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| RESEARCH ARTICLE

Learning Styles and Mathematics Achievement of Grade 8 Students

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| ABSTRACT

This research aimed to determine the correlation between the Grade 8 students' learning styles and academic achievement in factoring polynomials. It utilized a descriptive correlational method. The sample comprises 316 Grade 8 students, selected using simple random sampling. A survey questionnaire from the National Training of Grade 9 Core of Trainers of the K to 12 Enhanced Basic Education Curriculum and an achievement test were used to describe academic performance in Mathematics. The data were analyzed using frequency counts, percentages, and the chi-square test. The study revealed that most respondents were 12-13 years old and female. It also revealed that most parents had a high school education, and their combined family income was 10,000 or less. The respondents' academic performance was satisfactory. The relationship between the respondents' learning styles and academic achievement in mathematics was found to be non-significant. This supports students developing observable, concrete skills and knowledge without identifying their learning styles. The researchers recommend that the proposed intervention plan be used and monitored.

| KEYWORDS

Teaching Mathematics, Learning Styles, Mathematics Achievement, Descriptive-correlational, Cebu, Philippines

| ARTICLE INFORMATION

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1. Introduction

Mathematics remains one of the most important yet challenging subjects in basic education. Beyond developing computational skills, it equips learners with logical reasoning, critical thinking, and problem-solving abilities that are essential for academic success and everyday life. Despite ongoing curriculum reforms and improvements in teaching practices, many students continue to struggle with mathematics, particularly algebra, which serves as a foundation for more advanced mathematical concepts. This persistent challenge is evident across many education systems and continues to be reflected in international assessments of student achievement (*Global Education Monitoring Report 2023*, 2023; OECD, 2023)

The situation is particularly evident in the Philippines. Results from the Programme for International Student Assessment (PISA) 2022 showed that Filipino learners continue to perform below the international average in mathematical literacy, highlighting the need for more effective and learner-responsive instructional approaches (Laron & Caldoza, 2026). In response, the Department of Education (DepEd) has strengthened its commitment to learning recovery through the Basic Education Development Plan (BEDP) 2030 and the MATATAG Agenda, both of which emphasize improving foundational learning, enhancing instructional quality, and addressing students' diverse learning needs (DepEd, 2023). These initiatives recognize that improving mathematics achievement requires not only effective teaching strategies but also a better understanding of the characteristics that influence how students learn.

Learning style remains a learner-related factor that continues to receive attention. It refers to an individual's preferred way of receiving, processing, and organizing information during learning. The Visual-Auditory-Kinesthetic (VAK) framework suggests that learners differ in how they engage with instruction, and understanding these preferences may help teachers design

learning experiences that are more meaningful and responsive to students' needs. As classrooms become increasingly learner-centered, recognizing these differences can support differentiated instruction, promote student engagement, and provide opportunities for learners to participate more actively in mathematics lessons (Aina, 2025; Alamri, 2023).

Although learning styles have been widely explored in educational research, their relationship with mathematics achievement remains inconclusive. Some recent studies suggest that students whose learning preferences are considered during instruction demonstrate greater engagement and improved academic performance (Nugroho et al., 2023; Yusof et al., 2022). In contrast, other studies argue that learning styles alone do not significantly predict achievement and that factors such as motivation, prior knowledge, self-regulated learning, and instructional quality may exert a greater influence on students' academic outcomes (Pérez-González et al., 2022; Wang & Kao, 2022). These differing findings indicate that the relationship between learning styles and mathematics achievement may vary across educational contexts, necessitating further investigation.

In the Philippine context, research on learning styles and mathematics achievement among junior high school students remains limited, particularly with respect to specific competencies such as factoring polynomials. Factoring polynomials is a fundamental algebraic skill that supports learners' understanding of more advanced topics, yet many students continue to struggle to master this skill. In selected public secondary schools in Mandaue City and Cebu Province, Grade 8 learners have consistently recorded Mean Percentage Scores (MPS) ranging from 40% to 50%, substantially below the Department of Education's target proficiency level. Despite teachers' continuous efforts to improve instruction through varied teaching strategies, students' performance in mathematics remains a concern.

Given these circumstances, it is important to examine whether students' learning styles are associated with their academic achievement in mathematics. Understanding how learners prefer to acquire and process information may provide valuable insights for designing instructional approaches that better respond to their learning needs. Therefore, this study examined the relationship between Grade 8 students' learning styles and their academic achievement in factoring polynomials in selected public secondary schools in Mandaue City and Cebu Province during the School Year 2022–2023. The findings are expected to contribute to the growing body of evidence on learner diversity in mathematics education and provide practical implications for developing more responsive and effective mathematics instruction.

2. Purpose of the Study

This study aimed to examine the learning styles and mathematics achievement of Grade 8 students enrolled in selected public national high schools in the Mandaue City Division and the Cebu Province Division during the School Year 2022–2023. Specifically, it sought to describe the respondents' demographic profile in terms of age, gender, parents' highest educational attainment, and combined family monthly income; determine the distribution of their learning styles; assess their level of mathematics achievement; and examine the relationship between learning styles and mathematics achievement. Furthermore, the findings served as the basis for developing action plans to enhance mathematics instruction and improve students' academic performance.

3. Methodology

This study used a descriptive- correlational design to examine the relationship between learning styles and mathematics achievement among Grade 8 students at three public national high schools in Cebu during School Year 2022–2023. The target population comprised 1,1521 Grade 8 students, from whom a sample of 316 respondents was selected using Slovin's formula with a 5% margin of error and simple random sampling. Data were collected using a three- part instrument comprising a demographic questionnaire, a 24- item Learning Styles Assessment Survey adapted from the National Training of Grade 9 Core of Trainers of the K to 12 Enhanced Basic Education Curriculum (Ateneo de Manila University, 2014), and a 40- item Mathematics Achievement Test on factoring polynomials. The survey measured students' dominant learning styles, such as visual, auditory, and tactile, using a three-point response scale, while mathematics achievement was classified according to the Department of Education's performance descriptors. Prior to data collection, approval was secured from the appropriate education authorities and school administrators, and informed consent from parents or guardians and student assent were obtained to ensure adherence to ethical research standards. The demographic questionnaire and learning styles survey were administered during regular mathematics classes, followed by the mathematics achievement test under standardized testing conditions. Completed instruments were retrieved, verified for completeness, and encoded for analysis. Descriptive statistics, including frequency counts and percentages, were used to summarize respondents' demographic characteristics, learning style distribution, and mathematics achievement levels, while the Chi- square test of independence was employed to determine whether the relationship between learning styles and mathematics achievement was significant at the 0.05 level. All participant information was treated with strict confidentiality, and the data were used exclusively for research purposes.

4. Results and Discussion

In this section, the results are presented on tables. The variables include respondents' profiles, the distribution of their learning styles, students' mathematics achievement levels, and the correlation analysis.

4.1 Profile of the Respondents

The profiles of the respondents in terms of age, gender, parents' highest educational attainment, and combined family monthly income were gathered and analyzed to provide an accurate description of the respondents. The frequency distribution of respondents by age and gender, parents' highest educational attainment, and combined family monthly income are shown in the tables that follow.

Table 1

Age and Gender of the Respondents

Age (in years)	Female		Male		Total	
	f	%	f	%	f	%
16 and above	6	1.90	5	1.58	11	3.48
14-15	21	6.65	22	6.96	43	13.61
12-13	133	42.09	129	40.82	262	82.91
Total	**160**	**50.63**	**156**	**49.37**	**316**	**100.00**

Table 1 presents the age distribution of the respondents. The majority were between 12 and 13 years old, comprising 133 females and 129 males, while respondents aged 16 years and above represented the smallest proportion of the sample.

This distribution indicates that most participants were enrolled at the grade level appropriate for their age, consistent with the age-placement guidelines of the Philippine K–12 curriculum. During early adolescence, learners undergo significant cognitive, linguistic, and socio-emotional development, gradually transitioning from concrete to more abstract modes of thinking. This developmental stage is characterized by heightened neuroplasticity, enabling substantial intellectual and emotional growth while also increasing sensitivity to environmental influences shaping learning and behavior(Rizky et al., 2025; Roslan et al., 2022). Consequently, the predominance of respondents in this age group provides an appropriate context for examining learning styles and mathematics achievement, as these developmental characteristics are likely to influence both learning preferences and academic performance (Malacapay, 2024; Tobe, 2023).

Table 2
Parents' Highest Educational Attainment

Educational Attainment	Mother		Father	
	f	%	f	%
College Graduate	49	15.51	51	16.14
College Level	42	13.29	36	11.39
High School Graduate	94	29.75	88	27.85
High School Level	55	17.41	54	17.09
Elementary Graduate	36	11.39	19	6.01
Elementary Level	32	10.13	52	16.46

No Formal Schooling	1	0.32	2	0.63
No Response	7	2.22	14	4.43
Total	**316**	**100.00**	**316**	**100.00**

Table 2 presents the educational attainment of the respondents' parents. The findings indicate that the largest proportion of both mothers and fathers were high school graduates, with 94 mothers (29.75%) and 88 fathers (27.85%), respectively.

This suggests that most respondents came from households where parents had attained secondary-level education, reflecting a moderate level of educational background among the families represented in the study. Parental educational attainment is widely recognized as a significant determinant of children's academic development (Costa et al., 2024), as it influences the quality of learning support, educational aspirations, and the availability of cognitive and socio-emotional resources within the home.

Parents with higher levels of education are generally better equipped to provide academic guidance, foster positive learning attitudes, and create environments conducive to educational success (Bhandari & Timsina, 2024; Sher & Inamullah, 2025). Consequently, children of educated parents are more likely to develop confidence, resourcefulness, and learning competencies that contribute to improved academic outcomes(Idris et al., 2020).

Table 3
Combined Family Monthly Income

Monthly Income (in pesos)	f	%
Above 30,000	16	5.06
25,001-30,000	16	5.06
20,001-25,000	22	6.96
15,001-20,000	37	11.71
10,001-15,000	40	12.66
10,000 and below	177	56.01
No Response	8	2.53
Total	**316**	**100.00**

Table 3 presents the respondents' combined family monthly income. The findings reveal that most respondents (177 families, 56.01%) reported a combined monthly income of ₱10,000 or less, while **8 respondents (2.53%)** did not disclose their household income.

The results indicate that a substantial proportion of the participants came from low-income households, reflecting the socioeconomic realities of many families enrolled in public secondary schools. Family income is a critical socioeconomic indicator that influences students' access to educational resources, learning opportunities, and overall academic development. Research has demonstrated that socioeconomic disadvantages are associated with differences in brain development, particularly in regions responsible for language, reading, executive functioning, and spatial reasoning (He et al., 2026; Poon et al., 2022).

Notably, the relationship between income and neurodevelopment is more pronounced among children from economically disadvantaged families, suggesting that even modest increases in household income may be associated with meaningful improvements in cognitive development and learning outcomes (Sosu & Schmidt, 2022). On the other hand, the predominance of respondents from lower-income households underscores the importance of considering socioeconomic factors when examining variations in learning styles and mathematics(Kweon et al., 2022).

4.2 Distribution of the Learning Styles of the Respondents

Observable and unique behaviors provide information about each person's learning styles. Every learner has a distinct learning style, like a fingerprint. Learning styles are inherited and predisposed.

Table 4
Distribution of the Learning Styles of the Respondents

Learning Styles	f	%
Auditory	110	34.81
Tactile	60	18.99
Visual	146	46.20
Total	**316**	**100.00**

Table 4 presents the distribution of respondents by dominant learning style. The findings indicate that **visual learning** was the most prevalent preference, reported by **146 respondents (46.20%),** whereas **tactile learning** was the least preferred, with **60 respondents (18.99%).**

This suggests that nearly half of the participants primarily acquire and process information through visual stimuli, highlighting the importance of incorporating visual representations into classroom instruction. Visual learners tend to comprehend and retain information more effectively when concepts are presented through diagrams, illustrations, charts, videos, graphic organizers, and other visual aids (Alabi, 2024; Haq & Madany, 2025). They also benefit from instructional strategies such as highlighting key ideas, organizing information into concept maps, and using concrete representations to facilitate understanding.

In contrast, learning environments that rely predominantly on verbal explanations with limited visual support may not fully accommodate their preferred learning style. These findings underscore the value of integrating diverse visual instructional materials into mathematics instruction to enhance students' engagement, conceptual understanding, and knowledge retention, particularly among learners who demonstrate a strong preference for visual learning (Leasa et al., 2020; Yulianci et al., 2021).

4.3 Level of Mathematics Achievement of the Respondents

Achievement signifies a degree of proficiency in knowledge and abilities. It signifies strong academic success and evidence of competence in difficult subject areas. Additionally, it denotes achievement beyond and beyond proficiency.

Table 5

Level of Mathematics Achievement of the Respondents

Level	Numerical Range	f	%
Outstanding	33-40	18	5.70
Very Satisfactory	25-32	69	21.84
Satisfactory	17-24	133	42.09
Fairly Satisfactory	9-16	92	29.11
Poor	0-8	4	1.27
Total		**316**	**100.00**
Mean		20.26	

St. Dev.	6.67

Table 5 presents the respondents' level of mathematics achievement. The results indicate that the largest proportion of respondents achieved a satisfactory level of performance, with 133 students (42.09%), while only 4 students (1.27%) were classified as having poor achievement.

These findings suggest that most respondents demonstrated an acceptable level of mathematical proficiency, although there remains considerable room for improvement in academic performance. Mathematics achievement is influenced by a complex interplay of learner, instructional, and environmental factors, including motivation, engagement, learning preferences, and the quality of educational experiences.

Previous studies have emphasized that students' satisfaction with their learning environment and educational experiences contributes positively to academic performance and overall learning outcomes (Suryanto, 2022). Likewise, academic achievement is shaped by multiple personal and institutional factors that collectively influence students' persistence, engagement, and success in school (Weiner, 2021). The predominance of respondents within the satisfactory achievement level highlights the need for instructional interventions that further strengthen mathematical understanding and support learners in attaining higher levels of performance.

4.4 Test of Significant Relationship Between the Learning Styles and Mathematics Achievement of the Respondents

This study hypothesized that there is no significant relationship between the learning styles and mathematics achievement of the respondents

Table 6

Test of Significant Relationship between the Learning Styles and Mathematics Achievement of the Respondents

Variables	df	χ^2-value	p - value	Decision	Result
Learning Styles and Mathematics Achievement	4	4.122	0.390	Do not reject Ho	Not Significant

*significant at $p<0.05$ (two-tailed)

Table 6 presents the results of the chi-square test examining the relationship between respondents' learning styles and mathematics achievement. The analysis yielded a χ^2 test of 4 degrees of freedom and a p-value of 0.390, which exceeds the 0.05 significance level. Consequently, the null hypothesis was not rejected, indicating no statistically significant relationship between learning style and mathematics achievement among the respondents.

The findings suggest that students' academic performance in mathematics did not vary significantly according to their dominant learning style, implying that no single learning preference was associated with superior or inferior achievement. This result supports the view that each learning style possesses distinct strengths and limitations (Essa et al., 2023)and that academic success is influenced by multiple interacting factors beyond individual learning preferences.

The findings are consistent with previous studies reporting no significant association between students' learning styles and mathematics achievement, suggesting that learning style alone is not a reliable predictor of academic performance in mathematics (Cardino Jr. & Cruz, 2020; Passolunghi et al., 2020).

5. Conclusion and Recommendations

The findings demonstrate that students' dominant learning styles were not significantly associated with mathematics achievement, indicating that learning preferences alone do not fully account for variation in academic performance. Although visual learning emerged as the most common preference among the respondents, no learning style conferred a statistically significant advantage in mathematics achievement. These results contribute to the growing body of evidence that questions the predictive value of learning style classifications for academic success and instead highlights the multifaceted nature of mathematics learning, shaped by the interplay among cognitive abilities, instructional quality, learner motivation, self-regulation, and contextual influences. Consequently, effective mathematics instruction should prioritize evidence-based pedagogical

strategies that promote conceptual understanding, critical thinking, active engagement, and equitable learning opportunities, rather than relying solely on learning-style-based instructional approaches.

Considering these findings, it is recommended that the proposed mathematics enhancement action plan be adopted and implemented to strengthen students' mathematical competencies through research-informed instructional interventions. While acknowledging learners' diverse preferences is important for fostering inclusive and engaging classroom environments, teachers should employ varied, flexible teaching strategies that integrate visual, auditory, collaborative, and experiential learning to maximize student participation and meaningful learning. Furthermore, future investigations should use broader, more diverse samples and examine additional predictors of mathematics achievement, including instructional quality, teacher effectiveness, classroom climate, learner motivation, self-efficacy, parental involvement, and socioeconomic conditions. Such research would provide a more comprehensive understanding of the determinants of mathematics achievement and generate stronger empirical evidence to inform educational policy, curriculum development, and instructional practice.

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