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THE USE OF MULTIMEDIA INTERACTIVE TO IMPROVE STUDENT'S SCIENCE LITERACY IN THE NEW NORMAL ERA

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Abstract: This study aims to describe the influence of interactive multimedia on students' science literacy in the new normal era and student responses after learning using interactive multimedia on energy flow materials. The type of research used is pre-experimental design research through one group pretest-postest design. The subjects in this study were 31 students of class VIIC in Muhammadiyah Junior High School 2 Taman Sidoarjo, even semester of the 2021/2022 academic year. Data collected by techniques use observation, tests, and questionnaires. Research instruments include observation sheets for the implementation of learning, science literacy tests, and student response questionnaire sheets. The data were analyzed descriptively using the N-Gain test, the implementation observation sheet, and the response questionnaire. The results showed that the implementation of learning using interactive multimedia on energy flow materials got the criteria for being carried out properly. Students' science literacy skills increased from an average pretest score of 38.5 to 81 on the posttest, with an average N-Gain score of 0.69, categorized as moderate. The learning process and the use of interactive multimedia applications on energy flow materials were also responded to positively by students. Based on the description above, learning using interactive multimedia on energy flow materials can improve students' science literacy skills in the new normal era.

Keywords: *Science literacy, Multimedia Interactive, Energy Flow.*

INTRODUCTION

Since 2020 Corona Virus disease 2019 (Covid-19) has become a pandemic that has spread in various parts of the world. Covid-19 is a new disease that has not been identified before. Common symptoms in people exposed to Covid-19 are acute respiratory problems such as fever, cough, and shortness of breath. The health emergency established by the World Health Organization (WHO) on January 30, 2020, is troubling the world community. Since the first Covid-19 case in Indonesia was reported on March 2, 2020, until now, the number of cases of covid-19 spread is still high [1].

The existence of the Covid-19 pandemic has impacted aspects of life, one of which is education. Implementing the new normal policy by the government is a solution that can be taken for Indonesian education today. Guidelines for implementing limited face-to-face and online learning (Hybrid Learning) during the 2020/2021 school year pandemic have been issued by the Ministry of Education and Culture along with three other ministers [2]. Hybrid learning combines face-to-face learning in the classroom (luring/offline) and internet-based distance learning (daring/online). Learning is carried out in the classroom and partly online at the same time [3]. The use of technology and communication in hybrid learning is carried out to meet educational standards so that learning can be realized during a pandemic [4]. In practice, both teachers and students experience obstacles during hybrid learning. Some of the obstacles that occur include internet network constraints [5], the process of limited learning with a lot of material, the implementation of practicum and student assessment that is not optimal [6], direct interaction between teachers and students not optimal, difficulty concentrating during learning [6].

With conditions like this, students must also have 21st-century science literacy skills. Science literacy is scientific knowledge and the ability to identify and explain scientific phenomena, draw conclusions based on facts, understand science and technology to shape the environment, nature, and culture, and overcome scientific problems. There are three large dimensions in measuring science literacy: science content, processes, and contexts [7].

The PISA assessment uses a scale with an average score of 500 and a standard deviation of 100 for all three categories. Based on the results of the PISA in 2018, the average science literacy score in Indonesia is only 396. Indonesia is ranked 71st out of 79 participating countries [8]. Since joining in 2000, Indonesia has remained at the bottom. It shows that Indonesian education still needs to achieve the international standards required by the global market. Students' low science literacy ability of students makes students less responsive to overcoming changes and problems in the surrounding environment [9]. It is due to the low curiosity of students [10], students tend to be more theoretical and have not been able to relate various concepts in science that are

interconnected [11], as well as the lack of the role of the teacher as a facilitator in the formation of literacy students [12].

The above facts are also supported by the results of an interview with a science teacher at Muhammadiyah Junior High School 2 Taman Sidoarjo. The teacher stated that student learning outcomes on the Energy Flow material still needed to be higher. As many as 70% of students scored below the minimum completion criteria on the Energy Flow material. The minimum completion criteria for science subjects at Muhammadiyah Junior High School 2 Taman Sidoarjo is 75. The teacher added that learning is more teacher-centered. Teachers only use learning media in the form of images and captions displayed in front of the class using LCDs and projectors.

During the science learning process, students have high hopes for teachers to provide new learning media that is not boring. The role of learning media as information-carrying technology can be utilized for the learning process. Interactive multimedia is one of the media that can use gadgets in the form of digital applications [12]. Digital applications significantly implement didactic principles and achieve educational goals [13]. Students prefer to learn something facilitated by animation rather than facilitated by other representations [14]. Media use in learning can be one of the alternatives for science learning in the current New Normal Era. It is supported by the results of Rohmawati's research [15] that there is an increase in students' science literacy after using media in the context of socio-scientific issues.

The importance of the research to be carried out in line with the demands of needs in the 21st century requires students with science literacy skills. Students are required to be able to apply their scientific knowledge in solving problems that exist in everyday life [16]. Therefore, the learning process using interactive multimedia in conditions of limitations in this new normal era is expected to make students more active. During the learning process, students can solve problems close to daily life, balanced with science literacy skills that students must possess. Based on this presentation, it is necessary to conduct research using Interactive Multimedia on Energy Flow material in the New Normal Era at Muhammadiyah Junior High School 2 Taman to improve students' science literacy and determine student responses after carrying out these learning activities.

RESEARCH METHODS

The type of research used is a pre-experimental design with a One-Group Pretest-Posttest Design. The research design is described in Table 1. The subjects of this study were class VIIC students at Muhammadiyah Junior High School 2 Taman totaling 31 students consisting of 15 male and 16 female students. The study subjects were determined using the Purposive Sampling technique, where sampling was carried out based on the lowest IPA value among other classes.

Table 1. The Research Design

Pretest	Treatment	Posttest
O_1	X	O_2

O_1 : Pretest results to measure students' science literacy before being given treatment
X : Interactive multimedia usage treatment
O_2 : Posttest results to measure students' science literacy before being given treatment[17].

Procedure

The data collection used in this study used observation, written tests, and response questionnaires. In this study, tests before (pretest) and tests after (posttest) were carried out learning using interactive multimedia. The test aims to see an improvement in students' science literacy skills. Student response questionnaires are given after the learning is carried out. It aims to determine students' responses to learning using interactive multimedia applications on energy flow materials. In addition, observations were also made during the learning.

Instruments

The learning implementation instrument consists of 10 points of a statement covering the preliminary aspects of 3 points, the core aspects of 4 points, and the closing aspects of 3 points. In the pretest and posttest test sheets to improve science literacy, there are 13 items of description questions oriented towards three indicators of science literacy competence, namely explaining the phenomenon scientifically, evaluating and designing scientific investigations, and Interpreting data and evidence scientifically. The student response questionnaire was presented as description questions related to learning using interactive multimedia and statements related to the interactive multimedia application.

Data Analysis

Learning implementation data are analyzed descriptively and quantitatively. Analysis of students' science literacy prestest and posttest data using N-gain. The n-gain analysis measures the magnitude of the increase in prestest and posttest results. The questionnaire of student responses to learning using interactive multimedia is analyzed descriptively and qualitatively.

RESULTS AND DISCUSSION

During the learning process, observations were made about implementing learning using interactive multimedia on energy flow materials. The results of the implementation of learning using interactive multimedia on energy flow materials are presented in Table 2.

Table 2. Results of Observation of Learning Implementation

Assessed Criteria	Questionnaire score	
	M1	M2
Preliminary Activities		
Displaying socioscientific-related phenomena of issues	2	3
Motivation	1	2
Delivery of learning objectives	2	3
Core Activities		
Organizing students to learn and conduct discovery activities	2	3
Guiding investigation or discovery, or problem-solving activities individually or in groups	2	3
Guiding students to develop and present work and present the results of activities.	2	3
Guiding students to analyze and evaluate the process of investigation or discovery or problem-solving that has been carried out	2	3
Closing Activities		
Associating the acquired concepts with motivational questions that have been carried out at the beginning of learning	2	3
Guiding students to make conclusions	2	3
Reflection	3	3
Sum	20	29
Max score	30	30
Percentage (%)	66.7	96.7
Criteria	Good	Very good

Information:
M1: Meeting 1 M2: Meeting 2

Based on table 2, there is an increase in each meeting. The study results obtained a percentage at the first meeting of 66.7% with good criteria, then an increase in the second meeting of 96.7%, which was included in the very good criteria. Observational data related to the learning process using interactive multimedia on energy flow material is observed by an observer. Learning using interactive multimedia that has been carried out consists of three kinds of activities, namely introduction, core, and closing.

Learning activities using interactive multimedia on energy flow materials are applied with a 5M scientific approach included in the core activities. Learning by applying the 5M scientific approach will make students understand and get to know various materials based on a scientific approach and realize that information can be centered from many sources, both from teachers, books, the internet, and the surrounding environment [18].

In the preliminary activity, researchers presented phenomena related to socio-scientific issues contained in interactive multimedia, providing motivation and conveying learning objectives. Activities displaying phenomena related to socio-social issues and the delivery of learning objectives have increased in each meeting. The motivation aspect has also increased, but from the lowest assessment score, which is from a score of 1 to a score of 2. The existence of a score of 1 in the aspect of motivation in this first meeting is because students can still not answer spontaneously when the researcher asks a question related to a problem that must be solved. Then in the second meeting, the motivational aspect increased because students could already provide answers in the form of alternative solutions when researchers gave questions related to a problem.

It shows that after learning using interactive multimedia on energy flow materials with a 5M scientific approach, there is an increase in student understanding and motivation. Learning using the 5M scientific approach can allow students to assimilate and apply concepts and help improve students thinking skills [18]. A Socicientific issues feature and an Exploration feature stimulate students to actively discuss in groups and analyze problems displayed in interactive multimedia. The use of interactive multimedia in learning leads students to focus on content. The complete media elements in interactive multimedia provide an opportunity for users to interact interactively through available features [19].

The core activities consist of several stages, namely 1) Organizing students to learn and carry out discovery activities, 2) Guiding problem-solving activities in groups, 3) Guiding students to develop and present the results of activities, and 4) Guiding students to analyze and evaluate the problem-solving process. In carrying out each stage of learning, researchers use a 5M scientific approach, namely 1) Observing, 2) Questioning, 3) Collecting information, 4) Associating information, and 5) Communicating. Before the core activities are carried out, researchers guide using interactive multimedia

applications. Students admitted they were enthusiastic when using interactive multimedia applications because they were using them for the first time. Students ask a lot about using interactive multimedia features that look attractive. Learning using interactive multimedia makes students more interested in learning [20]. The use of media can make students interact directly and provide interesting shows. There are animations in it, making students interested in following the teaching and learning process, thus generating new interest, motivation, and stimulation for students to learn [21].

In the Socicientific issues feature, students were asked to observe videos related to rat pests in the fields, which are a problem for farmers. Students in groups analyze the problem and are asked to provide alternative solutions to the problem. Through the Exploration feature, students are asked to provide alternatives and choose the best solution based on the disadvantages and advantages of each alternative solution. Students collect information related to it from various sources, whether from interactive multimedia, textbooks, the internet, etc. The availability of various features in interactive multimedia stimulates students to carry out activities of collecting information and associating it actively. Learning using Socio-scientific Issues in interactive multimedia can improve students' ability to make decisions related to social problems related to science [15].

The implementation of learning using interactive multimedia on energy flow materials obtained excellent results. In other words, interactive multimedia with a 5M scientific approach was carried out well to support the research results, namely the results of the student's science literacy test. Good science literacy test results are obtained if interactive multimedia learning can occur properly. The results of the analysis of the student's science literacy ability test are shown in Table 3.

Table 3. Result of Student's Science Literacy Test

Score		N-Gain Score	Category
Pretest	Posttest		
38.5	81	0.69	Medium

The student's science literacy test is carried out twice, namely before and after learning activities are carried out. The tests conducted before the learning activities aim to measure the initial science literacy of students. Meanwhile, the test carried out after the learning activity aims to determine the improvement of students' science literacy after learning using interactive multimedia on energy flow materials.

Based on Table 3, students' initial science literacy skills on energy flow materials in this study were shown through pretest results. Based on the results of the pretest, it can be said that all students still need to meet the Minimum Completion Criteria that have been set by the school, which is 75. The average score of the pretest results obtained was only 38.5. Meanwhile, the student posttest results obtained showed a significant increase from the previous pretest results, with an average posttest score of 81. The data was then analyzed using the normalized N-Gain Test. Data from the student science literacy test analysis obtained an average N-Gain result of 0.69 with a moderate category.

Learning interactive multimedia on energy flow materials can improve students' science literacy skills. Students' science literacy skills are trained during interactive multimedia learning activities, namely conducting an investigation or problem-solving activities and providing alternative solutions to problems in the surrounding environment regarding rat pests in the rice fields. There is an increase in students' science literacy skills after the application of interactive multimedia to energy flow materials. The paired t-test results prove this on the pretest and posttest test scores of students' science literacy ability. Before that, a normality test was carried out a determinant if the data obtained was normally distributed. The result was a significant level of >0.05, meaning the existing data is normally distributed. Then a paired t-test is performed, which is written in the following Table.

Table 4. Paired t-Test Results

	Mean	t	D*f*	Sig.(p)
Pretest-Posttest	-42.45	-30.98	30	0.000

Based on Table 4, the t-test has been carried out with the signification value is 0.000<0.05. So that H0 is rejected, and Ha is accepted [22]. So it shows a significant difference between the pretest and posttest values of science literacy.

The category of improving students' science literacy skills can be obtained by analyzing N-Gain scores in each indicator of science literacy competence. The following is the data from the analysis of N-Gain scores on science literacy competency indicators.

Based on Table 5 above, it is known that each indicator of science literacy has increased relatively high. Of the three indicators of competence, explaining the phenomenon scientifically is the indicator with the highest increase. As for the other two indicators of competence, they are in the moderate category.

The effectiveness of learning using interactive multimedia on energy flow materials can be seen by improving students' science literacy skills. The student science literacy test results showed that after learning interactive multimedia on energy

flow materials, there was an increase in the average value of the pretest and posttest with an average N-Gain score of 0.69 in the moderate category. The data shows that learning using interactive multimedia on energy flow materials effectively improves students' science literacy. These results are in line with several previous studies on learning using interactive multimedia, which was proven to make students trained in improving science literacy [23]. In addition, research by Winasti, Soetisna, & Hindriana [24] also showed that students' science literacy improved after implementing interactive multimedia-based learning.

Table 5. Result of Indicator's Science Literacy

Competency Indicators	Score		N-Gain Score
	Pretest	Posttest	
Explaining the phenomenon scientifically	29		.75 65.38 0.71
Evaluating and designing scientific inquiry	29		.59 63.49 0.67
Interpreting data and evidence scientifically	29		.64 60.48 0.61

The difference in the increase in students' science literacy pretest and posttest scores can be caused by several internal factors, namely students' interest in learning and the learning model used. Based on its function, multimedia can foster new interest, great attraction, and attention to a learning topic. The passive nature of students can be resolved by using appropriate and diverse multimedia [25]. The interactive multimedia contains energy flow material by presenting social and science issues (Socio-scientific Issues) close to student life. Students are led to be able to relate phenomena that occur in real life with science concepts in a fun way. The concept can train the dimensions of students' science literacy competencies. Learning is expected to be more meaningful for students by raising real-nature issues close to daily life and applying issues that can provide direct experience to students. Understanding the nature of science and technology and its relation to community problems is the focus of scientific literacy.

Three dimensions of scientific competence are indicators of students' scientific literacy assessment: identifying scientific issues, explaining scientific phenomena, and using scientific evidence[26]. There was a fairly high increase in the three indicators, as can be seen from the average prestest and posttest scores and the N-Gain results of each indicator in table 11. The highest increase was experienced by the indicator explaining the phenomenon scientifically with an N-Gain value of 0.71 thanks to the high category. The existence of science literacy activities supports the increase through exploration and understanding of features of the material available on interactive multimedia on energy flow materials. It means that after learning using interactive multimedia on the material of the energy flow, students can explain the phenomenon scientifically well.

Meanwhile, the indicator interprets data and evidence scientifically that the value of N-Gain of 0.61 is of the medium category. Science literacy can be interpreted as applying science to life problems, not just reading or knowing science [27]. The increase in these competencies shows that after using interactive multimedia, students can interpret the scientific evidence needed in scientific investigations to make conclusions [28].

The improvement of students' science literacy skills can be seen from the responses given by students sourced from the response questionnaire after conducting learning using mmi-oriented energy flow material, and positive results were obtained—student responses regarding learning using interactive multimedia on energy flow materials, as shown in Table 6.

Table 6. Students Responses To Interactive Multimedia Learning On Energy Flow Materials

No.	Students Responses
1	Learning using interactive multimedia is fun and easy to understand
2	Attractive and easy-to-use interactive multimedia app
3	Using interactive multimedia applications helps in understanding the concept of energy flow
4	Using interactive multimedia applications helps practice applying concepts to solve science literacy problems
5	Interactive multimedia applications are not yet accessible to iOS users.

Table 6 shows that students find learning using interactive multimedia on energy flow materials fun, easy to understand, interesting, and useful in understanding concepts and practicing students' science literacy. But there are obstacles to using the application. Namely, the interactive multimedia application has not been accessible to users other than Android. Some students who are not android users have to join with other friends. In addition, learning using interactive multimedia applications on energy flow materials runs smoothly.

The pandemic situation has resulted in the government implementing new policies in the learning process. The current new normal era requires learning to be carried out in a limited

manner, both in terms of time and the number of students. This condition makes the student's learning process constrained, where learning is carried out in a limited time, making students more passive because the teacher uses the lecture method for time efficiency. So, it impacts the need for an optimal learning process in reviewing the entire material studied. In this case, multimedia use can help with the problem of space limitations, time, and sensory power [25]. Multimedia combines various media in the form of images, writing, video, and animation manipulated digitally to display pleasant projections, have aesthetic value and maintain visual consistency [29]. Multimedia contributes significantly to the effectiveness of the teaching and learning process and the delivery of messages and content so that students are helped in improving their understanding and thinking ability.

Multimedia provides opportunities for students to improve their understanding of concepts by discussing in groups [30], learning to provide solutions to the problems presented, and playing an active role in learning. The combination of discussions between friends and research and problem-solving can help students develop thinking and social skills[31]. In addition, the interactive multimedia used is flexible. It can be learned independently by students outside of class hours.

CONCLUSION

Based on the results and discussion of research that has been carried out. There was a significant increase in the science literacy skills of grade VII C students of SMP Muhammadiyah 2 Taman after interactive multimedia was applied to energy flow materials, with an average pretest score of 38.5 to 81 on the average posttest score. Improving students' science literacy skills has an N-Gain index score of 0.69, thanks to the moderate category. Improving students' science literacy skills is also supported by implementing learning that is carried out properly. The application of learning using interactive multimedia received a positive response from students. Students find learning using interactive multimedia on energy flow material fun, interesting, and easy to understand and use, helping to understand the concept of energy flow and practicing science literacy. The results of this study imply that teachers can find out the level of science literacy of their students so that they can design the right learning model using various interesting media so that students' science literacy skills become even better.

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