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The Influence of Learning Styles on Mathematical Performance among Junior High School Students

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Abstract

Learning styles are different approaches individuals prefer for acquiring knowledge and information. This study examines the influence and relationship between learning styles and mathematical performance among junior high school students at Tolotolo National High School. By identifying and recognizing students' preferred learning styles, educators can better understand and meet students' learning needs. The research aims to identify the dominant learning style among students and its correlation with mathematical performance. Results show that students at Tolotolo National High School predominantly prefer auditory learning. However, the study found no significant correlation between auditory learning and mathematical performance. Interestingly, a significant relationship was found between kinesthetic learning styles and higher academic achievement in Mathematics with a significance score of 0.001. These findings suggest that while auditory learning is prevalent, kinesthetic learning plays a role in academic success. These insights contribute to developing effective teaching strategies and styles that encourage students to become more successful academically.

Keywords: learning styles, mathematical performance, influence, relationship

1. Introduction

1.1 Introduce the Problem

Learning styles refer to the ways individuals understand and respond to information during the learning process (Sapira et al., 2022). Recognizing and addressing diverse learning styles can enhance the educational experience by tailoring instruction to improve student engagement and performance. When learners are taught in their preferred style, retention and comprehension are significantly enhanced, leading to more effective learning (Kärchner et al.,

2022). Tailoring teaching approaches to match students' preferred modalities optimizes learning outcomes and enhances academic performance (Farman et al., 2021). Understanding these diverse styles allows educators to implement effective teaching strategies, reducing the risk of poor performance and student disappointment caused by mismatched teaching methods (Chetty et al., 2019). It is crucial for educators to identify and incorporate various learning styles to maximize educational effectiveness.

Mathematics education plays a vital role in technological advancement and everyday practicality (Widana et al., 2020). It not only imparts essential knowledge and skills but also equips students with the competencies to apply these abilities in real-life situations (Do'stov & Xolmirzayev, 2023). By fostering mathematical concepts and critical-thinking skills, mathematics education prepares students with essential life skills.

Several studies have examined the preferred learning styles in Mathematics. Jurenka et al. (2018) found that auditory learning was the most preferred, while Chetty et al. (2019) reported a preference for visual learning, with kinesthetic learning being the least favored. Contradicting these findings, Zain et al. (2019) stated that kinesthetic learners were the most common, and high achievers preferred this style. Putri, Mardiyana, and Saputro (2019) observed that visual learners outperformed auditory and kinesthetic learners among public junior high school students in Sragen, Indonesia.

Timisina et al. (2021) revealed a preference for auditory and kinesthetic learning styles among middle and high school students in Bhutan, while Ha (2021) highlighted the strong correlation between kinesthetic learning and academic performance in high schools in Thai Nguyen City, Vietnam. Lestari and Munajefi (2023) found that both visual and kinesthetic learners demonstrated good problem-solving skills and Mathematics performance.

In Surakarta, junior high school students preferred visual learning, followed by kinesthetic, auditory, and reading/writing (Fahrudin, Saputro, & Sarwanto, 2023). Similarly, Buiningtyas and Sutama (2024) showed that the majority of junior high school students in Susukan, Indonesia, preferred visual learning, with auditory and kinesthetic styles being less favored. Dey and Panda (2024) also found visual learning to be the most preferred style among students in Bhubaneswar, India.

These findings indicate that students tend to adopt learning styles that suit their abilities in learning Mathematics (Damanhuri, Jamlus, & Ahmad, 2020). However, Khan (2021) suggested that future studies should investigate other factors, such as classroom environment, instructional delivery, and students' self-efficacy, to better explain academic achievement.

Bearneza (2023) revealed that the preferred learning style of BS-Industrial Technology students at Carlos Hilado Memorial State University (CHMSC) is visual. However, auditory learners exhibited the highest mean performance in Mathematics. Damasco et al. (2024) found that kinesthetic learning was the most preferred style among Bachelor of Elementary Education (BEED) students at Bukidnon State University. Conversely, at Hindang Central School in Leyte, auditory learning was the favored method among students, as reported by Cavite and Gonzaga (2023). A local study by Ocampo et al. (2023) found no significant link

between learning styles and Mathematics grades, suggesting that other factors such as motivation and teacher quality might influence performance.

Considering these results and the varied nature of studies conducted, this study will investigate further the relationship between learning styles and the mathematical performance of junior high school students.

2. Method

2.1 Design

The study utilized a quantitative approach in the present study since the collected numerical data will be analyzed through statistics. This study utilized a correlational type to identify the relationship of the outcomes of the data that has been gathered to address the link between learning styles and mathematical performance among Junior High School students.

2.2 Participant

The participants of the study were the junior high school students in Tolotolo National High School, a public school located in Consolacion Cebu, Philippines. Participants were selected based on their willingness to participate and their availability during the study period.

2.3 Sampling Procedures

The study using a quota sampling approach. A total of 80 respondents were selected, with 20 students from each grade level. This sample size was chosen to ensure that each grade level was equally represented, reflecting a balanced view of the preferred learning styles across different grades. The relatively small sample size was appropriate given the school's size and resource constraints.

2.4 Instrument

The researcher created a Likert scale survey questionnaire as tools for gathering data. Each learning style comprises six (6) indicators for Visual, Auditory, Reading and Writing, and Kinesthetic learning style. Respondents used a rating scale, ranging from 1 (never) to 5 (always).

2.5 Data Gathering Procedures

Data collection was conducted after the students completed their final examinations to ensure full attendance. The structured questionnaire was administered during this period when all students were present. The respondents answered a 2-paged survey questionnaire with 4 major parts. After gathering the data, the researcher will grouped the responses according to the sub-problems of the study. During the data collection phase, the research team worked closely with school teachers and coordinated with the school principal. Academic grades were obtained reliably from school records, ensuring accuracy and completeness.

3. Results

Table 1 presents the Students' Academic Performance in Mathematics for a group of 80 students, categorized into four descriptors: Outstanding, Strongly Satisfactory, Satisfactory,

and Fairly Satisfactory. Each category shows the frequency and percentage of students who fall into that performance level, as well as an overall mean value and interpretation of the group's performance. Descriptor and grading scale was based on Dep-Ed Order 8, Series of 2015 (Department of Education, 2015). Out of 80 students, 26 (32.5%) are categorized as Outstanding and another 26 (32.5%) fall under Strongly Satisfactory. The Satisfactory category comprises 21 students (26.25%), while the Fairly Satisfactory category includes 7 students (8.75%). These frequencies and percentages indicate a substantial concentration of students in the higher performance categories, with over half achieving either Outstanding or Strongly Satisfactory levels. Students are excelling in Mathematics, with an average score of 86.38 categorized as "Strongly Satisfactory." This positive performance suggests that current teaching methods are effective. This aligns with findings by Veteska et al. (2022) and Haataja et al. (2023), as cited by Ocampo et al. (2023), which revealed a significant link between learning styles and academic performance. Therefore, investigating students' learning styles could further enhance educational outcomes.

Table 1. Students academic performance in mathematics

Descriptor	Frequency	Percentage	Mean Value	Interpretation
Outstanding	26	32.5%	86.38	Strongly Satisfactory
Strongly Satisfactory	26	32.5%		
Satisfactory	21	26.25%		
Fairly Satisfactory	7	8.75%		
Total	80	100%		

Table 2. Student's preferred learning style

Learning Styles	Frequency	Percentage
Visual	21	26.25%
Auditory	27	33.75%
Reading/Writing	18	22.50%
Kinesthetic	14	17.50%

The table below shows the various learning styles favored by a group of students at Tolotolo National High School, showing both the frequency of each learning style and the corresponding percentage. The most preferred learning style is Auditory, with 27 students (33.75%) favoring this method. This was observed in the study of Jurenka et al. (2018), Timisina et al. (2021), and Cavite and Gonzaga (2023). This suggests that a significant portion of the students learn best through listening and verbal instructions, indicating that they might benefit from lectures, discussions, and audio materials. The second most preferred

learning style is Visual, with 21 students (26.25%) selecting this option. Students who prefer visual learning often understand and retain information better when it is presented in a visual format, such as through diagrams, charts, videos, and written notes.

Table 3. Correlation between learning styles and mathematical performance

		Visual	Auditory	Reading/Writing	Kinesthetic
Mathematical Performance	r-value	0.191	0.109	0.207	0.349
	p-value	0.089	0.336	0.067	0.001

The table illustrates the correlation between different learning styles and mathematical performance, where mathematical performance is represented by the third quarter grades of the respondents. The learning styles considered in this study are Visual, Auditory, Reading/Writing, and Kinesthetic. Each correlation is described using two statistical values: the Pearson correlation coefficient (r-value) and the p-value. These values help in understanding the strength and significance of the relationship between learning styles and mathematical performance. The Visual learning style shows an r-value of 0.191 with a p-value of 0.089. The r-value indicates a positive but weak correlation between the Visual learning style and mathematical performance. The p-value, however, is greater than the standard limit of 0.05, suggesting that this correlation is not statistically significant. This means that while there is a slight tendency for visual learners to perform better in mathematics, the evidence is not strong enough to confirm this relationship definitively.

For the Auditory learning style, the r-value is 0.109, which indicates an even weaker positive correlation with mathematical performance compared to the Visual learning style. The p-value associated with this correlation is 0.336, which is well above the 0.05 benchmark. This high p-value suggests that there is no significant relationship between the Auditory learning style and mathematical performance. Therefore, the preference for auditory learning does not appear to influence math grades in a meaningful way.

The Reading/Writing learning style has an r-value of 0.207, indicating a weak positive correlation with mathematical performance. The p-value for this correlation is 0.067. While this value is closer to the 0.05 significance level than those for Visual and Auditory styles, it is still not statistically significant. This suggests that the relationship between the Reading/Writing learning style and mathematical performance is not strong enough to be considered reliable. Thus, students who prefer reading and writing as their primary learning methods do not show a significantly better performance in mathematics.

The Kinesthetic learning style stands out with an r-value of 0.349, which suggests a moderate positive correlation with mathematical performance. The p-value for this correlation is 0.001, which is well below the 0.05 benchmark. This indicates a statistically significant relationship, meaning that students who prefer a Kinesthetic learning style tend to perform better in mathematics. Zain et al. (2019) stated that high achievers in mathematics preferred

kinesthetic learning style. Kinesthetic learners thrive in hands-on, experiential learning environments (Ha, 2021), which may contribute to their enhanced ability to grasp mathematical concepts and consequently achieve higher grades in this subject. The strong correlation suggests that kinesthetic learners, who engage more in hands-on, movement-oriented activities, may find it easier to grasp mathematical concepts, leading to better academic performance in this subject. The strongest correlation in this study was kinesthetic learning style, which is inline with the findings of Ha (2021), and those kinesthetic learners have good problem solving skills and mathematical performance (Lestari, & Munajefi, 2023).

In summary, among the four learning styles examined, only the Kinesthetic learning style shows a statistically significant correlation with mathematical performance. This suggests that students who engage in more physical, hands-on learning activities tend to achieve better grades in mathematics. The lack of significant correlations for Visual, Auditory, and Reading/Writing learning styles implies that these styles may not have a strong impact on mathematical performance. These findings align with previous studies that have indicated varying preferences among students for different learning styles in relation to their academic achievement (Bearneza, 2023; Ocampo et al., 2023).

4. Conclusion

The study found that the Kinesthetic learning style had a statistically significant positive correlation with students' Mathematical performance, implying that hands-on, movement-oriented activities enhance mathematics understanding. Other learning styles, such as Visual, Auditory, and Reading/Writing, seemed to have little influence on students' Mathematics grades. The findings emphasize the need for educational strategies that incorporate kinesthetic activities to enhance mathematics learning. Future studies should explore other factors like classroom environment and instructional delivery to fully understand academic achievement. The results align with previous research highlighting the effectiveness of kinesthetic learning in improving mathematics performance. Overall, this study supports the integration of diverse teaching methods to address different learning styles, fostering better academic outcomes. Educators should consider incorporating more kinesthetic activities in their teaching as in this study, leaning to kinesthetic learning style can improve mathematical performance.

5. Recommendation

Mathematics teachers are encouraged to use more hands-on materials and activities when teaching. Research shows that when students use their bodies and move around during lessons, they tend to understand and remember the material better. This learning approach is helpful for students who prefer learning by doing, as they are more engaged and can grasp concepts more effectively. From the results, it has been found that the more teachers incorporate kinesthetic activities into their lessons, the more students' grades improve. Therefore, in ways like manipulatives, interactive games, and physical activities, teachers can help all students succeed in Mathematics. To better understand how different learning styles affect students' Mathematics performance, it's important to study a larger group of students.

Including more students from different schools will give us a clearer picture of how learning styles influence Mathematical skills. Then, the researcher make a better recommendation for teaching methods that work best for different types of learners. Overall, this would help us improve Mathematics education for all students. Finally, to confirm the findings of this study, it is suggested that a similar study be conducted. This follow-up research should involve different subjects connected to Mathematics, such as science, biology, chemistry, or any subject taught in junior high school that relates to Mathematics.

6. Limitations of the Study

This research has certain limitations. First, only two variables were considered: the students' learning styles and academic performance in Mathematics. Second, it is limited to 80 junior high school students at Tolotolo National High School, with 20 students from each grade level, 7 to 10. Using a quota sampling approach, participants were selected based on their willingness to participate. Third, only the 3rd-quarter grades in Mathematics were collected in this study. Further research may use a larger sample size, include more schools, and employ consistent research tools to enhance the study's reliability.

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Appendix A

Questionnaire

Name: _____ Gender: _____

Age: _____ Grade & Section: _____

Grade in Math (3rd Quarter): _____

Teacher in Math Subject (3rd Quarter): _____

Direction: Read carefully the statement below. Put a checkmark on each statement on the rating scale that it belongs to.

1 = never 2 = rarely 3 = sometimes 4 = very often 5 = always

Visual	**Never (1)**	**Rarely (2)**	**Sometimes (3)**	**Very Often (4)**	**Always (5)**
1. I like to write things down on or take notes for visual review.					
2. I obtain information on Mathematics subjects by reading relevant materials.					
3. I am good at working and solving jigsaw puzzles and mazes.					
4. I am skillful and enjoy developing and making graphs and charts.					
5. I can understand and follow directions using maps.					
6. I feel the best way to remember is to picture it in my mind.					

Auditory	**1**	**2**	**3**	**4**	**5**
1. I required an explanation of diagrams, graphs, or visual directions.					
2. I can tell if sounds match when presented with pairs of sounds.					
3. I do better at mathematics by listening to lectures and tapes.					
4. I follow oral directions better than written ones.					
5. I prefer listening to the news on the radio rather than reading about it in a newspaper.					
6. I would rather listen to a good lecture or speech than read about the same material in a textbook.					
Reading and Writing	**1**	**2**	**3**	**4**	**5**
1. I can scan important details and ideas of books with dense text, essay, and/or articles.					
2. I rephrase the text from the book to make it more understandable to me.					
3. I write detailed math notes.					
4. I write lists and order my notes into categories and hierarchies.					
5. I take care to spell-check and correct written language errors.					
6. I use dictionaries and glossaries in mathematics.					
Kinesthetic	1	2	3	4	5
1. I enjoy manipulating tools.					
2. I remember best when I have my hands-on experience.					
3. I learn by using trial and error during solving complex mathematical equations and problems.					
4. I learn best by demonstrating how to solve mathematical problems.					
5. I find ease in using calculators.					
6. I focus on applications and details before theories and abstract concepts.					

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Informed Consent

Obtained.

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Provenance and Peer Review

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Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data Sharing Statement

No additional data are available.