake (1999:1) which then the results are interpreted into 3 categories of increase according to the range of *N-gain indexes* obtained. In this study, the normality test used *the Kolmogorov-Smirnov* to determine whether the distribution of the data obtained was normally distributed. This is done after the data is known to be normally distributed. The homogeneity test used the *Levene test* at a significance level of 5% or = 0.05.

▪ RESULT AND DISSCUSSION

Based on the results of research conducted in the experimental and control classes, the average results of scientific literacy skills are presented in the following table:

Table 1. Pretest and posttest score data

	Class	Mean ± SD
Pretest	Experiment	54.70 ± 7.62
	Control	49.37 ± 7.43
Posttest	Experiment	75.52 ± 5.37
	Control	65.11 ± 6.01

Based on Table 1 above, it is known that the average pretest score of the experimental class is 54.70 and the control class is 49.37. Then the posttest score of the experimental class was 75.52 and the control class was 65.11. The results of the data calculation show

that the experimental class has a higher average score when compared to the control class. After knowing the average pretest and posttest scores of students, the next step is to perform statistical tests on each class group. Data obtained through normality test, homogeneity test and independent sample t-test. The results of statistical tests can be seen in the following table.

Table 2. N-gain, normality and homogeneity data results

Class	N-gain average	Normality test	Homogeneity Test	Independent Test Sample t-test [*Sig. (2-tailed)]*
E	0.45 ± 0.11 (medium)	Sig. 0.17 > 0.05	Sig. 0.10 > 0.05	< 0.05
K	0.29 ± 0.14 (low)	Sig. 0.17 > 0.05		

Description: E = Experiment, K = Control, SD = Standard deviation

Based on Table 2 it is known that Sig. *(2-tailed)* 0.000 <0.05, which indicates that the average *N-gain score* of scientific literacy ability of students between the experimental class and the control class is significantly different. The average *N-gain score for* each indicator can be seen in the following table.

Table 3. Average N-gain for each indicator of scientific literacy competence aspect

No	Indicator	Experiment Class		Control Class	
		Score	Interpretation	Score	Interpretation
1	K1	0.43	Currently	0.27	Low
2	K2	0.52	Currently	0.33	Currently
3	K3	0.50	Currently	0.22	Low
Average		0.48	Currently	0.27	Low

Description: K1 = Identifying Scientific Questions, K2 = Explaining Scientific Phenomena, K3 = Using Scientific Evidence

Based on Table 3, the average N-gain in the competency aspect indicator for the experimental class is 0.48 with the "medium" criteria while the control class is 0.27 with the "low" criteria. In Table 21, it can be seen that the indicator that has the highest average score is the indicator explaining scientific phenomena with an average score of 0.52 for the experimental class and 0.33 for the control class. The average score of the cognitive level of scientific literacy questions is as follows:

Table 4. The average score of each cognitive level

Cognitive Level	Average Score
C2	78.92
C3	74.30
C4	73.33

C5	79.23

The scientific literacy question consists of the distribution of cognitive levels, namely C2, C3, C4 and C5 as shown in table 4. For the highest average score is at the cognitive level C5, which is evaluating with a score of 79.23 and the lowest average score is at the cognitive level C4 which is analyzing with 73.33. Students' responses to the use of google classroom as a learning medium to improve scientific literacy were calculated by the average percentage of each indicator. The results of these calculations are then interpreted with descriptive percentage criteria. The results of student questionnaire data analysis can be seen in Table 5.

Table 5. Student response questionnaire

Indicator	**Experiment Class**	
	Percentage (%)	**Category**
Show interest in learning biology through *google classroom*	84	High
Demonstrate active participation in biology learning through *google classroom*	82	High
Demonstrate the ability to take biology lessons through *google classroom*	85	High
Demonstrate the benefits of following biology lessons through *google classroom*	84	High
Average ± SD	**83.75 ± 1.08**	**High**

The percentage of student questionnaire responses in the experimental class is the highest in the third indicator, which is showing the ability to participate in biology learning through the google classroom media (see table 5). Meanwhile, the lowest percentage is the second indicator, which shows active participation in biology learning through google classroom media. Based on the calculation results, the average percentage of student response questionnaires obtained is 83.75% with high criteria. When viewed as a whole, the average percentage of each indicator of the student response questionnaire is high. The implementation of learning using the discovery learning model assisted by google classroom is carried out through observations using the learning implementation observation sheet. The observation sheet filled in by the observer shows the extent to which the learning implementation process uses the discovery learning model assisted by google classroom. The results of the observation of the implementation of learning can be seen through the table of recapitulation of the implementation of learning as shown in Table 6.

Table 6. Recapitulation of learning implementation

Meeting-	**Stages**	**Execution (%)**	**Total (%)**	**Interpretation**
1	Opening	17	89	Very good

	Core	55		
	Closing	17		
2	Opening	22	94	Very good
	Core	55		
	Closing	17		
3	Opening	22	100	Very good
	Core	61		
	Closing	17		
Average			**94.4**	**Very good**

The percentage of learning implementation using the discovery learning model assisted by google classroom obtained an average percentage of learning implementation of 94.4% with the interpretation of each meeting being very good (see table 6). This shows that the learning process using the discovery learning model assisted by google classroom is running very well and in accordance with the stages that must be carried out in the learning. This influence occurs because of the application of the discovery learning model during learning which directs students to find a concept or principle so as to improve scientific literacy skills. The stages that occur during the learning process using the discovery learning model help students to be active in learning activities so that they are able to encourage students to think in finding the final result through questions on the students' worksheet. This is in accordance with research conducted by Niswatuzzahro (2018) that there was an increase in scientific literacy in the aspect of student competence after being given treatment using the discovery learning model during the learning process.

Discovery learning model learning process assisted by the use of google classroom makes learning better and interesting because there is a communication flow between teachers and students or between students. In addition, students can also share material with each other and interact in class forums that make it easier for students to discuss the problems contained in the students' worksheet. Teachers can also monitor students who are actively discussing on the forum and provide real-time input. the use of google classroom in this learning process can arouse the desire, attraction and motivation of students in finding concepts so that they are able to develop scientific literacy skills and apply them in life. This is in line with research conducted by Rikizaputra (2020) that the use of e-learning with google classroom has an effect on student learning outcomes and motivation in learning biology.

Discovery learning assisted by google classroom also affects each indicator on the competency aspect. Based on the analysis that has been carried out, the results show that there is an effect of using the discovery learning model assisted by google classroom which can be seen in the results of the average N-gain indicator of competence aspects of the experimental class and the control class. Based on the calculation results, the average N-gain score of the competency aspect indicator for the experimental class is 0.48 with the "enough" category and the control class is 0.27 with the "low" category. The indicator on the aspect of competence that has the highest N-gain score is the indicator explaining scientific phenomena because students are able to answer questions with the cognitive level of analyzing these indicators. This describes that the scientific literacy skills of students are more visible in the ability to recognize and remember simple concepts of

science, explain and describe a model, propose and predict hypotheses and apply scientific knowledge in everyday life. Learners can answer and express opinions correctly on questions with cognitive level C4 above because the learning process involves data collecting and data processing stages which are integrated using google classroom. This stage requires students to collect relevant information from various literatures which will then be processed together with the group in a group discussion forum in google classroom to answer scientific questions on the students' worksheet . These activities direct students to find out scientific concepts and facts through scientific approaches such as observing, asking questions, collecting data and reasoning in solving problems so that the second indicator of scientific literacy can be achieved. In line with this, Hosnan (2014:284) argues that discovery will help students form effective ways of collaborating, sharing information and listening and using other people's ideas which makes students more active in discussing learning concepts in class because they are directly involved in problem solving. In addition, the features on the google classroom learning media are also available facilitate students to be able to share information, assignments, questions and materials on the class assignment page feature easily.

Indicators with N-gain scores that are in second place are indicators using scientific evidence. In this indicator, students can interpret scientific evidence, make and communicate conclusions. Students can achieve indicators using scientific evidence because the verification and generalization stages in discovery learning train students to be able to prove the truth of the data that has been obtained and draw conclusions to answer problems. After students collect data from various literatures, then group representatives will present by sending voice recordings to the class forum in google classroom . In this process, students practice to provide explanations and conclude the problems contained in the students' worksheet. So that students can interpret scientific evidence, make and communicate conclusions. This is in accordance with Wahyuningsih's (2019) opinion that the verification or proof stage in the discovery learning learning model trains students in improving critical and creative thinking skills.

The indicator that gets the lowest N-gain score is identifying scientific questions. In this indicator, students are not accustomed to connecting their cognitive aspects with phenomena found around them so that it affects the ability of students to identify scientific questions. Students can achieve indicators of identifying scientific questions because the steps in the discovery learning model assisted by google classroom can provide a meaningful learning experience for students in exploring the knowledge they are learning. At the beginning of learning, students are given a stimulus in the form of pictures and videos that are shared in the classroom forum in google classroom regarding ecosystem components, energy flows and biogeochemical cycles. Furthermore, at the problem statement stage , students are directed to identify problems found from pictures and videos that have been shown to be formulated in the students' worksheet that has been given. It aims to train the ability to remember, understand, apply and analyze the problems that will be studied during learning activities.

The application of the discovery learning model assisted by google classroom during the learning process is also able to train students in working on questions with a cognitive level of understanding, applying, analyzing and evaluating. In Table 4 it can be seen that the average score of the highest cognitive level is evaluating or C5. This happened because the learning process involved students to verify and generalize the

learning that took place at that time through google classroom. This process requires students to be active during learning activities in discussion forums and classes in google classroom because the teacher does not immediately provide final results or conclusions from the material presented but students are given the opportunity to search and find data results so that the learning process will be easier to remember by students. learners. This condition makes students able to find their own concepts and when faced with questions with the evaluation category, students will be able to work according to the concepts they have found before.

The use of google classroom as a learning medium to improve scientific literacy was also responded positively by students through a response questionnaire. This is evidenced from the results of the average percentage of student responses of 83.75% with the "high" criterion which means that students show interest, activity, ability and usefulness in participating in biology learning to improve scientific literacy through the google classroom media very well . These things can be seen from the enthusiasm of students in participating in learning, increasing curiosity, discussing in groups, expanding knowledge from various literatures and understanding surrounding phenomena during the learning process using google classroom. This is in accordance with Toharudin's opinion (2011: 1) that the characteristics of individuals who have scientific literacy include having a positive attitude towards science and being able to use science in everyday life.

The implementation of the learning process using the discovery learning model with the help of google classroom on ecosystem materials is in the very good category . This can be proven by the percentage of research results obtained from the tutor teacher on the learning implementation observation sheet. The percentage obtained on the observation sheet on the implementation of learning for three meetings and the average is 94.4%. For the first meeting, based on Table 6, the implementation of the discovery learning model assisted by google classroom was in the percentage of 89%. This number falls into the very good category. Furthermore, the second meeting the percentage of implementation increased from the previous meeting, which was 94% in the very good category. Then in the third meeting, the researcher's mistakes when teaching at the previous meeting were corrected so that the implementation of discovery learning assisted by google classroom increased by 100% with a very good category. Based on the percentage of the data, it can be interpreted that the discovery learning learning model assisted by google classroom which is applied in class X MIPA 3 SMA Negeri 16 Bandar Lampung has been implemented in a very good category and this is further strengthened by qualitative data in the form of notes from observers on the learning implementation observation sheet by the teacher.

The results of this study are further strengthened by Mustofa's research (2019) that the discovery learning model which is integrated with google classroom has an effect on mastery of concepts and skills so that it can improve students' scientific literacy. In line with this, Ratnawati (2021) also said that learning using google classroom with discovery learning strategies makes learning more effective because students find it easier to understand and find a concept of understanding learning material in everyday life. Based on the description above, it can be concluded that there is a significant effect on the application of the google classroom -assisted discovery learning model on the scientific literacy skills of class X students on the subject matter of ecosystems at SMA Negeri 16 Bandar Lampung.

▪ CONCLUSION

This research concluded that there is a significant effect on the application of the Google Classroom-assisted discovery learning model on the scientific literacy skills of class X students on the subject matter of ecosystems at SMA Negeri 16 Bandar Lampung. This can be seen from the data on the average N-gain score obtained between the experimental class and the control class in each indicator of scientific literacy competence.

Learning using the discovery learning model assisted by Google Classroom can be used as an alternative that can improve scientific literacy skills in the field of education. It is better before other researchers carry out learning using the discovery learning model assisted by Google Classroom , researchers should make better activity plans in terms of classroom management to optimize the use of time and implement each syntax so that learning will be maximized. In addition, before carrying out research using google classroom media, researchers should introduce the features contained in google classroom first to students so that they are familiar and make it easier during the learning process.

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