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The Implementation of Differentiated Learning to Improve Science Learning Outcomes for Fifth Grade Students at SDN PUTAT JAYA IV

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Keywords

Diffrentiated Learning, Science, Learning Outcome

Abstract

Learning using the new paradigm currently provides freedom for teachers to design learning and assessments that can be adapted to the characteristics of students. One of them is differentiated learning. This research aims to find out how far students' abilities have increased in studying science material through the application of differentiated learning. The method used in this research is Classroom Action Research. The subjects in this research involved 30 class V students at SDN Putat Jaya IV. This research was carried out through 2 cycles. Based on the research results, the average pre-test score was 49 (20% completeness). In the post-test scores in cycle I, an average score of 66 was obtained (60% completeness). Cycle II obtained an average score of 80 (77% completeness). Based on the results of these values, it can be concluded that there is an increase in science learning outcomes by implementing differentiated learning.

Introduction

Learning is one part of education. Learning can be interpreted as the process and method a person uses to learn, this is in accordance with the opinion (Hidayat & Juniar, 2020). Learning can be interpreted as an interactive process that will later get results from learning

activities. Developing students' potential requires efforts to increase active learning to achieve the goals of learning, according to the opinion of (Prasetyo & Abdul, 2021). The process of learning and learning being active and meaningful cannot be separated from the role of the teacher so that it is able to make students have good personalities, have intelligence that can continue to be improved, have noble morals that are able to create skills that are useful in society, the nation and the state. Teaching and learning are two interrelated components.

Learning using the new paradigm currently provides freedom for teachers. Teachers can use this freedom to design learning and assessments that can be adapted to the characteristics of students. This is done as an effort to implement student-centered learning. Teacher-designed learning begins with mapping competency standards, then teachers can design learning and carry out assessments that suit the characteristics of students so that the expected results will be in accordance with competency (Kemdikbud, 2021). The competencies expected in the 21st century can be called the 4Cs, which include creative thinking, critical thinking and problem solving, communication and collaboration.

The curriculum is an important element in a learning process, with the curriculum as a framework for preparing learning programs that will be implemented to suit students. The curriculum currently used is the Merdeka Curriculum which is an option for restoring and improving education in Indonesia (Nugraha, 2022). The Merdeka Curriculum is designed to provide flexibility for teachers in designing learning and can develop students' potential according to their interests and talents (Sili, 2021). Current learning systems are very diverse, one of which is differentiated learning. In the differentiated learning process there are various activities that adapt to the potential of students.

Differentiated learning has a concept in learning activities, which is able to accommodate the diversity of students' conditions. This provides an understanding that each student is unique in various conditions. This difference can be seen from their physical and psychological conditions. Apart from this, there are differences in each student which can be seen from their abilities, talents, interests and learning styles (Santika & Khoiriyah, 2023). Differentiated learning is learning that can optimize and develop the competencies of each student through content, processes and products (Marlina, 2020). Differentiated learning is one way that teachers can understand the characteristics of students and provide knowledge that is tailored to their learning styles (Wahyuni, 2022). So teachers can become facilitators of students, because each student has a different character and learning style.

Teachers can use differentiated learning as an effort to meet the learning needs of each student. The application of differentiated learning itself can be adjusted to the material, methods and approaches by taking into account the characteristics and needs of students. This is done with the aim that students do not feel like they have failed in the learning process (Agung, 2020). The teacher's role in managing the learning process includes materials, activities and assessments, which need to pay attention to the interests, learning styles and readiness of students. The aim is to provide assurance that the learning provided is in

accordance with the characteristics and interests of each student (Jurais, 2023). Based on differentiated learning, it can influence students to be able to identify based on their abilities, because in one class students have diverse abilities.

Learning outcomes are something that students obtain from learning and the ability to understand material in certain subjects, Sari (2020). Learning outcomes can be seen by changes in each individual, this is in the form of knowledge, attitudes and skills, this is in accordance with the opinion of Nugraha, (2020). Learning outcomes to find out students' knowledge will be easy to know, while to know students' attitudes you need to make observations, and the ability to know students' skills can continue to be trained by giving experiments. It can be concluded that learning outcomes are new knowledge obtained by students through the learning process, the results obtained are in the form of abilities in knowledge, attitudes and skills.

Learning science and technology, especially at elementary school level, memorizing the digestive system is one of the concepts that students need to understand. Class V digestive system material is still about memorizing body organs and sequencing the human digestive process. Through various pictures of human digestive organs, students can understand with the help of the teacher, mention the body organs first. More precisely, the material on human digestive organs is found in the Social Sciences subject chapter 5. Topic C contains the various body organs used in the human digestive system and their functions. Students tend to be afraid of science lessons, students' fear does not mean that they feel that science lessons require them to memorize without reason. Students also mentioned that they found it difficult to memorize the sequence according to the stages of the digestive system.

Researcher as PPL students at SDN Putat Jaya IV Surabaya found problems in the learning process while it was taking place, namely that there were several students who felt bored and lacked focus in following the learning. According to research conducted by researcher, one of the causes is that the learning styles applied by teachers are less varied, causing low student learning outcomes. Based on observations, low learning outcomes are also caused by learning that does not involve many students. Students only receive learning from the teacher that is delivered without any feedback from the material that has been delivered. The teacher's role is only to convey the material without giving students the opportunity to interact.

Based on the existing problems, the researcher will make improvements to improve student learning outcomes in class V. The steps that the researcher will implement are using student-centered learning so that the learning objectives will be achieved. Researcher use several methods, first, they can identify the learning objectives that will be implemented. This is done to measure what you want to achieve in a clear time. Second, researcher can make observations to understand the characteristics of students and their potential by conducting direct interviews. Third, after knowing the characteristics of the students, the researcher prepared learning tools that were tailored to the students' potential. Fourth, researcher carry

out the learning process by applying learning tools that are adapted to students' learning styles. Fifth, researcher can provide feedback to students during the learning process. Sixth, in the final activity the researcher can reflect and find out the results of the learning.

Learning that researcher can apply using differentiated learning. This is in accordance with differentiated learning which is an approach to meet the diversity of characteristics of students with the potential of each individual. Researcher apply differentiated learning with the aim of providing opportunities for students to learn according to the learning style, level of ability and potential of each student. Learning is an individual's effort to gain knowledge from interactions that provide knowledge, these interactions can occur between teachers and students. Learning outcomes based on students' learning styles will vary, according to the learning objectives to be achieved. For example, students who have a visual learning style can understand material with pictures. The audio learning style can understand the material by listening, while students who have the learning style can understand the material by doing simple experiments.

Method

The research design applied is used to measure the success of the method applied. This type of research uses Classroom Action Research (CAR) with the aim of improving the science and science learning outcomes of class V students. CAR consists of planning, action, observation and reflection (Arikunto, 2021). The first stage, in planning, researcher can prepare the necessary facilities and infrastructure. Second, the researcher created a teaching module by adjusting the characteristics of students and preparing the instruments used to collect data. Third, at this stage the researcher carries out learning based on the module that has been designed.

The data collection technique used by researcher is the observation method. In collecting data in cycle I and cycle II, researcher used observation techniques, observation sheets used by researcher to determine the learning style of each student. The criteria used as a reference for researcher through Cycle I and Cycle II are averages based on learning style. The minimum standard is good, it can be said if students in one class get 70%. This research was carried out at SDN Putat Jaya IV, Surabaya city. Based on the research location, the subjects were selected directly by the researcher. Subjects are determined based on the needs of researcher who can provide valid information. The researcher determined that the subjects involved 30 V/A class students with 10 male students and 20 female students.

Differentiated learning can use a learning environment, this can be applied to the learning process to explore the talents, interests and learning styles of each individual (Stollman, 2019). CAR is a description of the actions that the researcher will carry out, these actions are guidelines that the researcher will carry out and procedures for improvement. Observation is

the recording of data related to the process of actions carried out by researcher. The final stage, namely evaluation, is a stage to find out the shortcomings of the actions taken (Sukendra, 2022). This evaluation can also be a reference for whether the action will stop or continue at the next stage.

Results and Discussion

Results

The results of the initial observation sheet for 30 class V/A students at SDN Putat Jaya IV showed that they were classified as having different learning styles. There are 8 students who have a visual learning style or 0.26%, 10 students who have an auditory learning style or 0.33% and 12 students who have a kinesthetic learning style or 0.41%. This research was carried out in 2 cycles, namely in cycle I the researcher only carried out learning by explaining the digestive system material without grouping students based on their learning styles. In cycle II, researcher carried out learning by grouping students based on each student's learning style and using differentiated learning. The assessments obtained by researcher were based on student observations and looking at test results. The pre-test score obtained was an average of 49 with 20% completeness. In cycle I, an average score of 66 was obtained with a completeness score of 60%. Cycle II obtained an average score of 80 with 77% completeness.

Table 1 The Comparison of students' science learning outcomes in pre-test, cycle I and cycle II with the application of differentiated learning.

	Pre test	Cycle I	Cycle II
Total	1.480	1.990	2.390
Mean score	49	66	80

Based on this table, it can be seen that the comparison results of the pre-test, cycle I and cycle II by applying differentiated learning in improving the science and science learning outcomes of class V A students at SDN Putat Jaya IV Surabaya are as follows: the pre-test gave results with an average of 49, then there were differences in cycle I with an average score of 66 and there was an increase in cycle II with an average score of 80. The increase in science learning outcomes from cycle I and cycle II can be seen to have increased significantly.

Student learning outcomes can be seen from the final results of the learning process by looking at the grades obtained. Teaching success can be demonstrated if students can understand the material presented and achieve results in accordance with the learning objectives. Based on Nurkancana's (2021), learning outcomes can be in the form of grades or scores. Learning outcomes are knowledge that students receive after going through the learning process, Sudjana (2022). Teachers can obtain information on improving student learning outcomes through the grades obtained at the end of learning, so it can be concluded that learning outcomes play an important role in learning.

Table 2 The Comparison of student observation results during Cycle I and Cycle II learning

Observation Object	Score	Mean score	Information
Cycle I student observations	30	3,0	Average
Cycle II student observations	40	4,0	Good

Based on the table above, it can be seen that the research results seen from the observation sheet show that several students did not pay attention when the researcher implemented differentiated learning. In cycle I, the researcher made observations during the learning process, based on the observation data, an average score of 3.0 was obtained with sufficient criteria. In cycle II, researcher obtained observation results by applying a differentiated learning model during the learning process, the average score obtained was 4.0 with good criteria. Based on observation data from cycle I and cycle II, there was an increase. It can be concluded that students can improve learning outcomes based on each individual's learning style.

At the differentiation stage, the teacher can use the process to find out whether students understand the material being studied. The ability to understand the material can be seen from student learning outcomes. This process is carried out in stages by providing various questions that are adapted to students' learning styles, allocating appropriate time for students to complete assignments, and being able to create varied activities (Sarie, 2022). Researcher at the differentiation stage of the process provide worksheet (LKPD) that has been adjusted based on students' learning styles into three parts based on visual learning styles, auditory learning styles and kinesthetic learning styles.

Table 3 Comparison of Science Learning Results for Cycle I and Cycle II Students

Assessment Description	Cycle 1	Cycle II
Average score	66	80
Highest score	100	100
Lowest score	30	50
Mastery learning	60%	77%

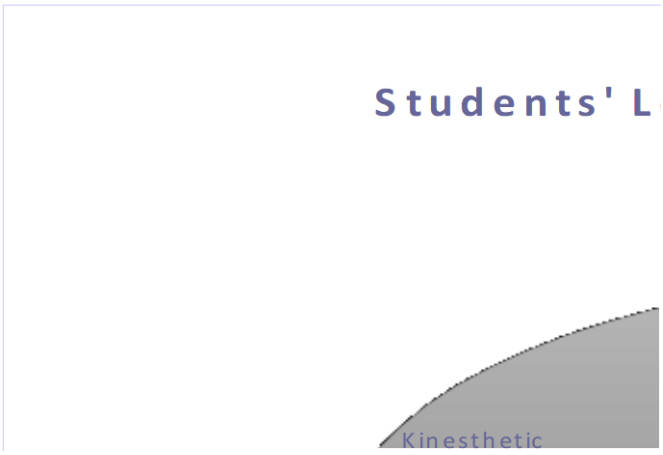
Based on this table, it can be seen that in Cycle II the science learning results increased further. Learning activities in cycle II explain that not only student learning outcomes but learning is more student-centered and students feel that they can understand the material according to each individual's learning style. Achievement of the learning objectives that have been designed is marked by students' ability to memorize the digestive system, students' ability to work together with groups and students' ability to understand the material presented by the teacher. So, researcher do not need to continue to the next stage.

Discussion

The results of the research show that differentiated learning can improve the science learning outcomes of class V/A students at SDN Putat Jaya IV. Basically, the application of differentiated learning that researcher apply adapts to each individual's learning style. Differentiated learning itself can provide space for students to explore themselves by developing their creativity, interests and talents independently (Marlina, 2019). Differentiated learning can adapt to student needs according to the learning profile for studying the digestive system in science subjects. Teachers can use learning by implementing differentiated learning to design learning that is adapted to science subjects, taking into account the differentiation of content, processes and products.

Content differentiation is something that teachers can do, namely by modifying lesson materials to suit students' learning styles. In the differentiation process, teachers need to pay attention to students' learning readiness, while students can explore their ideas and adapt to the digestive system material in science subjects. Furthermore, product differentiation can provide results from what has been learned during the learning process. From the application of differentiated learning, students can also present the knowledge they have learned, adapting it to their learning style. According to research results, students with a visual learning style can write down their understanding through summaries. Students who have an auditory learning style can express the results of their understanding with songs, while students who have a kinesthetic learning style can make posters related to the digestive system in science subjects. From grouping based on learning styles, students are able to provide optimal learning results.

Diagram 1. Comparison of IPAS Learning Styles



Based on the chart above, it shows that the results of observations carried out by researcher were to determine students' learning styles. After carrying out observations, researcher was able to find out that the learning styles of students in one class were visual learning styles with a percentage of 0.26%, students with auditory learning styles with a percentage of 0.33 and kinesthetic learning styles with a percentage of 0.41%. This shows that the kinesthetic

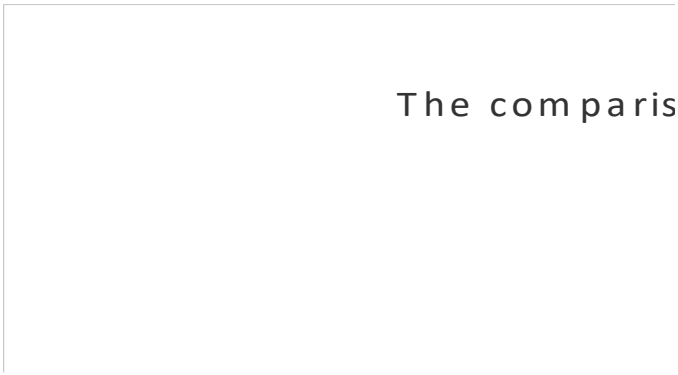
learning style is a learning style that many students are interested in. By using differentiated learning, researcher can achieve learning goals with various learning styles that each individual has.

Researcher carried out research through 2 cycles. Based on research in cycle I, the average score was 66 with a completeness score of 60%, while in cycle II the average score was 80 with a completeness score of 77%. There was an increase in student learning outcomes from cycle I and cycle II, namely an increase of 17%. The increase in student learning outcomes is based on the results of tests carried out during the learning process. Students can focus more on learning because researcher apply learning to each individual's learning style, so as to create student-centered learning.

The results of the research show that student learning outcomes have increased, this is in line with the increase in student observation sheets carried out by researcher. In the first cycle of observations, an average score of 3.0 was obtained in the sufficient category, while the results of the second cycle of observations obtained an average score of 4.0 in the satisfactory category. The comparison of the increase in cycle I and cycle II on the observation sheet is 1.0 with an increase in the satisfactory category. Based on the data obtained, the increase in cycle II was influenced by differentiated learning.

Based on a comparison of student learning outcomes in pre-cycle, cycle I and cycle II, there has been an increase by implementing differentiated learning. The improvement in science learning outcomes for class V/A students at SDN Putat Jaya IV with material on the digestive system in cycle II experienced a significant increase. It can be seen that students' mastery in cycle I only got 60%, while in cycle II learning mastery increased to 77%. This data can be seen based on the following graph.

Figure 2. Comparison of student learning outcomes for pre-cycle, cycle I and cycle II



Based on this graph, it can be seen that from the pre-test, cycle I and cycle II there was a significant increase in student learning outcomes. The pre-test increased by 20% in cycle I with a completeness score of 60% and increased in cycle II with a completeness value of 70%. Student learning outcomes by applying differentiated learning to class V/A students at SDN Putat Jaya IV with science and technology subjects, human digestive system material is able

to improve student learning outcomes. Student learning outcomes can be seen from giving tests at the end of learning. In accordance with existing data, an increase in student learning outcomes can be seen from cycle I to cycle II. Student learning achievements in science subjects can also be seen in students' enthusiasm and interest in participating in learning that suits each individual's learning style.

Conclusion

Based on the research results, it can be concluded that using differentiated learning can improve student learning outcomes in science and science subjects with digestive system material. This can be seen when the learning process takes place, students become enthusiastic about participating in learning using differentiated learning. The research was carried out in 2 cycles, the results of the research showed that there was an increase from cycle I to cycle II. The results obtained from cycle I were an average of 66 with a passing percentage of 60%, while in cycle II the average score was 80 with a passing percentage of 77%. From the results of observations made by researcher, they can be grouped into three learning styles, including visual, auditory and kinesthetic learning styles. This can be seen from the research results which prove that there are 8 students who have a visual learning style, 10 students who have an auditory learning style and 12 students who have a kinesthetic learning style.

From the research results, there are suggestions for teachers to be able to apply learning models and learning media that can attract students' attention. Basically, before carrying out the learning process, teachers can make observations regarding the potential of students. Teachers can also create a conducive learning atmosphere so that during the learning process students can participate in learning by focusing on the material presented. The choice of material can be adjusted to students' learning styles, because by adapting this it can provide opportunities for students to develop their previously possessed potential and learning will be student-centered.

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