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Improving Physics Learning Outcomes with Differentiate Learning on Vibration and Waves of Class VIII Students at MTs Al-Washliyah Gedung Johor Medan

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Abstract

This study aims to improve students' physics learning outcomes by applying differentiation learning to vibration and wave material. The population in this study were class VIII students of MTs Al-Washliyah Gedung Johor, Medan, for the 2022/2023 academic year. The sample in this study was class VIII-A as the control class totaling 40 students who were given conventional learning, and class VIII-B as the experimental class totaling 39 students who were given differentiated learning. The sampling method used was quasi-experimental and used a pretest-posttest control group design. Data on physics learning outcomes were collected using observation instruments and knowledge tests in the form of 10 essay questions. The increase in students' physics learning outcomes was seen by comparing the average hypothesis test scores customarily distributed and homogeneous in both classes. Based on the outcomes, the conclusion stated that the application of differentiated learning on vibration and wave material could significantly improve student learning outcomes.

Keywords: Differentiated learning, Vibrations and waves.

INTRODUCTION

Life in the modern era makes education the primary foundation for carrying out daily activities. Education for humans is essential, an effort to develop quality human resources. This refers to article 3 of Law Number 20 of 2003 concerning the national education system, which reads that national education aims to develop students' potential to become human beings who believe and fear God Almighty, have a noble character, are healthy, knowledgeable, and capable. , creative, independent, and become democratic and responsible citizens. The goal of national education is the basis for organizing education. The implementation of education has yet to identify much change, especially in the learning system, which does not look at the abilities of each individual and assumes that all children have the same abilities. Looking at the practice, the teacher teaches as if all students in one class have the same way of learning, whereas it is well known that there are around 20-30 students in one class, and all have their way of learning (Iskandar, 2021).

Each student certainly has his way of learning and absorbing the information provided by the teacher. Therefore, providing learning using only one way, namely direct explanation, will make it difficult for students with inappropriate learning styles to get a good understanding, and this impacts student learning outcomes. According to (Irawati et al, 2021) in Pijar MIPA, learning style is a way that is suitable for students in learning so that students can easily and comfortably understand the information provided. Richard Bandler and John Grinder Neuro-Linguistic experts say that in receiving information, humans have three ways of reasoning based Visual, Auditory, and Kinesthetic, commonly called VAK (Didipu et al, 2021; De Poter et al, 1999). According to (Wiyani, 2013), visually learning students prefer to learn by what is seen. According to (Hasrul, 2009), students with an auditory learning style prefer to learn by what is heard, and students with a kinesthetic learning style prefer to learn by what is touched and moved. From this explanation, learning styles significantly affect students' understanding and influence their learning outcomes.

Learning outcomes are influenced by the learning process and the interaction between teachers and students during learning (Syachtiyani et al, 2021). Learning outcomes are achievements obtained after a learning process that provides a change (Handayani, 2021). Therefore, the teacher's introduction to student characteristics must be in-depth. Learning that follows student learning styles can overcome these problems. The independent curriculum has begun to be implemented in many schools to direct learning so that learning favors students, one of which is by implementing differentiated learning. Differentiated learning is a learning process that is appropriate to these problems. Research (Suwartiningsih, 2021) explains that differentiated learning is an effective teaching process to obtain learning with the diversity contained in the classroom by adjusting the diverse abilities of students by differentiating content, processes, and products in learning.

Researchers conducted interviews with physics teachers at MTs Al-Washliyah Gedung Johor, Medan. The results of the interviews were that in the implementation of learning, the teacher never used learning media to support students' understanding of the physics material. The lack of use of media as a support for learning is due to the teacher's lack of ability in technology. The teacher also pays little attention to the various student learning styles and only teaches in one way, namely using conventional methods so that only some students can optimally understand the physics learning material provided by the teacher. Therefore, learning is needed, requiring

teachers to recognize students in learning, namely student learning styles and teaching skills in utilizing learning media to get good physics learning outcomes.

The results of these interviews were supported by data collection on student learning outcomes in mid-term exams Physics for class VIII students obtained from the physics teacher's documentation during initial observations at MTs Al-Washliyah Gedung Johor. The physics learning outcomes mid-term exams of class VIII for the 2022/2023 school year show that 54,16% of class VIII students still need to achieve the set Minimum Completeness Criteria, which is 75. That matter is because, in learning, the teacher only teaches conventionally without using learning media or other methods. In diverse teaching also, the teacher needs to learn each student's learning style. After carrying out a learning style test using a learning style questionnaire, it was found that in one class, 17,94% of students had a Visual learning style, 38,46% with an Audio learning style, and 43,58% with a Kinesthetic learning style. The data shows that students have different learning styles in one class even though they are in the same classroom. Thus, when the teacher provides subject matter by directly explaining to students with an inappropriate learning style, it will be difficult to digest the material, and they will need help understanding it. That matter influences student learning outcomes at the end of learning.

Differentiated learning has been applied by (Iskandar, 2021) in his research, and it is stated that in the initial pre-cycle conditions, students obtained 36,36% completeness achievements to 66,67% in cycle I and in cycle II reached 90,91% students completed. The results of this study indicate that the application of differentiated learning can improve the achievement of student learning completeness. The results of non-test reflection in this study indicate that students enjoy learning through differentiation learning. The results of reflection on learning and observation show that students feel happy, motivated, and creative, so they are more enthusiastic about learning to obtain better learning outcomes.

Other research (Suwartiningsih, 2021) also mentions that the application of differentiated learning shows that differentiated learning can improve student learning outcomes because in cycle I, 27,58% of students were completed and 72,42% of students were incomplete, while in cycle II there were 96,55% of students reach the KKM and only 3,45% of students do not reach the KKM. Reflection on this study shows that the shortcomings in cycle I am time efficiency that could be more optimal.

The studies' results provide a basis for researchers to implement differentiated learning for further research. In addition, applying differential learning can be a solution in introducing

teachers to student learning styles and honing teacher skills in using learning media that are appropriate to student learning styles. It is expected to improve students' physics learning outcomes. According to (Setianingrum, 2017; Widayanti, F, D, 2013), teachers need to know student learning styles so they do not teach using one method that only fits one student's learning style. So that students with inappropriate learning styles find it more challenging to understand the material provided and even make students lazy to study. Therefore, learning is needed to provide teachers with strategies for managing learning media according to the three student learning styles, namely Audio, Visual, and Kinesthetic, by providing differentiated learning.

METHOD

This research was conducted at MTs Al-Washliyah Gedung Johor Medan, located at Karya Jaya Street No. 267. The population in this study were all eighth-grade students at MTs Al-Washliyah Gedung Johor, Medan. The research was carried out in the even semester of the 2022/2023 Academic Year. The sampling technique used is cluster random sampling. The sample in this study was two classes taken from the population where class VIII B, the experimental class, was given differentiated learning, and class VIII A, the control class, was given conventional learning.

In this study, both classes were given a pretest before being given different treatments to determine the student's initial abilities in both classes. Differentiated learning was applied in the experimental class, while conventional learning was applied in the control class. Student learning outcomes were obtained from the posttest given to both classes after being given different treatments. The research design is described in Table 1

Table 1. *Pretest-Posttest Control Group Design*

Class	Pretest	Treatment	Posttest
Experiment	P_1	Q_1	P_2
Control	P_1	Q_2	P_2

Informastion:

$P_1 = P_2$

P_1 : *pretest* in both class

P_2 : *posttest* in both class

Q_1 : treatment using differentiated learning

Q_2 : treatment using conventional learning

(Sugiyono, 2012)

Data collection in this study was carried out using observation instruments and learning achievement tests in the form of essays. The observation instrument is intended to assess students' attitudes and skills, while the learning outcomes test instrument assesses students' knowledge abilities.

Data on learning outcomes that have been obtained are tested by testing the hypothesis using the t-test. The average value of learning outcomes is compared to the t-test of the experimental and control classes, which are usually homogeneous distributions. The data obtained were averaged and previously analyzed the data with the following steps: 1) calculating the average and standard deviation, 2) Normality test, 3) Homogeneity test, 4) Hypothesis test (t-test).

RESULTS AND DISCUSSION

Result

The results obtained from the research that has been done are that the pretest value in the experimental class is 45,12, and the pretest value in the control class is 43,48. The following are the pretest values in the experimental class and control class in the following table:

Table 2. Pretest value data

Experiment Class		Control Class	
Interval	Frequency	Interval	Frequency
30 – 35	6	26 – 32	8
36 – 41	11	33 – 39	4
42 – 47	4	40 – 46	14
48 – 53	12	47 – 53	7
54 – 59	1	54 – 60	5
60 – 65	5	61 – 67	1
		68 – 74	1

The two classes were given different treatments where. The experimental class was given differentiated learning, and the control class was given conventional learning. The average post-test learning outcomes for the experimental class was 71,3, and the average post-test for the control class was 59,03. Based on the learning outcomes in the post-test, the scores in the experimental class are higher than those in the control class. Post-test scores in the experimental class and control class are described in the following table:

Table 3. Posttest value data

Experiment Class		Control Class	
Interval	Frequency	Interval	Frequency
48 – 54	5	31 – 37	3
55 – 61	5	38 – 44	0
62 – 68	5	45 – 51	8
69 – 75	7	52 – 58	9
76 – 82	8	59 – 65	6
83 – 89	5	66 – 72	10
		73 – 79	4

Discussion

Based on the results of the research that has been done, it can be seen that differentiated learning has an effect on the physics learning outcomes of class VIII, even semester students of MTs Al-Washliyah Gedung Johor, Medan. This can be seen from the results of the post-test average in the experimental class, namely 71.3, and the post-test average in the control class, namely 59.03. Data in the experimental and control classes are typically distributed and homogeneous in the normality and homogeneity tests.

Differentiated learning is done in the experimental class by dividing students into groups according to their learning styles (Didipu et al., 2021). It is said that students have three ways of reasoning, namely visual, auditory, and kinesthetic. In comparison, conventional learning is carried out in the control class by giving students the same learning as the method used by the teacher when teaching. The experimental and control classes were given a pretest before being given different treatments. Then, after being given different treatments for the two classes, the Posttest was given as the final assessment.

Testing one party as a hypothesis test to find differences in student learning outcomes shows the value of. If you compare the values, you will get 4,430 > 1,665. Therefore, it is rejected and is accepted. Then there is the influence of differentiated learning on student learning outcomes in vibration and wave material.

Based on the description above, the physics learning outcomes of students who receive differentiated learning are better than students who receive conventional learning. This proves that the explanation (Tomlison, 2001) is correct, where it is said that students have different ways even though they are of the same age. With the data obtained, the learning process that does not apply differentiated learning is challenging to understand by students with learning styles that do not follow the teacher's conventional learning methods. After being given differentiated learning, where content, processes, and products are adapted to students' learning styles, physics learning is easier to understand and impacts student learning outcomes, namely, increasing student learning outcomes. The results of this study are the same as those of research (Iskandar, 2021) and (Suwartiningsih, 2021), which state that Differentiated learning influences student learning outcomes.

Research with differentiated learning is proven to be able to achieve the learning objectives as described by (Marlina, 2020), namely differentiated learning aims to support all students in learning, increase motivation and level of student learning outcomes, increase teacher and student harmony, make students independent learners, and be a challenge for teachers. The research shows that students are motivated to learn because learning helps all students. This is evidenced by the level of student learning outcomes which increased significantly in the experimental class compared to the control class. Differentiated learning that is applied to the experimental class also makes students independent in learning, where students process information from the material provided by the teacher with their respective learning styles.

(Purba et al., 2021) One of the principles of implementing differentiated learning is good teacher leadership in the classroom. The teacher must be skilled in organizing and managing the class well. In the research, teacher skills are the primary basis for implementing well-differentiated learning. The lack of teacher skills in managing the class can affect the differentiation learning process and impact objectives. The results of this study conclude that Differentiated learning can affect students' physics learning outcomes at MTs Al-Washliyah Gedung Johor, Medan.

CONCLUSION

Research carried out at MTs Al-Washliyah Gedung Johor Medan has concluded that the learning outcomes of students who are given Differentiated learning are higher than those of students who are given Conventional learning. This can be seen based on the average learning outcomes of experimental class students who received Differentiated learning of 71,30 while the learning outcomes of control class students who received Conventional learning were 59,03. There was a significant influence on student learning outcomes of MTs Al-Washliyah Gedung Johor on Vibration and Wave material through Differentiated learning conclusions and suggestions without being separated in subtitles.

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