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Thinking Styles, Triarchic Intelligence, and Mathematics Performance

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ABSTRACT: Students differ in how they use their abilities and approach learning tasks, and these differences may help explain variation in mathematics performance. This study examined the relationships among thinking styles, triarchic intelligence, and mathematics performance among students enrolled in a university mathematics course. Using a correlational-predictive design, data were obtained from 92 randomly selected students from the College of Engineering and Technology of a state university in the Philippines. Thinking styles were measured using a Thinking Styles Questionnaire, triarchic intelligence was assessed through a revised Triarchic Intelligence Inventory, and mathematics performance was evaluated using a researcher-developed test covering achievement and problem-solving skills. Data were analyzed using descriptive statistics, Pearson correlation, and multiple linear regression. Results showed that several thinking styles were significantly associated with triarchic intelligence dimensions. Profile-specific regression analyses further revealed that selected thinking styles significantly predicted achievement and problem-solving performance among students with particular dominant intelligence profiles. The findings suggest that students' stylistic preferences and ability patterns may provide useful bases for designing more responsive mathematics instruction and learner support in higher education.

Keywords: *Thinking styles, triarchic intelligence, mathematics performance, mathematics course, correlational-predictive study.*

INTRODUCTION

Students do not enter a mathematics classroom with identical ways of thinking. Some prefer to follow clear directions, others to generate their own approaches, and still others to apply ideas to practical situations. These differences matter because mathematics performance may reflect not only what students know, but also how they prefer to use their abilities when faced with academic tasks. In this sense, success in mathematics is shaped not only by content exposure, but also by the cognitive tendencies students bring to learning (Abín et al., 2020).

This concern is especially relevant in contexts where mathematics achievement remains persistently low. In the Philippines, the Organization for Economic Co-operation and Development (OECD, 2023) reported in PISA 2022 that only 16% of students attained at least Level 2 proficiency in mathematics, the baseline level at which learners begin to interpret and recognize how simple situations can be represented mathematically. The same report also noted that almost no students in the Philippines reached Levels 5 or 6, which reflect advanced mathematical modelling and strategic problem solving. These results underscore the continuing need to examine learner-level factors that may help explain variation in mathematics performance and inform more responsive instruction.

Among the learner characteristics that merit closer attention are triarchic intelligence and thinking styles. Sternberg's triarchic theory broadens the concept of intelligence beyond conventional academic ability by emphasizing analytical, creative, and practical dimensions of intelligent performance (Sternberg, 1985). Related work on successful intelligence further argues that students learn more effectively when instruction allows them to capitalize on strengths while compensating for weaknesses across these dimensions (Sternberg, 2002). Complementing this perspective, Sternberg's theory of mental self-government conceptualizes thinking styles as preferred ways of using one's abilities rather than ability itself (Sternberg, 1997).

Thus, two students with comparable ability may still differ in mathematics performance because they prefer to approach, organize, and carry out tasks in different ways.

Empirical work suggests that these constructs are educationally meaningful. Abín et al. (2020) emphasized the role of cognitive variables in mathematics achievement, while Naval et al. (2019) found that a triarchically based mathematics intervention improved students' mathematical skills and performance in a Philippine setting. However, relatively few studies have examined thinking styles and triarchic intelligence together as correlates and predictors of mathematics performance among higher education students. Much of the available work has focused either on intervention, on intelligence alone, or on thinking styles as separate variables. This leaves an important gap in understanding whether students' preferred ways of using their abilities are meaningfully linked with mathematics performance across different dominant intelligence profiles.

Hence, this study examined the relationships among students' thinking styles, triarchic intelligence, and mathematics performance in a university mathematics course. Specifically, it sought to describe students' preferred thinking styles and dominant triarchic intelligence profiles, determine the relationships between triarchic intelligence and thinking styles, and identify the thinking styles that significantly predict mathematics performance within dominant intelligence profiles. By doing so, the study contributes to a more nuanced understanding of learner differences in mathematics and provides evidence that may inform more responsive mathematics instruction in higher education.

THEORETICAL AND EMPIRICAL BACKGROUND

This study is anchored on Sternberg's triarchic theory of intelligence and his theory of mental self-government. Sternberg's triarchic theory broadens the concept of intelligence beyond a single general ability by proposing three interrelated dimensions of intelligent performance: analytical, creative, and practical intelligence (Sternberg, 1984, 1985). Analytical intelligence refers to the ability to analyze, compare, evaluate, and judge information; creative intelligence pertains to generating novel ideas and dealing effectively with unfamiliar situations; and practical intelligence involves applying knowledge to real-life contexts and adapting to environmental demands (Sternberg, 1985). In mathematics learning, these dimensions suggest that students may differ not only in how well they understand concepts and procedures, but also in how they generate strategies and apply mathematical ideas in context.

The educational significance of the triarchic perspective is reinforced by Sternberg's theory of successful intelligence, which holds that learners perform more effectively when they are allowed to capitalize on strengths while compensating for weaknesses across analytical, creative, and practical domains (Sternberg, 2002). Empirical studies have supported this position. Grigorenko et al. (2002) reported that triarchically based instruction and assessment produced stronger outcomes than more conventional approaches, while Sternberg et al. (2014) likewise found that teaching grounded in successful intelligence led to better learning outcomes in language arts, mathematics, and science. These studies support the view that differences in ability patterns have meaningful implications for academic performance.

Complementing the triarchic perspective is Sternberg's theory of mental self-government, which explains thinking styles as preferred ways of using one's abilities rather than abilities themselves (Sternberg, 1997; Sternberg & Grigorenko, 1997). In this framework, students may possess comparable ability yet differ in how they prefer to organize tasks, make decisions, attend to detail, respond to rules, or interact with others. Sternberg (1997) classified these preferences into styles such as legislative, executive, judicial, monarchic, hierarchical, oligarchic, anarchic, global, local, internal, external, liberal, and conservative. Thus, thinking styles should be treated as a distinct explanatory construct because they reflect how students prefer to deploy their abilities, not how much ability they possess. This distinction has been emphasized in later scholarship showing that intellectual styles are related to, but not reducible to, ability (Zhang, 2004, 2010; Zhang & Sternberg, 2005).

Related studies likewise indicate that thinking styles are educationally consequential. Bernardo et al. (2002) found that thinking styles were significantly related to academic achievement among Filipino students, providing local support for the educational relevance of Sternberg's framework. Zhang (2004) further showed that thinking styles contributed to academic performance beyond ability-related self-perceptions. In mathematics education, Risnanosanti (2017) reported that mathematical thinking styles were associated with undergraduate students' achievement in mathematics, while Güner and Erbay (2021) found that certain Sternbergian thinking styles were significantly related to mathematical problem-solving skills among prospective mathematics teachers. In the Philippine context, Naval et al. (2019) found that a mathematics intervention grounded in the triarchic intelligence model improved students' mathematical skills and performance. Taken together, these studies suggest that mathematics performance may be better understood when both dominant ability patterns and preferred ways of thinking are considered.

Guided by these theoretical and empirical foundations, the present study conceptualizes triarchic intelligence as students' dominant ability profile and thinking styles as their preferred modes of using those abilities in learning situations. Mathematics performance is treated as the outcome variable and is represented in this study by students' achievement and problem-solving performance. The study assumes that thinking styles are meaningfully associated with students' dominant triarchic intelligence profiles and that selected thinking styles may significantly predict mathematics performance within particular intelligence profiles. In this way, triarchic intelligence provides the ability base of performance, whereas thinking styles represent the preferential mode through which that ability may be expressed in mathematical tasks.

METHODS

Research Design

This study employed quantitative correlational-predictive research design. This design was appropriate because the study sought to examine the relationships among students' thinking styles, triarchic intelligence, and mathematics performance, and to identify the thinking styles that significantly predict mathematics performance within dominant intelligence profiles. In quantitative research, correlational designs are used when variables are examined as they naturally occur, without manipulation, to describe associations and estimate the predictive contribution of one or more variables to an outcome (Creswell & Creswell, 2018; Tabachnick & Fidell, 2019).

Respondents and Locale of the Study

The respondents of the study were 92 randomly selected students from the College of Engineering and Technology of a state university in the Philippines. All respondents were enrolled in a university mathematics course during the conduct of the study. The use of random selection was intended to minimize selection bias and to provide a more representative set of participants from the target student population within the college. For journal presentation, the institution may be referred to in generic terms unless disclosure is necessary for contextual clarity or institutional reporting requirements.

Research Instruments

Three instruments were used in the study. First, students' dominant triarchic intelligence profile was measured using a revised Triarchic Intelligence Inventory adapted from the Triarchic Theory of Human Intelligence Survey. The instrument consisted of 30 Likert-type items, with 10 items each representing analytical, creative, and practical intelligence. In the earlier instrument development and pilot use, the revised scale yielded a high internal consistency estimate of $\alpha = .896$.

Second, students' preferred thinking styles were measured using a Thinking Styles Questionnaire adapted from the Sternberg-Wagner Thinking Styles Inventory. The questionnaire consisted of 104 items, with 8 items for each of the 13 thinking-style subscales: legislative, executive, judicial, monarchic, hierarchical, oligarchic, anarchic, global, local, internal, external, liberal, and conservative. These subscales represent the broader style dimensions of functions, forms, levels, scope, and leanings as described in Sternberg's theory of mental self-government (Sternberg, 1997; Sternberg & Grigorenko, 1997).

Third, students' mathematics performance was assessed using a researcher-developed mathematics test consisting of 25 multiple-choice items for mathematics achievement and 5 open-ended items for problem-solving performance. The test covered selected competencies in the target mathematics course. In the original test development, the instrument yielded a reliability estimate of $\alpha = .744$, which is generally acceptable for classroom-based assessment. The problem-solving component was scored using an analytic rubric to ensure consistency in evaluating students' solution processes and final answers.

Data Gathering Procedure

Prior to data collection, permission to conduct the study was secured from the appropriate university authorities. After approval was obtained, the researchers coordinated with course instructors regarding the administration schedule of the instruments. The respondents were informed of the purpose of the study, the voluntary nature of participation, and the confidentiality of their responses.

Data were gathered in a single phase consistent with the correlational-predictive design. The revised Triarchic Intelligence Inventory and the Thinking Styles Questionnaire were administered to measure students' dominant intelligence profiles and preferred thinking styles. Thereafter, the mathematics performance test was administered to obtain students' achievement and problem-solving scores. All instruments were collected, checked for completeness, encoded, and prepared for statistical analysis.

Data Analysis

The data were analyzed using descriptive statistics, Pearson product-moment correlation, and multiple linear regression. Descriptive statistics were used to summarize respondents' scores across the major study variables. Pearson correlation was employed to examine the relationships between triarchic intelligence and thinking styles.

To address the predictive objective of the study, separate multiple linear regression analyses were performed within each dominant intelligence profile to determine which thinking styles significantly predicted students' achievement and problem-solving performance. This analytic approach was used to examine whether thinking styles functioned as significant predictors of mathematics performance within specific intelligence profiles. In interpreting the regression results, the assumptions relevant to regression analysis, including linearity, normality, homoscedasticity, independence of errors, and absence of problematic multicollinearity, were considered (Field, 2018; Hair et al., 2022; Tabachnick & Fidell, 2019).

Ethical Considerations

Participation in the study was voluntary. Respondents were informed about the purpose of the study and were assured that their responses would be used solely for research purposes. Confidentiality and anonymity were observed in the handling, encoding, analysis, and reporting of data. No identifying personal information was disclosed in the presentation of the findings. These procedures are consistent with standard ethical expectations in educational research involving student respondents (Creswell & Creswell, 2018).

RESULTS

The results are presented in terms of the respondents' preferred thinking styles, dominant triarchic intelligence profiles, mathematics performance, correlations between triarchic intelligence and thinking styles, and profile-specific regression models of mathematics performance.

Table 1 Mean and Standard Deviation of Students' Preferred Thinking Styles

Thinking Styles		**Mean**	**SD**
Function	Legislative	4.53	0.99
	Executive	4.88	1.17
	Judicial	4.40	0.81
Forms	Monarchic	4.78	0.97
	Hierarchical	4.55	1.12
	Oligarchic	4.43	0.79
	Anarchic	4.40	1.05
Levels	Local	4.05	0.99
	Global	4.20	1.00
Leanings	Liberal	4.23	1.01
	Conservative	4.40	0.98
Scope	Internal	3.68	1.41
	External	4.78	1.28

Table 1 shows that among the function-based thinking styles, executive obtained the highest mean (M = 4.88, SD = 1.17), followed by legislative (M = 4.53, SD = 0.99) and judicial (M = 4.40, SD = 0.81). Among the form-based styles, monarchic registered the highest mean (M = 4.78, SD = 0.97), followed by hierarchical (M = 4.55, SD = 1.12). For the level dimension, global thinking style (M = 4.20, SD = 1.00) was slightly higher than local (M = 4.05, SD = 0.99). Under leanings, conservative (M = 4.40, SD = 0.98) was slightly higher than liberal (M = 4.23, SD = 1.01). In terms of scope, external thinking style obtained one of the highest means overall (M = 4.78, SD = 1.28), whereas internal registered the lowest mean among all thinking styles (M = 3.68, SD = 1.41).

Overall, the highest mean scores were observed in executive, monarchic, and external thinking styles, while internal obtained the lowest mean. These results indicate that the respondents generally preferred structured tasks, focused goal pursuit, and socially interactive learning conditions.

Table 2 Frequency, Mean, and Standard Deviation of Students' Intelligence Profile

Triarchic Intelligence Profile	***n***	**Mean**	**SD**
Analytical	12	37.8	4.16
Creative	37	36.2	5.25
Practical	43	35.5	5.01

Table 2 presents the distribution of respondents according to their dominant triarchic intelligence profile. Among the 92 students, practical intelligence had the highest frequency (n = 43), followed by creative intelligence (n = 37) and analytical intelligence (n = 12). In terms of mean scores, analytical intelligence obtained the highest mean (M = 37.8, SD = 4.16), followed by creative intelligence (M = 36.2, SD = 5.25) and practical intelligence (M = 35.5, SD = 5.01).

These results show that although practical intelligence was the most common dominant profile among the respondents, analytical intelligence registered the highest average score.

Table 3 Mathematics Performance of the Students in Terms of Achievement and Problem-Solving Scores

Mathematics Performance	Mean	SD
Achievement Scores	19.7	3.95
Problem-Solving Scores	13.6	5.76

Table 3 shows the mathematics performance of the respondents in terms of achievement and problem-solving scores. The students obtained a higher mean score in achievement (M = 19.7, SD = 3.95) than in problem-solving (M = 13.6, SD = 5.76). These results indicate that the respondents performed better in the achievement component than in the problem-solving component.

Table 4 Correlations Between Students' Triarchic Intelligence and Thinking Styles

Domain	**Category**	**Analytical** (*r*)	**Creative** (*r*)	**Practical** (*r*)
Function	Legislative	.647*	.411*	.464*
	Executive	.445*	.233	.359*
	Judicial	.546*	.400*	.245
Forms	Monarchic	.215	.042	.243
	Hierarchical	.547*	.355*	.491*
	Oligarchic	.503*	.418*	.359*
	Anarchic	.500*	.333*	.393*
Levels	Local	.667*	.591*	.472*
	Global	.418*	.238	.319*
Leanings	Liberal	.498*	.338*	.319*
	Conservative	.474*	.359*	.456*
Scope	Internal	.149	-.039	.259
	External	.481*	.432*	.310*

Note. *r* = Pearson product-moment correlation coefficient. $p < .05$.

Table 4 shows that several thinking styles were significantly correlated with the three dimensions of triarchic intelligence. For analytical intelligence, the strongest significant correlations were observed with local ($r = .667$), legislative ($r = .647$), judicial ($r = .546$), and hierarchical ($r = .547$) thinking styles. For creative intelligence, significant correlations were highest for local ($r = .591$), external ($r = .432$), oligarchic ($r = .418$), and legislative ($r = .411$). For practical intelligence, the strongest significant correlations were found with hierarchical ($r = .491$), local ($r = .472$), legislative ($r = .464$), and conservative ($r = .456$) thinking styles. These findings indicate that local, legislative, and hierarchical thinking styles consistently showed significant positive relationships across the three intelligence profiles.

Table 5 Summary Results of the Multiple Linear Regression on the Significant Contributory Factors of Students' Mathematics Performance as Accounted for by Their Ability Patterns

Triarchic Intelligence	**Mathematics Performance**	**Thinking Styles** (*Significant Predictors*)	**Beta**	**t-value**	**p-value**
Analytical	Achievement Performance	Global	.805	3.595	.009*
Analytical	Problem-Solving	None	—	—	—
Practical	Achievement Performance	Local	.899	2.242	.039*
		Legislative	1.092	3.812	.002*
		Executive	1.015	2.731	.015*
Practical	Problem-Solving	Judicial	-0.810	-2.349	.032*
		Local	.599	2.217	.041*
		External	.691	2.580	.020*
Creative	Achievement Performance	None	—	—	—
Creative	Problem-Solving	None	—	—	—

Note. Beta = standardized regression coefficient. $p < .05$.

Table 5 shows that the significant predictors of mathematics performance varied across students' dominant triarchic intelligence profiles. For students with analytical intelligence, global thinking style significantly predicted achievement performance ($\beta = .805$, $t = 3.595$, $p = .009$), while no significant predictor emerged for problem-solving.

For students with practical intelligence, local thinking style significantly predicted achievement performance ($\beta = .899$, $t = 2.242$, $p = .039$). In terms of problem-solving performance, legislative ($\beta = 1.092$, $p = .002$), executive ($\beta = 1.015$, $p = .015$), local ($\beta = .599$, $p = .041$), and external ($\beta = .691$, $p = .020$) thinking styles were significant positive predictors, whereas judicial thinking style ($\beta = -.810$, $p = .032$) emerged as a significant negative predictor.

For students with creative intelligence, no significant predictor was identified for either achievement or problem-solving performance. The results revealed that significant thinking-style predictors were more evident among students with practical intelligence, particularly for problem-solving performance.

DISCUSSION

The findings indicate that the respondents generally preferred executive, monarchic, and external thinking styles. This suggests that the students tended to favor structured tasks, focused goal pursuit, and socially interactive learning conditions. Interpreted through Sternberg's theory of mental self-government, these preferences reflect students' favored ways of organizing and carrying out academic tasks rather than their level of ability itself (Sternberg, 1997; Sternberg & Grigorenko, 1997). The dominance of these styles may also reflect the learning context of students in engineering- and technology-related programs, where tasks often involve clear procedures, goal-oriented performance, and collaborative work. This finding is broadly consistent with the view that thinking styles are partly shaped by educational environments and are therefore meaningfully related to how students engage with learning demands (Zhang, 2004; Zhang & Sternberg, 2005).

In terms of dominant intelligence profile, practical intelligence emerged as the most common among the respondents, although analytical intelligence registered the highest mean score. This pattern suggests that while a larger proportion of students tended to identify more strongly with the practical application of knowledge, those classified under the analytical profile demonstrated stronger performance within their dominant domain. Considering the nature of the respondents' academic setting, this result appears reasonable, as students in technical programs are often required to apply knowledge in concrete and task-oriented contexts. At the same time, the stronger mean for analytical intelligence is consistent with Sternberg's view that successful academic performance often depends on the effective use of analytic processing in evaluating, comparing, and judging information (Sternberg, 1985, 2002).

The finding that students performed better in achievement than in problem-solving suggests that they were generally more successful in dealing with tasks that required recognition, recall, and direct application of learned mathematical content than with tasks requiring deeper reasoning and strategic solution processes. This pattern is consistent with established views of mathematical proficiency, which distinguish procedural fluency from higher-order competencies such as strategic competence and adaptive reasoning (National Research Council, 2001). It is also consistent with recent international evidence showing that mathematics performance in more demanding problem-solving and modelling contexts remains a challenge for many learners (OECD, 2023). The wider variability in problem-solving scores further suggests that students differed more substantially in their ability to handle open-ended or nonroutine tasks than in their performance on achievement-type items. From an instructional standpoint, this result points to the need for mathematics teaching that not only supports content mastery but also deliberately develops reasoning, strategy use, and nonroutine problem-solving skills.

The correlation results further showed that several thinking styles were significantly associated with the three dimensions of triarchic intelligence. In particular, local, legislative, and hierarchical thinking styles consistently showed significant positive relationships across analytical, creative, and practical intelligence profiles. This suggests that students' preferred ways of approaching tasks are meaningfully linked with their dominant ability patterns. The repeated significance of local thinking style implies that attention to details and particulars may be an important mode through which different forms of intelligence are expressed in mathematics-related tasks. Likewise, the recurrent significance of legislative and hierarchical styles suggests that planning one's own way of working and organizing multiple tasks according to priority are closely tied to students' dominant ability patterns. These findings support the argument that intelligence and thinking styles are related but distinct constructs: intelligence refers to what students are able to do, whereas thinking style refers to how they prefer to use those abilities (Sternberg, 1997; Zhang, 2010; Zhang & Sternberg, 2005).

The profile-specific regression results provide a more nuanced view of how thinking styles relate to mathematics performance. For students with analytical intelligence, global thinking style significantly predicted achievement performance. This suggests that analytically oriented learners may perform better in achievement tasks when they are able to organize details within a broader conceptual structure. For students with practical intelligence, the predictive pattern was more pronounced. Local thinking style significantly predicted achievement performance, while legislative, executive, local, and external thinking styles significantly predicted problem-solving performance. In contrast, judicial thinking style emerged as a negative predictor of problem-solving performance within this group. These results imply that the contribution of thinking styles to mathematics performance is not uniform but depends on students' dominant intelligence profile. They also suggest that practically oriented students may perform better when they prefer styles emphasizing execution, task organization, attention to particulars, and interaction with others. This partly aligns with prior studies showing that thinking styles are educationally consequential and may shape performance in mathematics-related tasks (Bernardo et al., 2002; Güner & Erbay, 2021; Zhang, 2004).

By contrast, no thinking style significantly predicted either achievement or problem-solving performance among students with creative intelligence. This suggests that within this subgroup, stylistic preferences did not uniquely account for variation in mathematics performance. One possible explanation is that creative tendencies may not automatically translate into higher scores unless classroom instruction and assessment explicitly provide opportunities for novelty, flexibility, and original solution production. Earlier work on successful intelligence has likewise emphasized that stronger outcomes are more likely when teaching and assessment deliberately engage diverse forms of intelligent performance rather than privileging only conventional forms of response (Grigorenko et al., 2002; Sternberg et al., 2014).

Taken together, the findings support the view that mathematics performance is shaped not only by students' dominant abilities but also by how they prefer to use those abilities in academic tasks. The study therefore extends existing literature by showing that the link between thinking styles and mathematics performance is profile-specific rather than universal. This is an important contribution because it suggests that learner differences in mathematics may be better understood when cognitive preferences and ability patterns are examined together rather than in isolation.

The findings should, however, be interpreted in light of several limitations. The study was conducted among students from one college within one state university in the Philippines, which may limit the broader generalizability of the results. The measures of thinking styles and triarchic intelligence were also based on self-report instruments, which may be influenced by response tendencies. In addition, the regression analyses were conducted separately within dominant intelligence profiles, and the analytical subgroup in particular was relatively small. Thus, the predictive findings should be interpreted as profile-specific and exploratory. Future studies may strengthen the evidence by using larger and more diverse samples, incorporating additional institutions, and testing full-sample predictive models alongside profile-based analyses.

CONCLUSION AND IMPLICATIONS

This study examined the relationships among students' thinking styles, triarchic intelligence, and mathematics performance in a university mathematics course. The findings showed that the respondents generally preferred executive, monarchic, and external thinking styles, indicating tendencies toward structured task performance, focused goal pursuit, and socially interactive learning conditions. In terms of dominant intelligence profile, practical intelligence emerged as the most common among the students, although analytical intelligence registered the highest mean score. The results also showed that students performed better in achievement than in problem-solving, suggesting that routine or content-based mathematical tasks were handled more successfully than tasks requiring deeper reasoning and strategic solution processes.

The study further revealed that several thinking styles were significantly associated with the three dimensions of triarchic intelligence, particularly local, legislative, and hierarchical styles. More importantly, the profile-specific regression analyses showed that the contribution of thinking styles to mathematics performance was not uniform across intelligence profiles. Significant predictors were most evident among students with practical intelligence, especially in relation to problem-solving performance, while prediction was more limited for the analytical group and absent for the creative group. These findings suggest that mathematics performance may be better understood when students' dominant abilities and preferred ways of using those abilities are considered together.

The findings have important implications for mathematics instruction in higher education. First, they suggest the value of designing learning experiences that recognize variation in how students approach mathematical tasks. Instruction that provides clear structure, purposeful engagement, and opportunities for interaction may be responsive to the dominant profiles observed in this study. Second, the lower performance in problem-solving highlights the need for teaching approaches that deliberately strengthen reasoning, strategy use, and nonroutine problem-solving skills rather than focusing mainly on content mastery. Third, the profile-specific predictive patterns imply that learner support may be improved when teachers consider that certain thinking styles may be more facilitative for some students than for others, depending on their dominant intelligence profiles.

Overall, the study supports the view that mathematics learning is shaped not only by what students are able to do, but also by how they prefer to use their abilities in academic tasks. By integrating thinking styles and triarchic intelligence in explaining mathematics performance, the study contributes to a more nuanced understanding of learner differences in mathematics and offers a useful basis for more responsive and cognitively informed instructional practice.

For future research, studies may use larger and more diverse samples, include multiple institutions, and test broader predictive models to further validate the profile-specific patterns observed in this study.

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