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The influence of discovery learning model assisted with comics media on students' scientific literacy in heat matter and its transfer

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Abstract

The Research to see the effect of using comic media in the discovery learning model on the scientific literacy of junior high school students. This research uses a two-group experimental design, namely between the experimental and control groups. The samples in this research used random sampling techniques. Instruments used in this research, the test is a multiple choice test with 20 numbers. The population in this research are all 91 class VII students consisting of A, B and C at SMP Negeri 1 Suwawa. The research results show influence of the discovery learning model assisted by comic media in increasing students' scientific literacy in the material of heat and its transfer. Average Posttest value shows this for both classes, namely the experimental class of 81.67 and the control class of 53.50. Apart from that, based on hypothesis testing, the value was 0.000 < 0.005, meaning H0 was accepted and H1 was rejected, so it was found that the discovery learning model with the help of comic media, has an effect on the scientific literacy of students at SMP Negeri 1 Suwawa.

Keywords: discovery learning; comics; scientific literacy

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INTRODUCTION

PISA defines scientific literacy as the ability to use scientific knowledge, investigate questions, and draw conclusions based on scientific evidence in to understand and make decisions regarding nature and its changes due to human activities (OECD, 2016). According to Rusilowati, (2018) scientific literacy is the main focus in the science learning process which has three components that cannot be separated, science as a product, process and attitude. Science as a product means of organizing facts, concepts, procedures, principles and natural laws. Science as a process explains that scientific findings are obtained from scientific processes or scientific work. Science as an attitude means that a scientific attitude underlies scientific processes that are useful in producing scientific products. These three components are benchmarks for increasing scientific literacy.

The era of the 21st century makes world development increasingly rapid and complex. These changes are basically aimed at improving the quality of life of modern society. Scientific literacy is one of the skills needed in the 21st century among the 16 skills identified by the World Economic Forum

(Wefusa, 2015). According to PISA data Indonesia is included in the low level, namely the bottom 10 positions when scientific literacy is a very important factor in determining the quality of education in a country (OECD, 2014).

Scientific literacy is essential to develop because: (1) understanding science offers personal satisfaction and pleasure that arises after understanding and studying nature, (2) in everyday life everyone needs information and scientific thinking for decision making, (3) everyone needs involving their abilities in public discourse and debate on important issues involving science and technology, (4) and scientific literacy is essential in the world of work, because more and more jobs require high skills, thus requiring people to learn science, reason, think creatively, make decisions, and solve problems.

The 2018 PISA (Program for International Student Assessment) results show that the scientific literacy skills of students in Indonesia need to be improved when compared to other participating countries. Indonesia's scientific literacy ability obtained a score of 306 in category 1a. This level shows that Indonesian students are still weak in demonstrating epistemic knowledge, distinguishing between scientific and non-scientific problems, identifying scientific evidence, interpreting data, taken from quite complex data sets, and evaluating experimental designs (OECD, 2019). Indonesia's scientific literacy capabilities are lagging behind neighboring countries such as Thailand, Brunei Darussalam, Malaysia, and Singapore.

The lack of development of students' scientific literacy can be influenced by several things such as the models or media used. As has happened in several schools in Indonesia, it shows that the learning process carried out is not optimal in involving students actively during learning, teachers deliver material using the lecture method and rarely use varied learning models and media. Efforts to increase students' scientific literacy can be done by improving the learning process in the classroom. The way to chance the learning process in the classroom is by choosing learning models and media that are suitable for the material to be taught and involving students more in the learning process. Science learning should use learning models and media that require students to actively discover the problems or phenomena that occur. One alternative for increasing students' scientific literacy is by implementing the Inquiry Discovery Learning learning model using comic media.

Maharani and Hardini (2017:552), that the Discovery Learning learning model is a learning model that emphasizes the importance of understanding ideas in a learning process whose application is that students are expected to be able to discover the concept or idea themselves. Therefore, this research uses a discovery learning model to increase students' scientific literacy because this model requires students to be active and discover learning concepts for themselves.

Apart from the learning models used to improve students' literacy skills, learning media also has an important role. In learning, many kinds of media have been developed, especially those that are more visual or audio-visual. Apart from the sense of hearing, learning uses more of the sense of sight, namely the eyes. Apart from that, media that is more supported to be developed supports enjoyable learning, so that the subjects studied will be more easily recorded in students' memories and attract students' attention to reading. One form of media in question is comics. The educational value of comic media in the teaching and learning process is beyond doubt.

Comic media in the teaching and learning process creates interest in students, makes the teaching and learning process more effective, can increase interest in learning and generate interest in appreciation. Sipayung et al, (2019), stated that the characteristics of comics contain images that are designed to be very attractive, so they have more appeal for students. By designing teaching materials in the form of comics, students' perceptions that learning is boring tedious and burdensome will slowly

disappear. In this way, comic-based learning media can be expected to be a remedy for students against burdensome complaints.

Based on the problems above, this research aims to determine the effect of the discovery learning learning model assisted by comic media on students' scientific literacy in heat material and its transfer at SMP Negeri 1 Suwawa. This research is important to do to improve students' scientific literacy.

METHODS

This research was carried out at SMP Negeri 1 Suwawa, Bone Bolango Regency. The research was carried out in the odd semester of the 2022/2023 academic year. The method used in this research was the True Experiment method. The research design used in this research was pretest posttest Control Group Design. The research was carried out in four meetings, the first meeting was a pretest, and the second, third and fourth meetings carried out learning and also provided a posttest.

The population in this study as all class VII students at SMPNegeri 1 Suwawa, a total of 91 students, male 45 and female 46. The samples taken in this research were representative of the population using cluster random sampling techniques. The sample used in this research was 60 students.

The data collection technique in this research uses a questionnaire (test) in the form of multiple choices (Multiple Choice) which is given to students. In this research thr pre-test is given before learning and aims to determine the effectiveness of learning. Meanwhile, the posttest is given after providing the learning material determine the extent of students' understanding of the learning material after the activity is carried out. Furthermore, the data analysis techniques in this research are carrying out normality tests, homogeneity tests, hypothesis tests, and N-gain tests.

Before conducting research, researchers first validate the device that will be used This validation aims to perfect the instrument created and assessed based on the criteria in the validation sheet. According to Ariani (2020), the validation process by validators helps increase the validity of research instruments. By involving parties who are competent in this field, researchers can ensure that the instruments used can actually measure the intended variables accurately. After obtaining a summary of the scores from the three validators several times revision stage, then the validity of the device can be decided by means of Compare the percentage price of each device. The validity coefficient for every learning tool obtained is very valid.

The research results obtained were in the form of student learning outcomes scores, which were obtained through a scientific literacy test which was obtained using an essay test, a scientific literacy test consisting of 20 multiple choice questions aimed at measuring students' scientific literacy in the material of heat and its transfer. This research was carried out at SMP N 1 Suwawa. This research used a pretest posttest Control Group Design. In this design, classes are selected at random and then given treatment using the Discovery Learning model assisted by comic media, in contrast the control class uses Power Point as a learning medium. After receiving treatment from both classes, both classes were given a post-test.

RESULTS AND DISCUSSION

The data from this research were obtained through a test instrument consisting of 20 questions given before and after treatment was given to students. The average value of the test instrument results is listed in Table 1.

Table 1. Results of Analysis of Pretest-Posttest Scores and Average Test Instrument Values

Class	Average Value of Test Instrument Results	
	Pretest	***Posttest***
Eksperiment	50,17	81,67
Control	45,33	53,50

In the first indicator, namely explaining scientific phenomena 7 questions are given, in the indicator identifying scientific issues there are 5 questions, and in the indicator using scientific evidence there are 8 questions. The average values of the indicators for the two classes are presented in Table 2.

Tabel 2. Average Value Of Indicators

Class	Explaining Scientific Phenomena	Identifying Scientific Issues	Using Scientific Evidence
Experiment	87,62	84,67	54,24
Control	61,9	54,67	33,03

Data on the average value of indicators for the two classes is presented in Figure 1.

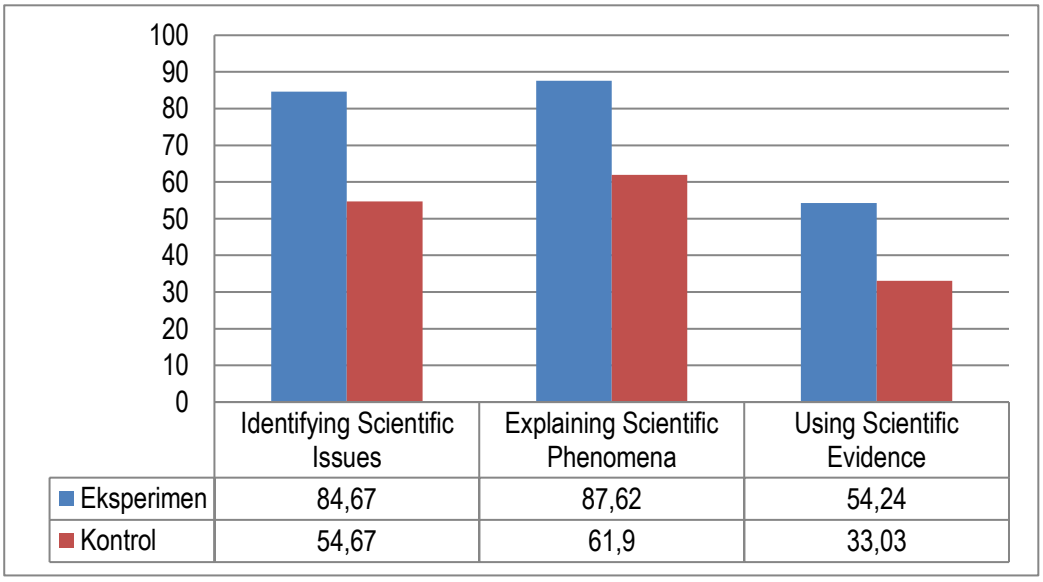

Figure 1. Graph of Average Value of Indicators

Normality Test Results

The data normality test aims to find out whether the data is normally distributed or not. In this research, the Kolmogrov Smirnov normality test formula was used to test the normality of data in both classes, namely control and experiment.

As is the decision making requirement for the normality test, if the significance value is more than (>) 0.05 then the data is normally distributed. Based on the values obtained for the experimental class the significance value is 0.354 > 0.05 in the control class, the significance value is 0.202 > 0.05. As required for decision making, the significance value for the experimental class and control class is > 0.05, so it can be concluded that the data is normally distributed for the experimental class and control class.

Homogenity Test Results

Based on the Output Table of the Test of Homogeneity of Variances, it is known that the Significance Value (Sig) of the variables in the Experimental Class Trial for the Pre-Test and Post-Test for students is 0.322. Because the Sig value is 0.32 > 0.05, as a basis for making it can be concluded that the variance of the pre-test and post-test data in the experimental class is the same or homogeneous.

Based on the Test of Homogeneity of Variances Output Table, it is known that the Significance Value (Sig) of variables in the control class experiment for pretest and posttest for students is 0.093. Because the Sig value is 0.093 > 0.05, as a basis for decision making, it can be concluded that the variance of the pretest and posttest data in the control class is the same or homogeneous.

Hypothesis Test Results

Based on the test requirements for normality and homogeneity in hypothesis testing which shows that the data is normally distributed and homogeneous, the test carried out to test the hypothesis is the t test. Hypothesis testing is a test used to see whether there is a significant influence and treatment given to the use of the Discovery Learning model assisted by comic media. The test used is the t test statistic.

As is the basis for decision making in the Independent Sample t test, if the value obtained is less than (<) 0.05 then H0 is accepted and H1 is rejected. Based on the interpretation of the independent sample test output table obtained, it is guided by the values contained in the Equal Variances Assumed table. From the hypothesis test data obtained, it can be seen that the Sig. (2-tailed) is 0.000 < 0.005, so it can be concluded that H0 is accepted and H1 is rejected. H0 means that discovery learning model assisted by comic influences students' scientific literacy.

N-gain Test Results

The n-gain test aims to see an increase in students' scientific literacy through pre-test and post-test. For the n-gain testing process, data from both classes is presented in Table.

Table 3. N-Gain score

Class	*N-gain* score	Criteria
Experiment	0,61	Medium
Control	0,25	Low

Based on this data, the results of calculating N-gain data from the experimental class and control class are included in the medium and low categories respectively. The research carried out is the influence of the Discovery Learning learning model assisted by comic media on students' scientific literacy in the material of heat and its transfer. This research took class VII as the subject population.

The aim of this research was to determine the effect of using the Discovery Learning learning model assisted by comic media on students' scientific literacy in the material of heat and its transfer.

Before this research was carried out, the researcher first prepared an instrument that had been validated by the validator.

Learning activities were carried out in three meetings over two weeks for each class, with a time classification of two lesson hours (2 x 40 minutes). At the first meeting before being given treatment, students were first given a pretest, after that they entered the material discussing heat, the influence of heat. regarding changes in temperature, the second meeting discussed the influence of heat on the shape of objects, the black principle and the third meeting discussed heat transfer and gave a posttest. The learning process for the first, second and thirtd meetings in the experimental class used the discovery learning learning model assisted by comics, while in the control class used Power Point (PPT).

In the learning process, after being given an apperception, the enthusiasm of students has begun to appear because the majority of students respond what they have observed, as explained by Sudarti (2014), giving apperception before entering the core learning activities can motivate and give enthusiasm to participate. Purwanto (2022) also added that teachers carry out an apperception at the beginning of the lesson to help attract students' attention by taking one unique event in each meeting related to the sub-material being discussed.

Ward, students were directed to form 4 groups to share comics as a learning medium. Students' enthusiasm increases when they are required to read comics about heat that have been distributed because in the comics, there are pictures that make students enthusiastic about participating in learning. In Khoerunnisa Nursho seen's research (2017), comics as a science learning medium can increase students' interest learning.

When distributing comics, researchers use cellphones and share comics as a learning medium via Shareit to share them with other friends. Apart from comics, cellphones are also a tool that can make students feel enthusiastic and more interested in learning. The sense of interest that students have is important during the learning process. A boring learning process can cause a lack of intensity of attention and interest in students and will result in less than optimal learning. This is in accordance with Gunaidi (2021), cellphone comics can be used as a tool that attracts students' attention. The use of visual elements, narration and light language in Comics can make learning material more interesting and easy for students to understand, so they can be more motivated to learn.

In learning, the teacher is still the main player in the learning process and students are not fully involved. It still makes students tired and does not foster students' curiosity. Therefore, teachers must try to create learning from passive learning to active and creative learning. According to Dananjaya (2023), teachers can create active learning by increasing student interaction and participation in the learning process. By encouraging questions, discussion, and creative activities, teachers help students actively engage in understanding the subject matter.

In the book written by Ester Reni Sawitri with the title discovery learning model assisted by comic media to increase student interest and learning outcomes, it is said that one way that can be used to enter environmental discovery learning is the use of comics. Comics are very popular reading, currently comics are one of the most popular reading among children and teenagers. Comics are indeed essential reading for children and teenagers, apart from the stories being fun to read, in the comics there are also interesting pictures to support the readers' hearts, especially students. Comics are dominated by images that seem to speak and these images form a narrative in the comic story. According to Narestuti, et al (2021), comics rely on pictures to convey material that can help students

easily understand and understand the content of the material in them. This makes comics very effective in presenting strong visualizations on a material topic.

The comics referred to in this research are comics in the form of pictures and stories related to heat material and its transfer. In this research, the author uses a discovery learning model assisted by comic media to increase students' scientific literacy so that students do not only receive information from the teacher but are active and creative in searching for information to discover new concepts themselves. In this way, it will be easier for students to embed it in their minds if students are given the opportunity to express it in the form of pictures.

After conducting research, data was obtained on students' learning outcomes or scientific literacy abilities before being given treatment and after being given treatment. Based on the results of the analysis of the average value of the test instruments listed in Table 10, the average value of the pretest results for the experimental class was 50.17, while for the control class it was 45.33, the average value of the posttest results for the experimental class was 81.67. in the control class it was 53.50. Based on the average value obtained, it shows that there are differences before and after being given treatment from each class. Learning in the experimental class using the discovery learning learning model assisted by comic media is more significant than learning in the control class which does not use comics or only uses PPT. These results indicate that the learning model and media used in the experimental class have a significant influence on increasing students' scientific literacy.

The analysis of the average value of scientific literacy indicators from the two classes listed in the diagram shows that the average value of scientific literacy indicators in both classes has increased. However, the experimental class experienced a higher increase than the control class. Learning in the experimental class using the discovery learning model greatly influences students' scientific literacy abilities. Learning using the discovery learning model directs students to discover concepts through various information or data obtained through observation or experimentation. As stated by Maharani & Hardini (2017), discovery learning is a process of implementing learning that conveys the material incompletely or only as an illustration, because the discovery learning model requires students to be actively involved in the learning process and discover a concept for themselves. Apart from that, according to Prasetyo (2021) students tend to be more motivated when they are given the opportunity to become inventors themselves. Discovery learning activities provide them with challenges and freedom, creating a sense of curiosity and intrinsic motivation to learn.

The first indicator is identifying scientific issues. In this indicator the average value for the experimental class is 84.67 and for the control class it is 54.67. Students can achieve this second indicator because this indicator is related to daily activities so that students can identify scientific issues. This is in line with research (Latip & Faisal, 2021) that shows that learning in the from of pictures has an influence on increasing students scientific literacy. Android-based animation and media.

The second indicator explains scientific phenomena. This indicator is the highest among the three scientific literacy indicators, where the average value of this first indicator is 87.62 in the experimental class and 61.9 in the control class. Students can achieve the first indicator because of the discovery learning model and comics presented by researchers as sources or references in learning. students can answer because students can understand and explain the correct concept. This is by Izmi (2023), combining the discovery learning model and the use of comics provides visual elements that can help students understand concepts better. The images in comics can be a visual aid that facilitates understanding and arouses students' curiosity.

Explaining this correct scientific phenomenon is also due to the comic media containing problems that are combined with the story line, making it easier for students to imagine through the pictures and stories in the comic in their way. This is in line with McCloud (in Nurgiyantoro, 2013, p. 411) that comics ith sequential images are a superior means of communication. It can be used to convey scientific messages that are not stories, but are presented like stories. The combination of images and story lines in comics can be a in extraordinary force for students to read, comics can also make it easier for children to imagine the content and stories being told. Digital media can also increase students' scientific literacy (Jalil et al., 2019).

The third indicator is using scientific evidence. In this indicator the average value for the experimental class is 52.24 and for the control class it is 33.03. Students get low scores on this indicator because students still have difficulty distinguishing arguments and drawing conclusions. This is in line with research by Rusilowati et al. (2016), that various factors indicate a lack of student literacy skills, including students' skills in critical thinking, inductive deductive reasoning, analyzing and analyzing or using scientific data are still lacking.

Based on the results of data analysis for the two sample groups through statistical normality testing, the data was obtained for the experimental class, the Sig 2 Tailed value was 0.354 > 0.05, while for the control class in the table the Sig 2 Tailed value was 0.354 > 0.05. So, it can be concluded that the research data for the experimental class and control class are normally distributed.

As for the homogeneity test, it is known that the significance value (Sig) of the variable in the experimental class for pretest and posttest for students is 0.322. In the control class for pretest and posttest for students it was 0.093. Because the significance value in the experimental class is 0.322 > 0.05 and in the control class it is 0.093 > 0.05, it can be concluded that the variance of the pretest and posttest data in the experimental class and control class is the same or homogeneous.

In the hypothesis test test in Table 16, it shows that the hypothesis test calculation has a significance value of 0.000 < 0.05, so it can be concluded that H0 is accepted and H1 is rejected. This shows that there is a significant influence on scientific literacy between the experimental class which uses comic media and the control class which does not use comics. This is in accordance with Marlina (2020), the use of comic media can have a positive impact on students' scientific literacy, providing a richer learning experience and supporting understanding of scientific concepts in an interesting way.

The results of the gain analysis show that the results for the experimental class obtained a value of 0.61, meaning that the experimental class experienced an increase in scientific literacy in the moderate category because 0.3 < g 0.7. In the control class, a value of 0.25 was obtained, meaning that the control class also experienced an increase in scientific literacy, but the increase was in the low category because g < 0.3.

CONCLUSION

Based on these data, it shows that the experimental class experienced a higher increase compared to the control class. This is also reinforced by the results of the gain analysis in the experimental class which experienced an increase of 0.61 in the medium category, while the control class experienced an increase of 0.25 in the low category. In the results of hypothesis testing there is a significant difference between the experimental class and the control class. This is in accordance with the hypothesis testing criteria which shows that the significance value is 0.000 < 0.05. With the results of the analysis that has been obtained, it can be concluded that there is an influence of the use of the

assisted discovery learning model comic media on students' scientific literacy. In this case, the treatment using the discovery learning learning model assisted by comic media in the experimental class had a significantly higher increase compared to the control class which did not use comic media.

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