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The Implementation of Differentiated Instruction Based on Learning Styles to Improve Science Learning Outcomes of Eighth Grade Students at SMP Negeri 11 South Tangerang City

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ABSTRACT

This classroom action research aimed to describe the implementation of differentiated instruction based on students' learning styles and to improve science learning outcomes among eighth-grade students at SMPN 11 South Tangerang. The instructional approach was designed to accommodate visual, auditory, and kinesthetic learning preferences. The results indicated a meaningful enhancement in students' academic performance from the initial to the subsequent cycle. The overall class achievement showed noticeable progress, and the number of students meeting the learning objectives increased. Additionally, improvements were observed across all learning styles, with each group reaching a high level of mastery by the end of the intervention. These findings confirm that differentiated instruction tailored to learning styles is effective in promoting better science learning outcomes.

Keywords:
Differentiated Instruction, Learning Styles, Learning Outcomes

INTRODUCTION

Science education at the junior high school level plays a vital role in shaping students' scientific thinking and problem-solving abilities. However, in actual practice at SMPN 11 South Tangerang, particularly in the eighth grade, students' science learning outcomes have not yet reached their full potential. Observations from daily assessments indicate that many students have not achieved the minimum learning mastery standards. During classroom activities, a noticeable number of students remain passive, with only a few actively engaging in discussions or responding to questions. This suggests that the current teaching approach remains relatively uniform and has yet to accommodate the diverse learning preferences of students. In fact, each class comprises students with varying characteristics—visual, auditory, and kinesthetic learners—each requiring specific instructional strategies to better understand the material.

A critical issue in 21st-century education is how educators can deliver instruction that aligns with the individual learning needs of students. A growing body of literature highlights the importance of differentiated instruction as an innovative pedagogical approach to address these challenges. According to Tomlinson (2014), differentiated instruction involves the teacher's effort to design curriculum, instruction, and learning outcomes tailored to students' readiness, interests, and learning profiles. Relevant research, such as that conducted by Fitriani (2020), found that implementing differentiated instruction based on learning styles improved science achievement among seventh-grade students in Bandung. Similarly, a study by Sari and Suparno (2019) demonstrated that integrating visual, auditory, and kinesthetic learning styles significantly enhanced students' conceptual understanding in science. Nonetheless, based on a comprehensive literature review, there appears to be a lack of studies specifically investigating

the application of learning style-based differentiation in science instruction for eighth-grade students at SMPN 11 South Tangerang.

Given this context, a gap exists between the need for learning strategies that address students' diverse learning styles and the uniform instructional practices currently in place. Therefore, this classroom action research was conducted with the general aim of improving science learning outcomes through the implementation of differentiated instruction based on students' learning styles. Specifically, the study seeks to (1) describe the implementation process of learning style-based differentiation in science instruction for eighth-grade students, and (2) enhance their science learning outcomes through this approach. It is expected that this research will make a meaningful contribution to improving the quality of science education, increasing students' learning motivation, and providing a practical example of differentiated instruction that can be adopted by other educators in similar educational settings.

METHODS

This study employed a Classroom Action Research (CAR) approach, conducted in a collaborative and participatory manner, with the primary aim of improving students' science learning outcomes through the implementation of differentiated instruction based on learning styles. The research adopted a cyclical model developed by Kemmis and Taggart, which comprises four sequential phases in each cycle: planning, action, observation, and reflection. The issues identified during the first cycle served as the foundation for designing improvements in the second cycle. Activities in the second cycle followed the same structural phases as the first, planning, implementation, observation, and reflection, while incorporating necessary modifications to address the challenges encountered previously.

The planning phase marked the initial stage of the research, focusing on the preparation of instructional tools and resources to be used throughout the study. These included lesson plans, student worksheets, learning media, observation sheets for both teachers and students, and learning outcome assessments. The action phase involved the execution of the instructional plans developed during the planning phase, based on the differentiated teaching modules. The observation phase was dedicated to monitoring the learning process and students' performance using instruments such as observation sheets and evaluation tests. Observations were conducted by a collaborating teacher. Finally, the reflection phase entailed an evaluative discussion between the researcher and the collaborating teacher, aimed at analyzing the strengths and weaknesses of the instructional process. Identified shortcomings were used as the basis for refinement and improvement in the subsequent cycle. The procedural flow of this research was illustrated in the accompanying diagram.

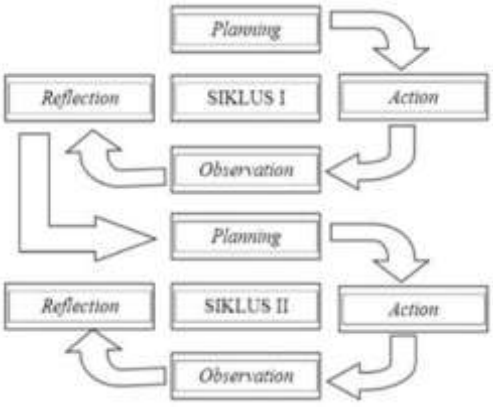

Figure 1. Research Procedure and Data Analysis

The study was conducted at SMPN 11 South Tangerang, involving eighth-grade students during the first semester of the academic year. The research focused on a science topic aligned

with the core curriculum, specifically the human circulatory system. The instructional content was designed using a differentiated teaching module tailored to students' learning styles—visual, auditory, and kinesthetic.

To identify students' dominant learning styles, an online learning style test was administered using the Aku Pintar platform. Students completed the test independently in class using their devices, and the results were used to group them for differentiated instruction.

Data collection was carried out across three action cycles, including learning outcome tests, classroom observations during differentiated instruction, and teacher field notes. Quantitative data were analyzed descriptively to assess learning mastery, while qualitative data from observations and field notes were used to evaluate student engagement and learning independence.

The analysis combined descriptive qualitative and quantitative approaches. Qualitative analysis aimed to interpret behavioral patterns related to students' learning independence, while quantitative analysis measured the average percentage of learning mastery and engagement using standardized scoring methods. These analyses provided insights into the effectiveness of the intervention and informed conclusions regarding instructional impact.

$$M\ (\%) = \frac{M}{SMI} \times 100\%$$

M% = Average percentage
M = Mean score
SMI = Maximum ideal score

A student is considered to have achieved individual learning mastery if their absorption percentage meets the minimum standard, which is set at seventy percent.

$$KBK = \frac{\sum N}{\sum S} \times 100\%$$

KBK = Classical learning mastery
∑N = Number of students who achieved mastery
∑S = Total number of students

The criteria for classical learning mastery are fulfilled when the number of students who have achieved individual learning mastery reaches a minimum threshold of seventy percent.
The criteria used to determine the level of success of an instructional action are as follows:

- Very High = 90%–100%
- High = 80%–89%
- Moderate = 65%–79%
- Low = 55%–64%
- Very Low = 0%–54%

(Source: Agung, 2014)

An instructional action is considered successful if it meets two conditions: (1) The level of classical learning mastery reaches at least seventy percent, and (2) Observations indicate active engagement from both the teacher and students.

RESULTS AND DISCUSSION

The following is the data resulting from the identification of learning styles obtained from Class VIII.11, as illustrated in the figure below.

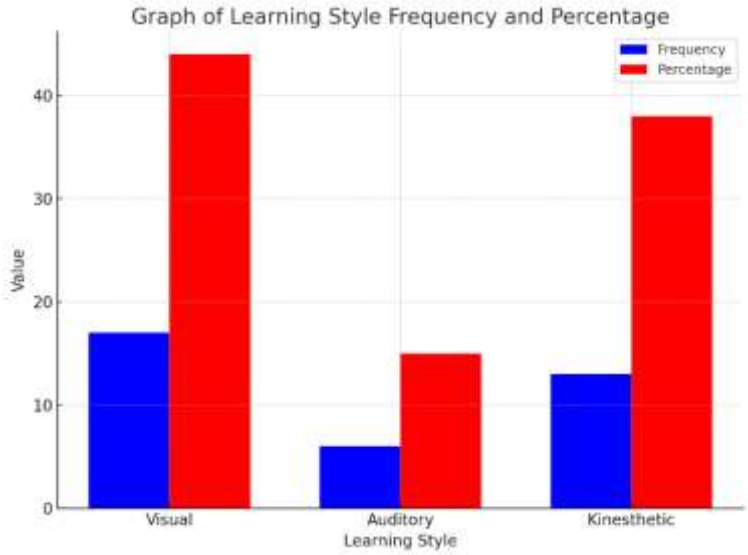

Figure 2. Identification of Students' Learning Styles

The chart above illustrates the distribution of learning styles among eighth-grade students at SMPN 11 South Tangerang, based on the initial pre-intervention test. The results include visual, auditory, and kinesthetic learning styles. It is evident that the majority of students exhibit visual and kinesthetic learning preferences, while the auditory style is less common. This data serves as a critical reference for the classroom action research in designing a differentiated science learning strategy tailored to the dominant learning styles, with the expectation of improving both student engagement and learning outcomes.

After conducting classroom action research across two intervention cycles in the eighth-grade science class, the students' learning outcomes were as follows:

Table 1. Student Learning Outcomes – Cycle I

Test Type	Score
Class Average	70.38
Highest Score	90
Lowest Score	40
Number of Students Achieving Mastery	26
Number of Students Not Achieving Mastery	13
Percentage of Mastery	66.67%
Percentage of Non-Mastery	33.33%

Based on the analysis of students' cognitive learning outcomes in Cycle I, most students had understood the material, but improvement efforts were still needed for those who had not yet achieved mastery.

Table 2. Observed Learning Styles – Cycle I

Aspect	Percentage	Category
Learning Outcome – Visual Style	76.92%	Moderate
Learning Outcome – Auditory Style	71.43%	Moderate
Learning Outcome – Kinesthetic Style	68.42%	Low

These findings suggest that students with visual and auditory learning styles tended to perform better than kinesthetic learners, indicating the need for more targeted strategies to support kinesthetic learners in achieving improved outcomes.

Table 3. Student Learning Outcomes – Cycle II

Test Type	Score
Class Average	80.33
Highest Score	100
Lowest Score	60
Number of Students Achieving Mastery	33
Number of Students Not Achieving Mastery	6
Percentage of Mastery	84.62%
Percentage of Non-Mastery	15.38%

Based on the analysis of students' cognitive learning outcomes in Cycle II, the class average increased, with the highest score reaching the maximum and the lowest score showing considerable improvement. A significant portion of students achieved mastery, while only a small number had not yet reached the expected level, indicating that most students had understood the material well. Nonetheless, continued efforts were still needed to support those who had not yet met the learning objectives.

Table 4. Learning Outcomes by Learning Style – Cycle II

Aspect	Percentage	Category
Learning Outcome – Visual Style	84.62%	High
Learning Outcome – Auditory Style	85.71%	High
Learning Outcome – Kinesthetic Style	84.21%	High

The data suggest that students across all three learning styles—visual, auditory, and kinesthetic—achieved high levels of learning outcomes. The highest percentage was observed among auditory learners, followed by visual learners, and then kinesthetic learners. This implies that all students, regardless of their preferred learning style, were able to attain good academic performance, with auditory learners showing slightly better results.

In Cycle I, students' overall learning outcomes were categorized as adequate. The class average was moderate, and the percentage of students achieving mastery was slightly above half, with a considerable number of students still below the expected threshold. Specifically, students with visual and auditory learning styles were categorized as moderate, while those with kinesthetic learning styles fell into the low category. These results indicated that the initial instructional approach was not fully effective, especially for kinesthetic learners who required additional support.

In Cycle II, there was a marked improvement in students' academic performance. The class average rose significantly, the percentage of students achieving mastery increased substantially, and the number of students who had not reached mastery dropped considerably. In terms of learning styles, all three groups—visual, auditory, and kinesthetic—showed improvement and reached the high-performance category. This suggests that the improvements made in Cycle II were successful in accommodating students' diverse learning preferences. Consequently, the learning implementation in Cycle II was more optimal and effective compared to Cycle I.

CONCLUSION

Based on the results of this classroom action research, it can be concluded that the implementation of differentiated instruction based on students' learning styles was successfully applied in science learning for eighth-grade students at SMPN 11 South Tangerang. This was evident from the learning process, which effectively accommodated various learning styles, visual, auditory, and kinesthetic, ultimately leading to improved learning outcomes for each group from Cycle I to Cycle II. Moreover, the implementation of this strategy proved effective in enhancing overall science achievement, as demonstrated by the increase in the class average

score and the rise in the percentage of students who achieved learning mastery. Therefore, this study confirms that the objective of describing the application of learning style-based differentiated instruction was achieved, and the approach was proven to improve science learning outcomes among eighth-grade students at the school.

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