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THE EFFECTIVENESS OF VIDEO-ASSISTED PROBLEM-BASED LEARNING MODEL ON STUDENTS' SCIENCE LITERACY SKILLS OF VIBRATION AND WAVE MATERIAL IN SMP NEGERI 27 MEDAN.

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ABSTRACT

This study aims to determine the effectiveness of the video-assisted PBL learning model on students' science literacy skills on vibration and wave materials. This research used quasi experiment with Pretest and Posttest Control Group Design. Sampling was done by Random Sampling technique. The sample in this study consisted of 2 classes, namely class VIII-4 (Experiment Class) with PBL Learning model assisted by Video and VIII-5 (Control Class) with Conventional learning model. Data collection with tests and documentation. The average data of pretest and posttest learning outcomes in the experimental class were 34.84 and 63.87, respectively, and in the control class 25.06 and 42.96. Data were analyzed with Independent Sample t-test using SPSS Version 21. Based on hypothesis testing, it was found that the PBL learning model assisted by video was effective in using the science literacy skills of students on vibration and wave material in class VIII SMP Negeri 27 Medan in the 2023/2024 academic year. In the experimental class, the achievement of the learning level after being treated with the Video-Assisted PBL model was achieved with an experimental class N-gain value of 45% in the sufficient category. And in the control class using the conventional model, the N-gain obtained was 24% with a very low category.

Keywords: PBL, Science, Literacy

INTRODUCTION

The educational process is an activity where all components of education are mobilized by educators with the aim of achieving educational goals. The way the educational process is implemented greatly affects the quality of the results in achieving educational goals. The quality of the educational process is characterized by two aspects, namely the quality of its components and the quality of its management. These two aspects are interdependent. Although the components such as the availability of facilities and infrastructure, adequate costs, etc. are very good, and even if they are supported by reliable management, the achievement of goals will not be maximized. Similarly, proper management in poor conditions leads to suboptimal results (Ilham, 2019).

The Law on the National Education System No. 20/2003 states that education is a learning process in which students participate actively with the aim of maximizing the development of skills, spirituality, discipline, morality, intelligence, and good character. The intentional and purposeful teaching of the knowledge necessary to succeed in personal, social, and national life is known as education. In addition to being grounded in Pancasila and the 1945 Constitution of the Republic of Indonesia, National Education is also influenced by religious values and Indonesian culture and adapts to the changing demands of society.

The 21st century is an era in which technology, science, and research are progressing at a rapid pace. The progress achieved in the development of advanced technologies, especially in the information and communication sector, especially in the innovation of wireless network systems, has significantly facilitated social interaction, human movement, and relationships between individuals. With this wireless network, everyone can quickly access a variety of information through their cell phones. (Oetomo, 2002). Millennials, who came of age in the late 20th and early 21st centuries, have embraced advances in information and communication technology more rapidly than Generation Z did. Both generations embody the technology era, almost all aspects of business are conducted through technology-based media, where they engage in various activities such as reading, searching for information, enjoying music, and seeking answers to academic questions, to expressing their creativity and art using smartphones. Teaching in the 21st century places a strong emphasis on the need for educators to adapt lesson plans, pedagogical approaches and learning models according to students' needs. Teachers must now be imaginative and original in their teaching methods, as they can no longer rely solely on conventional learning strategies, constantly developing their knowledge and skills to be able to utilize technology to present activities.

Today's technological advancements are characterized by the widespread deployment of the internet, providing convenience in communication, business transactions, and ensuring that services and products can be accessed easily wherever and whenever needed. The internet also makes it easier to find information, allowing access to the latest news, and quickly understand events in different locations. In the context of learning, technological developments make it easier for students to access various information, including learning materials and the latest news. According

to Prihantini (2020), the current 21st century can be considered a global era with a generation often referred to as the Net generation. This global era affects the condition of society which has global and multicultural characteristics. A comparison between current students and previous generations shows significant differences in terms of information access, where students today face great pressure to obtain information quickly, even before it is delivered by their educators (Kartini et al., 2022).

Science literacy is one of the most important competencies for learners to succeed in the Industrial Revolution 4.0, in addition to technical skills, social competencies/skills and attitudes/character. Science literacy plays an important role in advancing individual abilities, including the ability to think critically, analyze information carefully, and develop effective problem-solving mindsets. The initial concept of science literacy was introduced by Hurd in 1958. The term science iteration has been used to express the broad and overarching goals of science in education. The use of this term probably began in the 1940s with the work of James Bryant Conant (Holton, 1998) and was introduced in his 1958 article Science Literacy by Paul DeHart Hurd. Hurd explained that science literacy is an understanding of science and its application to social experience. Hurd argued that science plays a very important role in society. Personal decision-making must take into account the involvement of science and technology (Bybee et al., 2009). The four main components of science literacy are science knowledge, science competence, science application context and science attitude. Explanation of scientific phenomena, planning, analysis and interpretation of scientific data and evidence all fall under science competence.

In 2018, in Indonesia, the level of science literacy of students still showed a low level, indicated by the PISA score which was below the OECD average (487-489), with the average score in science reaching 396 based on the Program for International Student Assessment (PISA, 2018). In the PISA evaluation, Indonesia ranked 72 out of a total of 80 countries assessed (OECD, 2019). The PISA findings indicate the need to improve students' science skills in various aspects. Some factors that explain students' low science literacy include a lack of understanding of basic science concepts due to a lack of initiative to ask questions, a conventional approach to science learning, students' limitations in interpreting tables or graphs, lack of attention to reading and writing skills as essential skills, and students' lack of interest in reading and repeating learning materials (Firda & Rizka, 2023). As a pillar of education, teachers need to understand and interpret science learning with a focus on scientific skills, not just on understanding concepts. Science literacy-based learning also requires teachers to present learning methods that are scientific, proactive, creative, innovative, and related to the environment and students' daily lives (Susilowati & Saputra, 2022).

Based on interviews conducted with 1 science teacher, namely Mrs. Erlina Jumiati, S.Pd. who teaches in class VIII at SMP Negeri 27 Medan in the 2023/2024 academic year, it is known that it has been using the Merdeka Curriculum since 2022. The Merdeka Curriculum provides freedom of learning and the ability of students to

explore knowledge from various reliable sources available. However, the implementation of this curriculum is not yet fully optimal because teachers still often use conventional learning methods and tend to maintain a teacher-centered approach. This condition has an impact on the difficulty of understanding science material by a number of students. Science teachers interviewed at SMP Negeri 27 Medan also stated that they had heard about science literacy from the internet, but in the learning process it had never been applied. The teacher of SMP Negeri 27 Medan helped students to recognize scientific concepts through classroom learning. The science teacher also said that the way the mother did it, namely by identifying students seen from their ability to respond to questions from the teacher and activeness during learning conducted in class. Most of the material provided is also only from textbooks without any additional learning resources provided. From the statement of the science teacher of SMP Negeri 27, it can be stated that the science teacher at the junior high school still does not know what science literacy is, and of course the assessment of science literacy in the school, especially in class VIII, has never been done. To address this, a student-centered learning model is needed to develop students' science literacy.

The PBL (Problem-Based Learning) model is a learning approach intended to support the growth of students' intellectual abilities, including critical thinking, problem solving, and teamwork. Problem solving in this model is adapted to the context of students' daily lives, where learning begins by presenting a problem to them. The steps in the PBL model include an initial step where students are given a problem related to real life. The first stage in PBL is problem identification, where students are asked to discover the concept of the problem at hand. The second step involves teacher guidance to guide students in the learning process. In the third stage, the teacher acts as a facilitator, providing support for problem-solving activities, and finding answers. In the fourth stage, students are asked to write a report on the problem solving they have done. The fifth stage involves re-evaluating the problem-solving process (Tamam, A., & Subrata, H., 2022). PBL emerged as a model in alternative learning that effectively increases students' learning enthusiasm, inquiry skills, and scientific reasoning skills (Anila, et al., 2015). Simanjuntak, et al. (2023) explained that the improvement in the ability to interpret scientific data and evidence occurs because students have been trained during the learning process in the third stage of PBL, where they seek information and conduct investigations. Students become more proficient in identifying, understanding problems, and scientific phenomena that arise in everyday life through the use of PBL models.

Vibrations and waves are fundamental concepts in physics that play a crucial role in the understanding of various natural phenomena and technological applications. Vibration and wave materials not only provide insight into the oscillatory movement (repetitive back-and-forth motion around a point or its equilibrium position) of particles or objects, but also provide avenues for a deeper understanding of the fundamental properties of matter and the way energy moves through space and time. An understanding of vibrations and waves is not only limited to the world of

science, but also has a direct impact on everyday life and technological advancement. By continuing to explore and understand these concepts, we can continue to move towards a deeper understanding of the universe and how we interact with our surroundings. So that in the learning process regarding vibration and wave material requires reasoning and creative thinking to make it easier to understand the material. The application of the Problem Based Learning (PBL) model has proven effective in improving students' scientific literacy, supported by a number of studies. Alatas and Fauziah (2020), for example, there is an important impact between students who use a scientific approach and those who use the PBL model.

It has been proven that PBL is effective in improving students' science literacy in four domains, including competence, knowledge, context, and attitude. Another study by Widiana et al. (2020) stated that the PBL model was able to improve the science literacy skills of grade XI students in the affective, cognitive, and psychomotor domains. Astutik and Jauhariyah (2021) also concluded that the use of PBL in physics learning has a significant impact on learning outcomes, critical thinking, higher order thinking, conceptual understanding, and science literacy. Kritis (2020) stated that students' critical thinking skills can be improved by using a literacy-based PBL model. Meanwhile, Dewanti et al. (2022) stated that students' science literacy in science learning was positively and significantly affected by the application of the Problem Based Learning model combined with the mind map approach.

PURPOSE

The aim of this research is to determine the effectiveness of the video-assisted Problem Based Learning model on students' scientific literacy in learning science on vibration and wave material and to find out which aspects of scientific literacy develop after students take part in learning using the video-assisted Problem Based Learning model on vibration material. and a wave in class VIII of SMP Negeri 27 Medan academic year 2023/2024

RESEARCH QUESTION

Is there any effectiveness of the video-assisted Problem Based Learning model on students' scientific literacy skills in learning science on vibration and wave material in class VIII SMP Negeri 27 Medan academic year 2023/2024

METHOD

This research is a quantitative study that adopts a positivism approach in methodology. Its main purpose is to investigate a predetermined population or sample. Data is collected using research instruments that have been prepared, and then analyzed quantitatively or statistically. The analysis aims to test the validity of the hypotheses that have been formulated previously (Sugiyono, 2019). Quasi-experimental quantitative research using a pretest and posttest control group design was the methodology used. Two classes were used in this study, namely the experimental class taught using the Video-Assisted Problem Based Learning (PBL) model, and the control class that was not given treatment with the video-assisted Problem Based Learning (PBL) model.

Random sampling is a sampling technique used in this study characterized by random sampling based on the existing

population (Hardan et al., 2020). In determining the sample, researchers and teachers work together to determine the sample by taking into account the similarity of abilities of the 8 existing classes. The results of the decision which became the research sample consisted of 62 students, where VIII-5 as a control class that did not receive treatment and VIII-4 as an experimental class with a video-assisted Problem Based Learning model. The material taught in both classes, namely vibration and wave material.

This study applied a Pretest-Posttest Control design involving two groups that had been previously selected. The initial purpose is to assess the initial condition of each group through a pretest, after which both groups are subjected to a treatment. In this study, two classes were used, namely class VIII-5 which acted as a control group and did not receive special treatment, and class VIII-4 which acted as an experimental group and received learning with a video-assisted Problem Based Learning learning model.

In validating the instrument, validity test, reliability test, differentiating power test, and difficulty level analysis were carried out. To assess construct validity, this study consulted with assessment experts based on the validity requirements of the test instrument, namely the validity coefficient obtained from rpbi compared to the Point Biserial rtable value with a significance level of 5% ($\alpha = 0.05$) with the criteria: if rpbi> rtabel, then the test instrument is said to be valid (Supardi, 2016). An assessment instrument item is considered good if it has a balanced level of difficulty, neither too easy nor too difficult (Solichin, M. 2017). The magnitude of the difficulty index ranges from 0.00 to 1.0. When the difficulty index reaches 0.00, this indicates that the question is too difficult, while a value of 1.0 indicates that the question is too easy. The items of assessment instruments that are considered good are those that have a medium level of difficulty, namely with a difficulty index value between 0.30 and 0.70 (Supardi, 2016). The measure of the success of an assessment instrument item in distinguishing between high and low skill level respondents is called the discrimination index or discriminating power. "D" stands for discrimination index, which ranges from 0.00 to 1.00. Items of assessment instruments with a discrimination index between 0.4 and 0.7 are considered satisfactory (Supardi, 2016). An assessment instrument item is considered reliable if when used to measure at different times, the results remain the same (Supardi, 2016).

Data analysis techniques in the form of descriptive statistical results analysis, through prerequisite test analysis, hypothesis testing, normality test of gain, and analysis test of students' science literacy skills. Prerequisite test analysis in the form of normality test and homogeneity test. Normality test to determine whether the data is normally distributed or not. The normality test uses the Shapiro Wilk test with the help of the Statistical Program for Social Science (SPSS) version 22 application.

To ensure whether or not the two sample groups are homogeneous in the same population, the homogeneity test was used. With the help of SPSS version 22 software, the Lavene Homogeneity Test was used to conduct the test. To ensure the same or not the variance in the experimental class and control class, a homogeneity test was conducted. With a significance threshold of 5%, the variance homogeneity test was carried out in this study using SPSS software version 22. With the provisions of significance > 0.05 is categorized as normal while

significance <0.05 is categorized as abnormal.

RESULT AND DISCUSSION

A. Results

This study aims to determine the effectiveness of the video-assisted Problem Based Learning model on students' science literacy skills on vibration and wave material in class VIII SMP Negeri 27 Medan for the 2023/2024 academic year. The sample used in this study consisted of 62 students, where VIII-5 as a control class that did not receive treatment and VIII-4 as an experimental class with a video-assisted Problem Based Learning model.

1. Science Literacy Ability

Data on students' Science Literacy Skills were obtained from pretest and posttest scores. Pretest and posttest were given to the experimental class whose learning used the video-assisted Problem Based Learning model, and the control class which used the conventional learning model. The posttest aims to determine the improvement of students' skills after participating in learning by using the video-assisted Problem Based Learning model in class VIII SMP Negeri 27 Medan, while the pretest aims to determine the initial abilities of students from both the experimental and control classes.

Data on pretest scores of experimental and control classes can be seen in Table 1.

Table 1 Pretest Value of Experimental Class and Control Class

Experimental Class (Video-Assisted PBL)			Control Class (Conventional)		
Pre-Test	F	$\bar{x}$	Pre-Test	F	$\bar{x}$
50	3		45	1	
48	1		38	2	
45	2		35	1	
43	3		33	1	
40	1		30	2	
38	3	35.231	28	5	28.182
35	4		25	5	
33	3		23	3	
30	3		20	4	
28	1		18	3	
25	3		15	4	
23	4				
20	1				

The pretest results of students in the experimental class and control class are still quite low, as shown in table 4.1 above. With an average pretest score of 35.231, the experimental class students obtained the lowest pretest score, which was 20 and the highest score was 50. Conversely, the control group obtained an average score on the pretest of 28.182, with the lowest score of 15 and the highest was 45. The low student pretest learning outcomes are understandable because students have not learned about vibration and wave system material plus students also do not know how science literacy questions and even rarely do science literacy questions in learning. Data on posttest scores of experimental and control classes can be seen in table 2.

Table 2 Posttest scores of Experimental and Control Classes

Experimental Class (Video-Assisted PBL)			Control Class (Conventional)		
Post-Test	F	$\bar{x}$	Pre-Test	F	$\bar{x}$
78	2		58	1	
75	2		53	2	
73	5		50	5	
70	5		48	4	
65	4		45	4	43
60	6	62.4	43	1	
55	2		40	5	
53	1		38	2	
50	3		35	1	
45	2		33	4	
			30	2	

Based on table 4.2 above, the test given has a maximum value of 100 for correct answers to all questions. The posttest results in the experimental class had the lowest score of 45 and the highest score of 78, with an average posttest score of 62.4. Meanwhile, in the control class, the lowest posttest score was 30 and the highest score was 58, with an average posttest score of 43.

From the statistics in the table above, it can be seen that the experimental class that applied the video-assisted Problem Based Learning model experienced a greater increase than the control class that used conventional learning. Although from both classes, both experimental and control classes when compared to the KKM (Minimum Completeness Criteria) for class VIII SMP still have not reached the KKM. However, the use of the video-assisted Problem Based Learning model can be said to be effective in improving students' science literacy, especially in the material of vibrations and waves in class VIII SMP. One of the factors of student scores that still cannot be said to be high seen from the pretest and posttest, namely because the learning model that has been carried out by students is still conventional, and they also previously did not even know how science literacy questions, so the adaptation process still needs to be done to maximize the achievement of student scores, especially in students' science literacy skills. For more details, it can be seen in the diagram below the comparison between the experimental class and the control class based on pretest and posttest data. For more details, the comparison between experimental and control classes based on pretest and posttest data can be seen in the following diagram.

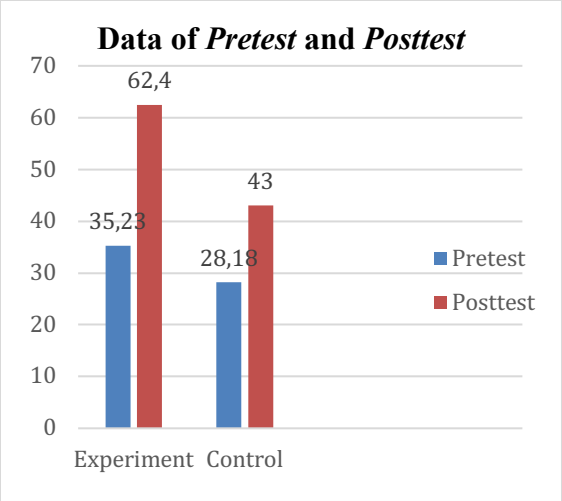

Figure 1 Diagram of Pretest and Posttest Data

2. Normality Test

The normality test was carried out to see whether the pretest and posttest data obtained were normally distributed or not. The normality test used is the Shapiro-Wilk test using SPSS softwareversion 22. The results of the pretest and posttest data normality test can be seen in table 3.

Table 3 Shapiro-Wilk Normality Test Results

		Shapiro-Wilk		
	Class	Statistic	df	Sig.
Scientific Literacy Skills	Experimental Pre-Test (Video Assisted PBL)	.948	32	.124
	Experimental Post-Test (Video Assisted PBL)	.934	32	.051
	Control Pre-Test (Conventional)	.942	31	.094
	Control Post-Test (Conventional)	.953	31	.194

Based on table 4.4 above, it can be seen that the significance value of the experimental class pretest learning outcomes is 0.124 and the experimental class posttest is 0.051. The normality test results for experimental class pretest learning outcomes data 0.124> 0.05 and experimental class posttest data 0.051>

0.05, so that the experimental class pretest and posttest learning outcomes data are normally distributed. The significance value of the control class pretest learning outcomes was 0.094 and the control class posttest was 0.194. The normality test results for the control class pretest learning outcomes data 0.094> 0.05 and the control class posttest 0.194> 0.05 so that the control class pretest and posttest learning outcomes data are normally distributed. Based on the normality test that has been tested using SPSS, it is concluded that the pretest and posttest data from both the experimental and control classes are normally distributed, so then the homogeneity test can be carried out.

3. Homogeneity Test

After the data is tested for normality and normal distribution, then proceed with the homogeneity test. Homogeneity test is a test that shows each variable has a homogeneous or inhomogeneous variation. The basis for decision making if the sig value> α (0.05) then homogeneous, otherwise if the sig value < α (0.05) then not homogeneous. The homogeneity test of pretest and posttest of experimental class and control class can be seen in table 4 and table 5.

Table 4 Pretest Homogeneity Test Results

		Levene Statistic	df1	df2	Sig.
Scientific Literacy Skills	Based on Mean	2.016	1	61	.161
	Based on Median	2.013	1	61	.161
	Based on Median and with adjusted df	2.013	1	60.760	.161
	Based on trimmed mean	1.989	1	61	.164

Based on table 4, it can be seen from the significant value, which is based on the average (based on mean) of 0.161, based on the median value of 0.161. Based on median and adjusted df with a value of 0.161, and based on the cut average with a value of 0.164.

Table 5 Posttest Homogeneity Test Results

		Levene Statistic	df1	df2	Sig.
Scientific Literacy Skills	Based on Mean	2.753	1	61	.102
	Based on Median	2.071	1	61	.155
	Based on Median and with adjusted df	2.071	1	59.064	.155
	Based on trimmed mean	2.609	1	61	.111

Based on table 5, it can be seen from the significant values, namely based on the average (based on mean) of 0.102, based on the median value of 0.155. Based on the median and adjusted df with a value of 0.155, and based on the cut average with a value of 0.111. Based on the overall significant value> 0.05, so it can be decided that from the homogeneity test that has been tested it can be concluded that the variation of each variable from both the experimental class and the control class is homogeneous.

4. Hypothesis Test

Based on the data obtained from the posttest results, the results of the hypothesis test are obtained as in table 6.

Table 6 Independent Sample t-Test Hypothesis Test Table

	t-test for Equality of Means						
					Std. Error Difference	95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference		Lower	Upper
Equal variances assumed	4.919	61	.000	11.189	2.275	6.640	15.737
Equal variances not assumed	4.944	56.651	.000	11.189	2.263	6.656	15.721

The hypothesis test calculation above shows that the data has a significant value (2-tailed) of 0.000. So it can be stated that 0.000 <0.05 so that the decision can be made that H0 is rejected and Ha is accepted. Therefore, it can be said that the video-assisted PBL model for class VIII students of SMP Negeri 27 Medan in the 2023/2024 academic year is effective in improving students' science literacy in vibration and wave material.

5. Gain Normality

In this study, N-Gain seeks to ensure the value of students' science literacy skills before and after treatment and to see the effectiveness of the learning model used in the study. The results of the N-Gain test can be seen in table 6.

Table 6 Gain Normality Test Results

Class	***Pretest***	***Posttest***	**N-gain**	**Criteria**
VIII-4 IPA (Experiment))	34.844	63.875	45%	Enough
VIII-5 IPA (Control)	25.065	42.968	24%	Very Low

Different N-gain results were obtained from the experimental and control classes. In the N-gain test in the experimental class, the N-gain result was 45% with a sufficient category. And in the N-gain test in the control class, the N-gain result was 24% with a very low category. Thus the experimental class has an increase in learning outcomes from students by providing video-assisted PBL treatment with sufficient improvement categories and in the control class or those that do not apply video-assisted PBL obtained an increase in student science literacy with a very low category.

6. Analysis of Students'

Science Literacy Skills Analysis of science literacy skills was conducted to determine the level of science literacy possessed by students in experimental and control classes. As well as to determine the extent of the effectiveness of Problem Based Learning assisted by video on students' science literacy skills. Pretest and posttest data were obtained through investigation findings, for more details, see table 7 below

Table 7 Students' Science Literacy Level Based on Pretest Score .

Class	*Pretest*	Level	Criteria
VIII-4 IPA (Experiment)	34.844	2	Low
VIII-5 IPA (Control)	25.065	2	Low

Table 8 Students' Science Literacy Level Based on Posttest Score.

Class	*Posttest*	Level	Criteria
VIII-4 IPA (Experiment)	63.875	4	Enough
VIII-5 IPA (Control)	42.968	3	Less

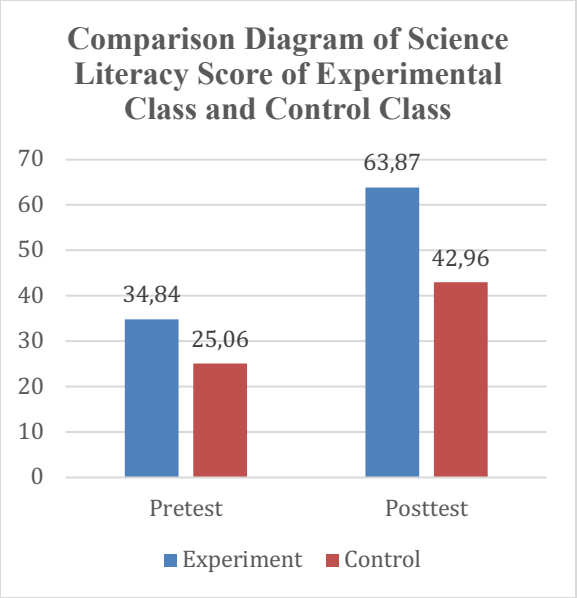

Figure 2 Comparison Diagram of Science Literacy Score of Experimental Class and Control Class.

Based on table 7 and table 8, the experimental class data obtained with an average pretest, namely 34,844 which is at level 2 which is categorized as low, the control class average pretest 25,065 which is at level 2 which is categorized as low. After giving treatment in the experimental class with the video-assisted Problem Based Learning model, the average posttest score was 63.875 at level 4 which was categorized as sufficient. And obtained an average posttest value of 42.968 at level 3 which is still categorized as less in the control class which still uses conventional learning. The experimental class that used the video-assisted Problem Based Learning model showed significant progress as shown in tables 7,8 and figure 2. In contrast, the control class that used the conventional model was still in the insufficient category or only showed a slight increase based on the average score obtained on the pretest and posttest given. Therefore, it can be stated that the video-assisted Problem Based model has effectiveness on students' science literacy skills, especially on vibration and wave material discussed in class VIII SMP Negeri 27 Medan.

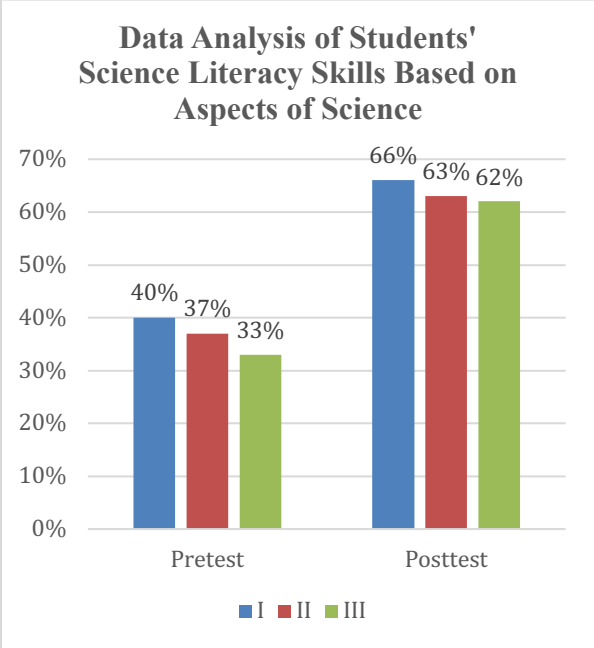

Figure 3 Data Analysis of Students' Science Literacy Skills Based on Aspects of Science

Literacy Competencies Description:
I. Competence in explaining phenomena scientifically
II. Competence in evaluating and designing scientific research
III. Competence in interpreting data and evidence scientifically

The results of the pretest and posttest data analysis in the experimental class are shown in Picture 3 which states that each aspect of science literacy competence has increased in the experimental class. In the aspect of competence to explain phenomena scientifically (I) in the pretest, obtaining a value of 40% and a posttest of 60% which means an increase of 20%, in the aspect of competence to evaluate and design scientific research (II), obtaining a pretest value of 37% and a posttest of 63% with an increase of 26%, in the aspect of competence to interpret data and evidence scientifically (III), obtaining a pretest of 33% and a

posttest of 62% with an increase of 29%. The increase occurred after the treatment with the video-assisted Problem Based Learning model, of the three aspects of competence seen, a significant increase was seen in the third aspect, namely the aspect of interpreting data and evidence scientifically by 29%.

Thus, it can be concluded that the application of the video-assisted Problem Based Learning model in the experimental class has a major positive effect on improving students' science literacy in terms of their ability to explain phenomena scientifically, plan and conduct scientific research, and evaluate data and evidence scientifically. So, it can be stated that the application of the video-assisted Problem Based Learning model has effectiveness on students' science literacy, especially class VIII SMP Negeri 27 Medan on vibration and wave material.

B. Discussion

1. Effectiveness of Problem Based Learning Model Assisted by Video on Science Literacy Skills

Students' science literacy skills are obtained through posttest scores obtained after giving a pretest to determine students' initial abilities. In the experimental class, this research used a video-assisted PBL model, while the control class applied conventional learning. The pretest scores of the control and experimental classes obtained low results, which indicated a lack of understanding of students, especially in the context of science literacy which requires higher analytical and critical thinking skills, plus students had never worked on science literacy-based problems. This is because teachers at the school are also not familiar with science literacy, so teachers usually give questions that tend to remember the material they have learned. Posttest scores were obtained after applying the video-assisted PBL model in the experimental class (VIII-4) and the conventional model in the control class (VIII-5) on vibration and wave material. The posttest score is given to see the effectiveness of the video-assisted PBL model and the conventional model on students' science literacy skills after the treatment of different models in both classes, namely the experimental class or the control class. Referring to the data analysis from table 7 and table 8 shows that the video-assisted PBL model is effective in developing students' science literacy skills, when compared to the conventional model.

Based on the results of the research conducted, the analysis of field data from students' pretest and posttest shows that the use of PBL model with video assistance significantly improves students' science literacy skills in understanding vibration and wave material in class VIII SMP Negeri 27 Medan. The results of data analysis showed that after the application of the video-assisted PBL model, students' understanding of vibration and wave concepts, problem solving skills, and critical thinking skills improved significantly. The experimental group that applied the video-assisted PBL model showed a greater increase in students' science literacy compared to the control group that used the conventional learning model.

Students who learn by using video-assisted PBL have effectiveness on science literacy skills. Because problem-based learning involves students to solve problems that have been given by the teacher through discussions with group members, the use of this model

encourages students to be more active. With group discussions, students will exchange opinions, think of solutions, and even argue with each other in finding solutions to existing problems with their groupmates, so that this will encourage student activeness in learning because they are not only listeners or recipients of material, but also active in finding out directly the concepts of the material they are learning. Indirectly, students are also slowly encouraged to be more active than the teacher. This is also in line with the findings of Widiana, et al., (2020) which emphasize that in the learning process the use of models can improve student understanding through reading exercises, so that it naturally also improves students' science literacy skills. The development of this competency can be observed when students are involved in the group learning process, where they actively share ideas or solutions that contribute to solving the problem at hand. In line with the statement of Kartini, et al., (2022) which confirms that in collaborative learning students who are involved with their groups tend to be more active and have better material understanding abilities than when the material is delivered in other forms. In addition, the model presented is assisted by a learning video which certainly helps students understand the vibration and wave material studied. With the problems oriented to students, of course, it will encourage students to discuss and share opinions with their groupmates so that there will be an analysis for problem solving in the discussion group which also improves students' problem solving skills and critical thinking skills. In addition, students are also accustomed to overcoming the relationship between concepts and phenomena in the field. So, students learn not only about concepts, but also learn how to connect and use that knowledge in real situations. This is supported by the findings of Putri, et al. (2017) which showed that the critical thinking skills of junior high school students were significantly improved with video-assisted Problem Based Learning. It is also in line with what was conveyed by Nofziarni, et al. (2019). To train students in critical thinking to solve real-world problems relevant to the material, the Problem Based Learning (PBL) model begins with the presentation of real-world problems. In addition, PBL seeks to improve students' ability to overcome obstacles and find effective solutions to problems.

Problem-based learning is able to attract students' attention to be more active in finding solutions to the problems presented, besides that, they are more interested in discussing these problems because they recognize them from everyday life. This is what happened when in the experimental class the video-assisted Problem Based Learning model was applied, where usually they learn to find more on their own from existing teaching materials such as books and with the lecture method, when learning with the video-assisted PBL model was implemented, they were more interested in discussing the material to be studied, especially the vibration and wave material presented during the study, coupled with media in the form of learning videos displayed at the beginning of learning which added to the attractiveness of students to learn. In addition, this conclusion is also consistent with the findings presented by Wulan (2022), which states that students involved in learning using the PBL model are very happy because in learning educators present videos that make students tend not to get bored easily,

because the PBL learning model is designed to attract students to be given real learning opportunities.

2. Factors affecting the Effectiveness of Applying a Video-Assisted Problem Based Learning Model in Science

Learning Though there has been an improvement in student literacy in the experimental class after treatment, the improvement is still in the "sufficient" category with level 4. One factor contributing to achieving results in student science literacy skills is video-assisted PBL learning that is still rarely used by teachers in learning. Students who are accustomed to conventional learning approaches still need time to adapt to the model with video-assists in their learning process. Conventional learning models tend to make teachers the primary source of information, with structured teaching treated by each teacher, so students tend to be passive, because most of the information they receive is only from teachers and books, and there is no appetite for students to dig up material so that they can obtain more information. The video-aided PBL model focuses more on students to be more active in learning, while teachers are only guides and directors in their discussions and learning. Students are also required to be able to collaborate in group discussions, to find solutions to problems given by teachers. So they'll start to be able to think critically, share opinions, and solve issues that are being discussed. By applying the video-aided PBL learning model, students will become more and more accustomed to learning, and of course their ability to think critically will also be increased. One of the skills that students need in the 21st century is science literacy, which is capable of helping students develop their scientific abilities by enabling them to recognize problems, learn new information, explain phenomena scientifically, and draw conclusions based on existing facts. This is also in line with what Sanjaya & Ratnasari have expressed. (2021). that the challenges of the 21st century require the application of critical thinking skills. It is important to master the six essential competences in critical thinking, namely interpreting, explaining, identifying, analyzing, evaluating, and problem-solving creativity. In studying vibration and wave matter, students must master those six competences of critical thought. Material delivery will be more effective if presented through activities that involve giving authentic issues to the student. The Problem Based Learning (PBL) model is a good choice in support of this, as the PBL model encourages students to interact with real problems and find knowledge and concepts through the problem-solving process.

CONCLUSION

Based on the discussion and the results of the research obtained from the data analysis results, so the conclusion is as follows.

1. Video-aided Problem Based Learning Model has effectiveness over the science process skills on vibration material and waves of class VIII SMP Negeri 27 Medan Fields Lesson Year 2023/2024, demonstrated by an average percentage increase in the experimental class that uses the PBL-assisted video model higher compared to the control class using the conventional model.
2. In the class VIII SMP Negeri 27 Medan, the use of a video-assisted Problem Based Learning model had a

significant effectiveness against students' science literacy skills on vibration and wave matter. This is demonstrated by a significant improvement in the science literacy aspects of students in the experimental classroom. Where the initial capabilities seen from the pretest data of 34,844 are at level 2 that are categorized low, the average posttest score at level 4 (63,875) after using the video-aided PBL model in the experimental class, is still in the category sufficient.

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