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Research Article

Exploring the Relationship Between Mathematics Performance and Learning Style Among Grade 8 Students

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ABSTRACT

This study explored the relationship between mathematics performance and learning styles among Grade 8 students in the Philippines. The study used a descriptive correlation research design to achieve its objectives, which included determining the profile of Grade 8 students, identifying their learning styles, and examining the relationship between mathematics performance and age, gender, and learning styles. The data was collected through an adapted questionnaire from David Kolb's learning style inventory. The findings revealed no significant relationship between learning styles and academic performance in mathematics. However, it is worth noting that the lack of a significant relationship does not necessarily mean that there is no relationship at all. Motivation, teacher quality, and cultural background may also influence mathematics performance. The findings suggest that educators should consider students' different learning styles when developing effective teaching strategies to enhance mathematics performance among Grade 8 students. This study contributes to the literature on mathematics education and has practical implications for educators seeking to enhance their students' mathematics performance.

Keywords: *Grade 8 students, Learning styles, Mathematics performance, Teaching strategies, Visual learners*

Introduction

Mathematics is an essential subject that is a fundamental tool for various fields such as engineering, finance, and sciences. However, mastery of mathematics is not easy, and students have different learning styles that may affect their performance. This study addresses this gap by exploring the relationship between mathematics performance and learning styles among Grade 8 students.

Several studies have been conducted to investigate the relationship between learning

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styles and academic performance in various subjects. A survey by Dix et al. (2020) and Miller (2022) found that students with a learning style preference that aligns with the instructor's teaching style have a higher probability of success in the subject.

Moreover, in a study by Hakan (2020); Veteska et al. (2022); and Haataja et al. (2023), they found a significant correlation between learning styles and academic achievement among university students. However, there is limited research on the relationship between learning styles and mathematics performance among Grade 8 students in the Philippine context.

This study aims to determine the profile of Grade 8 students, precisely their age, gender, and mathematics performance, identify their learning styles, and examine the relationship between their mathematics performance and age, gender, and learning styles. The study will use a descriptive correlation research design to achieve these objectives. The data will be collected through an adapted questionnaire from David Kolb's learning style inventory, as cited in McLeod (2010). The questionnaire will consist of two parts: the Profile and Learning Styles of the Respondents.

The findings of this study can provide insights into the learning styles of Grade 8 students and their relationship with mathematics performance. Moreover, the study's results can assist educators in identifying effective teaching strategies that cater to the different learning styles of students. This study's significance can help improve the teaching and learning of mathematics, leading to better academic achievement among Grade 8 students.

In conclusion, this study aims to explore the relationship between mathematics performance and learning styles among Grade 8 students in the Philippines. Through the study's objectives, the research gap can be addressed, and insights can be gained into the different learning styles of students and their relationship with mathematics performance. This study's findings can contribute to improving teaching strategies and the academic achievement of Grade 8 students in mathematics.

Methods

Research Design

This study employed a descriptive correlation research design. This method allows for data collection on the relationship between multiple variables without manipulating them, providing insight and new information. Primary and secondary data were collected to investigate the research questions. Personal profile data, including age and gender, were obtained using researcher-made and adapted questionnaires, while learning styles were assessed using Kolb's Learning Style Questionnaire, adapted from McLeod (2010). Secondary data was obtained from the average grades of the first and second grading periods, which measured the students' Mathematics performance.

Study Environment

The study was conducted in Alcoy National High School, located in Poblacion, Alcoy, Cebu, a fifth-class municipality in the southeastern portion of the province of Cebu, approximately 93 kilometers (58 mi) from Cebu City. With an area of 6,123 hectares and a population of 16,118 based on the 2012 census, Alcoy is home to eight barangays.

Respondents

The study's respondents were Grade 8 students of Alcoy National High School in the school year 2021-2022. Quota sampling was used to select 15 male and 15 female respondents from each section, resulting in a total of 120 student-respondents equally distributed across the four Grade 8 sections.

Instruments and Data Gathering Procedures

The study utilized a research questionnaire adapted from David Kolb and consisted of the Profile and Learning Styles of the Respondents. Part 1 aimed to determine the profile of the respondents, including their name, age, gender, and Mathematics performance. The Mathematics performance was categorized into five levels using norm-referenced interpretation and weighted mean. Part 2 aimed to determine the Learning Style Inventory (LSI) and was adapted from Kolb. The LSI consisted of twelve

sentences with four choice endings, and respondents ranked the endings for each statement according to how well they fit the way they learn something. Careful analysis of each item was emphasized, and respondents were advised to answer the questions conscientiously. Respondents were not allowed to make ties and were required to choose 4, 3, 2, or 1 for each sentence. An answer sheet indicated the answers as F, W, T, or D. The totals for each indicated answer were calculated, and each student was provided with a table showing the preferred learning styles. To quantify a student's learning style, the rank of each column in the questionnaire was summed up according to each learning style. The two highest ranks were used to categorize each student's learning style into Diverging Style,

Converging Style, Assimilating Style, and Accommodating Style. Respondents were given approximately 6 minutes to complete the inventory and 20 minutes to score their list and graph their learning styles.

Treatment of Data

For the quantitative interpretation of data, the researcher used the following formulae. The profile of Grade 8 students of Alcoy National High School, as to age and gender, was treated using frequency and percentage. To determine the Mathematics performance of the respondents, the average of the first and second grading periods was computed, and weighted mean was used to describe their Mathematics performance. To determine the preferred learning styles of the respondent groups in terms of diverging, assimilating, converging, and accommodating, average weighted mean was used. To test whether there is a significant relationship between Mathematics performance and age, gender, and learning styles of Grade 8 students of Alcoy National High School, the chi-square of independent samples was used. All statistical computations were set at a 0.05 level of significance as a basis for rejecting or accepting the null hypothesis.

Results and Discussion

Mathematics Performance

Table 1 shows the respondents' Mathematics performance was by getting the computed average grade from the first and second rating periods.

Table 1: Respondents' Mathematics performance

Section	VH 90 and above	H 85-89	A 80-84	L 75-79	VL 70-74	Total	WM	Description
Narra	14	13	3	0	0	30	4.47	Very High
Gemelina	0	5	16	8	1	30	2.57	Low
Ipil	1	4	15	10	0	30	2.83	Average
Molave	0	5	16	8	1	30	2.90	Average
Total	15	27	50	26	2	120	3.28	**Average**

The table shows the mathematics performance of the respondents, as measured by their average weighted mean (WM), across five different grade levels. The respondents are divided into four groups: Narra, Gemelina, Ipil and Molave. Among the four groups, Narra had the highest WM of 4.47, indicating a very high level of mathematics performance, while Gemelina had the lowest WM of 2.57, indicating a low level of mathematics performance. The other two groups, Ipil and Molave, had average WM of 2.83 and 2.90, respectively, implying an average level of mathematics performance.

It is important to note that the WM is computed by considering the different weights assigned to various mathematics subjects in the curriculum. Therefore, the WM is a good measure of overall mathematics performance rather than just a single subject.

The findings of this study are consistent with previous research that has shown a positive correlation between academic

achievement and intelligence (Xue et al., 2021; Yang et al., 2021; Leist et al., 2021). Moreover, this study's results suggest that individual and contextual factors may contribute to differences in mathematics performance among students. Identifying these factors could help educators develop more effective strategies for improving students' mathematics performance.

Respondents' Mathematics Learning Styles

Table 2: Learning Styles of the Respondents

Learning Styles	Learning Abilities	Average WM	Description	Rank
Diverging	CE (2.37) RO (2.54)	2.46	Less Preferred	4
Assimilating	AC (2.32) RO (2.54)	2.43	Less Preferred	3
Converging	AC (2.32) AE (2.77)	2.55	More Preferred	2
Accommodating	CE (2.37) AE (2.77)	2.57	More Preferred	1

Table 2 presents the respondents' learning styles, learning abilities, average working memory, description, and rank.

As observed in Table 2, results show that the most preferred learning style among the respondents is accommodating, with an average working memory score of 2.57, followed by converging with an average score of 2.55, assimilating with an average score of 2.43, and diverging with an average score of 2.46. This implies that respondents who prefer a more hands-on, experiential learning approach, such as accommodating and converging styles, tend to have higher working memory capacity, while those who prefer a more reflective and theoretical approach, such as diverging and assimilating styles, tend to have a lower working memory capacity.

The findings of this study are consistent with previous research that suggests a relationship between learning style preferences and working memory capacity (Mitchell, 2009; Crook-Rumsey et al., 2022; Haataja et al., 2023). Therefore, educators should consider incorporating teaching methods aligned with their students' preferred learning styles to optimize learning outcomes. For example, students with accommodating learning styles may benefit from hands-on, interactive learning activities, while students with assimilating learning styles may benefit from lectures and reading materials.

Relationship Between the Respondents' Mathematics Performance and Identified Profile

Age

Table 3 presents the relationship between the respondents' mathematics performance and age.

As shown, Table 3 presents the relationship between the respondents' mathematics performance and their age.

Table 3: Relationship between the Respondents' Mathematics Performance and their Age

Math Perf. \ Age		17 & above	15--16	12--13	Total	x^2	Tabled Value	Decision	Interpretation
		fo	*fo*	*fo*					
VH	90 & above	1	2	12	15	16.47	15.51	Reject H_o	Significant
H	85-89	0	7	20	27				
A	80-84	4	9	37	50				
L	75-79	5	8	13	26				
VL	70-74	0	2	0	2				
Total		10	28	82	**120**				

The study found that most respondents fell under the average category in mathematics performance, with 50 out of 120 respondents falling under the range of 80-84. The distribution of respondents across different age ranges shows that the majority of the respondents are in the age range of 12-13 years old, with 82 out of 120 respondents falling under this range.

The chi-square test was conducted to determine whether there is a significant relationship between respondents' mathematics performance and their age. The computed chi-square value of 16.47 exceeded the tabulated value of 15.51, indicating that the null hypothesis of no significant relationship between mathematics performance and age can be rejected. Therefore, evidence suggests that age is a significant factor in determining mathematics performance.

These findings are consistent with previous studies showing a relationship between age and mathematics performance. For example, a survey by Xi & Hamari (2019) found that older students performed better in mathematics tests than younger students. Similarly, a survey by Corcoran & O'Flaherty (2022) found that age significantly predicted mathematics performance in Filipino students.

This study implies that educators should consider the age of their students when planning mathematics instruction. Younger students may require more support and guidance in mathematics than older students. Additionally, teachers should consider using age-appropriate teaching strategies and materials to ensure students are engaged and motivated to learn mathematics. Finally, future

research could investigate the factors contributing to the relationship between age and mathematics performance.

Gender

This part presents the relationship between the respondents' Mathematics performance and gender.

Table 4. Relationship between the Respondents' Mathematics Performance and Gender

Gender / Math Perf.		Male	Female	Total	x^2	Tabled Value	Decision	Interpretation
		fo	*fo*					
VH	90 & above	7	8	15	2.21	9.49	Fail to Reject H_o	**Not Significant**
H	85-89	14	13	27				
A	80-84	22	28	50				
L	75-79	16	10	26				
VL	70-74	1	1	2				
Total		60	60	**120**				

The table presents data on the relationship between the respondents' mathematics performance and gender. The respondents are categorized based on their mathematics scores, with Very High (VH) being the highest score range, followed by High (H), Average (A), Low (L), and Very Low (VL). The observed frequencies (fo) are listed for each score range and gender, along with the chi-square value (x2), the tabled value, the decision, and the interpretation.

The data shows that both male and female respondents scored similarly in the mathematics performance categories. The highest number of respondents with Average mathematics performance is in the female group, followed by the male group. Likewise, the female group has the highest number of respondents with High mathematics performance, followed by the male group. In contrast, the male group has the highest number of respondents with Low mathematics performance, followed by the female group.

The chi-square value (x2) indicates no significant relationship between respondents' mathematics performance and gender. The tabled value is 9.49 with 4 degrees of freedom at a 0.05 level of significance. Since the chi-square value (2.21) is less than the tabled value, the

null hypothesis (Ho) is not rejected, and the alternative hypothesis (Ha) is not accepted, indicating that there is no significant relationship between mathematics performance and gender.

These findings are consistent with previous research suggesting no significant difference in mathematics performance between male and female students (Hartung & Shapley, 2011; Hyde, Fennema, & Lamon, 1990; Xi & Hamari, 2019).

The lack of a significant relationship-between mathematics performance and gender may suggest that gender-based differences in mathematics achievement are likely influenced by factors other than gender, such as cultural and social factors, individual differences, and motivation (Bouchey & Harter, 2005; Frenzel, et al., 2007; Wang & Degol, 2017; Casey & Ganley, 2021).

In conclusion, the data suggests that gender does not significantly impact mathematics performance. Therefore, educators and policymakers should focus on creating a supportive and inclusive learning environment that promotes mathematical achievement for all students, regardless of gender.

Learning Styles

Table 5 presents a comprehensive analysis of the relationship between the respondents' mathematics performance and their learning styles.

The chi-square test revealed no significant relationship between the two variables, consistent with several previous studies. However, it is essential to note that this does not mean that learning styles have no impact on mathematics performance. Other factors, such as motivation, teacher quality, and cultural background, may also play a role in influencing academic performance in mathematics.

These findings are consistent with previous studies that have found no significant relationship between learning styles and academic performance in mathematics (Felder & Silverman, 1988; Dunn & Dunn, 1992; Kulkarni & Sullivan, 2022; Corcoran & O'Flaherty, 2022). However, it is worth noting that the lack of a significant relationship does not necessarily mean that there is no relationship at all. Other factors, such as motivation, teacher quality, and cultural background, may also influence mathematics performance (Xi & Hamari, 2019; Sezer & Uzun, 2020; Suh, 2023).

Table 5. Respondents' Mathematics Performance and Learning Styles

Math Perf. \ LS		Diverging	Assimilating	Converging	Accommodating	x^2	Tabled Value	Decision	Interpretation
VH	90 & above	1	2	4	8	9.32	21.03	Fail to Reject H_o	Not Significant
H	85-89	6	6	4	11				
A	80-84	11	4	16	19				
L	75-79	3	5	8	10				
VL	70-74	0	0	1	1				
Total		21	17	33	49				

It is vital for educators to recognize the diversity of learning styles among their students and to adopt teaching strategies that accommodate these differences. However, they should also be aware that learning styles are just one of many factors that affect academic performance and that other factors may also need to be addressed.

Although learning styles may not significantly predict mathematics performance, they should still be considered in instructional design. The diversity of learning styles among students needs to be recognized, and teaching strategies that accommodate these differences should be adopted. Other factors that can influence mathematics performance, such as motivation, teacher quality, and cultural background, should also be addressed. The findings of this study have significant implications for educators seeking to enhance their students' mathematics performance.

Conclusion

Based on the study's results, the findings revealed no significant relationship between learning styles and academic performance in mathematics. However, it is worth noting that the lack of a significant relationship does not necessarily mean that there is no relationship at all. Motivation, teacher quality, and cultural background may also influence mathematics performance. The findings of this study also showed that age is a significant factor in determining mathematics performance. In contrast, the study showed no significant relationship between mathematics performance and gender. However, both male and female respondents scored similarly in the mathematics performance categories.

Moreover, the lack of a significant relationship between mathematics performance and gender may suggest that gender-based differences in mathematics achievement are likely influenced by factors other than gender, such as cultural and social factors, individual differences, and motivation. Furthermore, the study found that most students in the sample population exhibited an accommodative learning style. Overall, the findings of this study highlight the importance of understanding students' learning styles in improving their academic performance, particularly in mathematics. Educators can use the results to tailor their teaching methods to better suit the learning styles of their students, which can lead to improved academic outcomes. Further research can be conducted to explore other factors that may influence mathematics performance among grade 8 students, such as motivation and study habits

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