

THE CURRENT STATUS OF MATHEMATICAL COMPETENCY AMONG GRADE 9 STUDENTS FROM SIX SECONDARY SCHOOLS IN HO CHI MINH CITY

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Received: June 6, 2026. Revised: July 4, 2026. Accepted: July 24, 2026.

Abstract. This study aims to investigate secondary school students' mathematical competency across its two components of mathematical comprehension and mathematical execution. Employing a mixed-methods design, the quantitative phase used a survey with Likert-scale items and empirical performance-based tasks to collect data from 384 Grade 9 students from six secondary schools in Ho Chi Minh City. Descriptive and inferential statistics show that students' overall mathematical competency reached the Satisfactory level, with mathematical comprehension higher than mathematical execution. Reasoning and mathematical modeling were among the lowest components. Significant differences were found by school location, interest in learning mathematics, and parental expectations, but not by gender, age group, private tutoring, thinking games, or family economic status. The study contributes a two-dimensional framework that distinguishes students' internal mathematical understanding from their external task performance, highlighting the need to strengthen the transition from comprehension to execution in competency-based mathematics assessment.

Keywords: mathematical competency; secondary school students; mathematical comprehension; mathematical execution; Ho Chi Minh City

1. Introduction

Given Vietnam's comprehensive general education reform, which focuses on developing students' attributes and competencies, mathematical competency is regarded as an essential domain-specific competency that schools need to foster. Mathematical competency has been operationalized into five different sub-skills under The General Education Mathematics Curriculum as mathematical thinking and reasoning, mathematical modeling, mathematical problem-solving, mathematical communication, and the utilization of mathematical tools and resources (MOET, 2018). Mastering these different sub-skills not only helps students understand mathematical concepts but also allows them to use mathematics in understanding certain phenomena.

Internationally, mathematical competency has been widely studied as a multidimensional concept. Niss and Højgaard (2011, pp. 49-52) viewed mathematical competency (approaches within the PISA framework) as the application of mathematical knowledge, competences, understanding, and attitudes in various situations through actions like reasoning, modeling, problem handling, communication, representation, and use of tools and aids. In the same vein, the mathematical literacy of the PISA framework can be seen as the ability of students to think mathematically and be able to formulate, apply, and interpret mathematics in different real-world contexts (OECD, 2023, pp. 23-28).

These approaches suggest that assessing mathematical competency should extend beyond merely calculating procedures and final answers to measuring higher-level skills like reasoning, modeling, problem solving, communication, and the use of tools (Boesen et al., 2018). Recent studies also highlight reality-based tasks, process-oriented assessments, digital assessments, rubric-based

assessments, and formative assessments as major ways of measuring the mathematical performance of learners and their problem-solving independence (Leiss et al., 2024; Meissner et al., 2024). These international perspectives provide support for the research method in the current study, where mathematical competency is assessed in terms of mathematical comprehension and mathematical execution. This method allows determining not only what the students understand, but also how well they perform mathematically based on this knowledge.

In Vietnam, mathematical competency has in recent years drawn increasing attention from researchers in the field of general education. For instance, Do et al. (2017, pp. 1-2) described it as a quality that is oriented towards action and allows individuals to deal with mathematical problems in particular contexts. Furthermore, other studies have mostly focused on various aspects of mathematical competency: mathematical modeling (Nguyen, 2015), mathematical communication (Nguyen, 2023), and mathematical problem-solving (Vu, 2022). Yet there is still rather limited empirical evidence concerning students' overall mathematical competency from an integrated point of view. This lack of evidence is especially applicable to the present study, which looks at Grade 9 students in Ho Chi Minh City in the final year of lower secondary education, since these students have to make the high-stakes transition to upper secondary education while under examination pressure, facing the influence of shadow education, and with greater access to technological and AI-assisted learning tools.

This paper presents a two-process view of mathematical competency: mathematical comprehension and mathematical execution. Accordingly, mathematical comprehension is defined as students' capacity to identify, encode, and analyze mathematical knowledge, algorithms, and logical relationships, while mathematical execution involves their ability to put these cognitive resources into practice when carrying out mathematical tasks. In the present study, the term "two-process" does not refer to the traditional division between automatic and controlled thinking, but rather describes two complementary aspects of a single competency – internal cognitive understanding and external task performance. It is important to note that students might understand mathematical concepts or procedures yet still be unable to apply them on their own in new situations. Mathematical competency is therefore defined in terms of reasoning, modeling, problem solving, communication, and the use of mathematical tools, enabling the study to look at both students' internal understanding and their actual performance in mathematical tasks. The fact that this study looks at mathematical comprehension and mathematical execution at the same time provides an integrated empirical framework for examining the difference between what students understand and what they can do independently when working on mathematical tasks.

Based on these viewpoints, the study looks at the level of mathematical ability shown by Grade 9 students in Ho Chi Minh City from two aspects: understanding mathematics and carrying out mathematical tasks. Specifically, it addresses three questions: students' levels of mathematical comprehension and execution, their overall mathematical competency, and differences in mathematical competency according to selected demographic and learning-related characteristics. By distinguishing between understanding mathematics and performing mathematics, the study provides preliminary evidence for competency-based mathematics assessment among lower secondary students. These questions were answered using descriptive statistics to determine mathematical competency level, independent-samples t-tests and one-way ANOVA to examine differences among groups, and interviews with Grade 9 mathematics teachers to gain qualitative insights.

2. Theoretical framework

The construct of competency is described by many researchers as an integrated set of psychological traits of the individual, which results from the synergistic coordination of knowledge, skills, attitudes, experiences, and personal qualities that are required to perform a certain task effectively (Dang, 2012; Hoang, 2015). Nevertheless, competency is neither a fixed trait nor an isolated capacity; on the contrary, its development depends on the participation of the individual in

context-related activities. Therefore, the accurate assessment of competency requires embedding the individual into a certain situation that involves resolving the problem with the mobilization of internal resources (Trinh et al., 2024). Within the framework of this theory, the mathematical competency of students cannot be identified only by means of counting the number of learned formulas or grades obtained in tests. On the contrary, it should be evaluated through the continuous work of students on authentic mathematical tasks.

Competency is generally understood as an integrated psychological attribute that enables individuals to mobilize knowledge, skills, experience, attitudes, readiness for action, and personal responsibility to perform tasks effectively in specific contexts. This view is consistent with Hoang (2015), who emphasizes the integration and application of knowledge and skills, and Dang (2012), who associates competency with action, task performance, and achieved outcomes.

This study adopts an integrated perspective, defining competency as the observable ability to mobilize knowledge, skills, attitudes, and personal psychological attributes to perform tasks effectively in specific activities. This view is suitable for empirical research because competency can be operationalized through concrete indicators, actions, and performance outcomes.

Mathematical competency refers to students' capacity to draw on mathematical knowledge, procedural skills, and personal psychological traits to carry out mathematical activities effectively, both in school and in everyday life. While competency-based frameworks emphasized reasoning, modeling, communication, problem solving, and tool use (Niss et al., 2011; OECD, 2019; Do et al., 2017; MOET, 2018), this study proposes a two-dimensional structure: mathematical comprehension from applying them to tasks. This separation helps clarify the gap between knowing mathematics and using it well in practice.

In this study, mathematical competency is operationalized as students' ability to mobilize mathematical knowledge, skills, and psychological attributes to perform observable actions, including reasoning, modeling, problem solving, communication, and tool use. This allows the assessment of both task performance in mathematics learning and the transfer of mathematical knowledge to real-life contexts.

3. Research methodology

Aiming at exploring the current level of mathematical competency among Grade 9 students in Ho Chi Minh City, the study used a mixed-methods design. To attain quantitative data, the study employed a questionnaire built upon the proposed structure of mathematical competency and aligned with the learning outcomes of the 2018 General Education Mathematics Curriculum. Specifically, students' mathematical competency is reflected through their understanding of mathematics and their capacity to solve mathematical problems. The questionnaire was administered on 384 Grade 9 students from six secondary schools in Ho Chi Minh city, recruited in April 2026 through quota-based non-probability sampling. Schools were selected based on location in urban or suburban districts. Urban and suburban areas were defined based on Ho Chi Minh City's new administrative boundaries. Within each school, 3 Grade 9 classes were nominated by the school administration, and all students present in these classes agreed to participate completed the instrument. Of 450 students, 423 returned

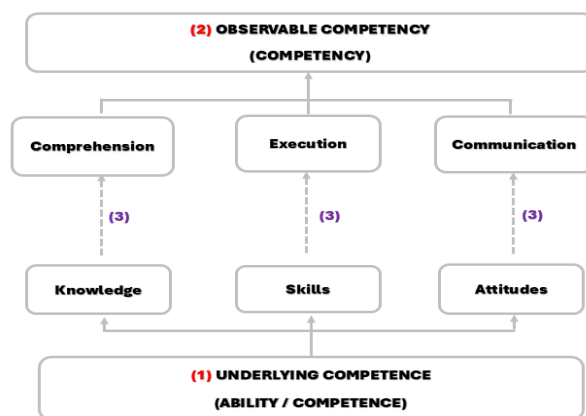


Figure 1. Approaches to the structural conceptualization of the competency system (Synthesized from Hung, 2012; Binh, 2015)

responses; 39 were excluded because of missing data, leaving 384 valid cases (191 urban, 193 suburban). Students' responses to the execution tasks were scored using an analytic rubric with four levels corresponding to Imitation (1), Manipulation (2), Precision (3), and Mastery (4) (see Table 1). To triangulate the data, semi-structured interviews with 10 Grade 9 mathematics teachers were conducted to gain qualitative evidence to clarify the manifestations and causes of the observed results.

Statistical tests including Descriptive and Inferential were used to analyze students' mathematical competency and differences in mathematical competency across demographic and learning-related groups. Qualitative data from interviews with 10 Grade 9 mathematics teachers. Ethical principles were ensured through voluntary participation, institutional approval, anonymity, confidentiality, and the use of data solely for research purposes. Figure 2 below describes the measurement scale, which includes 25 items, used to measure mathematical competency.

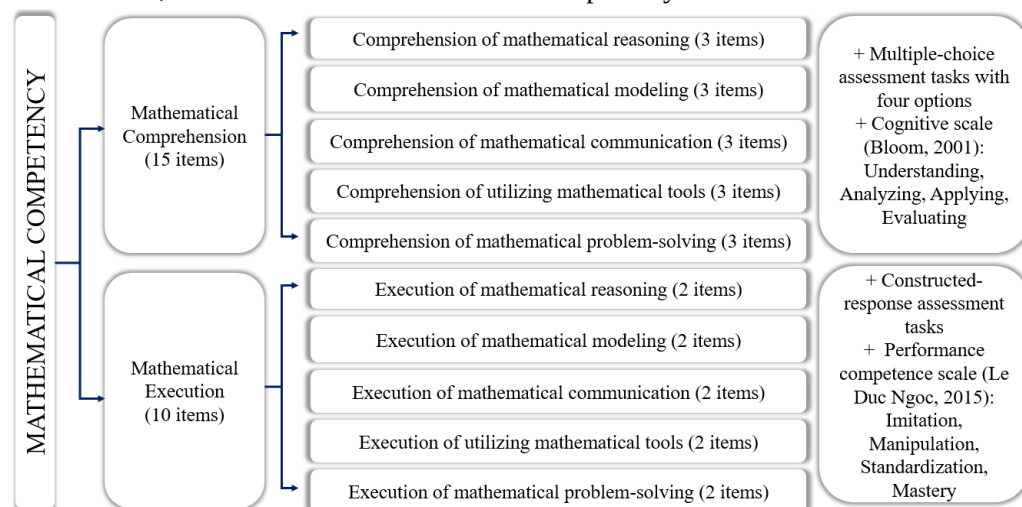


Figure 2. A conceptual framework of mathematical competency

Unlike TIMSS and PISA, this study proposed a distinction between students' internal mathematical understanding and observable task execution. The instrument therefore combined multiple-choice items for mathematical comprehension and rubric-scored performance tasks for mathematical execution. Reliability and construct validity were examined through Cronbach's Alpha and Exploratory Factor Analysis.

Expert interviews with ten ninth-grade mathematics teachers in Ho Chi Minh City were conducted to ensure content validity of the instrument. In addition, construct validity was tested using exploratory factor analysis. For mathematical comprehension, the KMO value was 0.83, Bartlett's test was significant ($p < .001$), communalities ranged from 0.623 to 0.780, and five factors explained 69.085% of the variance, with loadings from 0.759 to 0.895. For mathematical execution, the KMO value was 0.763, Bartlett's test was significant ($p < .001$), communalities ranged from 0.757 to 0.817, and five factors explained 78.328% of the variance, with loadings from 0.841 to 0.901. All items met the retention criteria of communality and factor loading above 0.50, theoretical consistency, and expert confirmation; thus, no item was deleted.

Cronbach's Alpha was used to examine internal consistency reliability. The Alpha values varied between 0.70 and 0.82 in the mathematical comprehension subscales and 0.63 and 0.77 in the mathematical execution subscales. Even though some values in the mathematical execution subscales were not quite high and, particularly, the values of 0.63-0.66 were relatively low, these Alpha values were regarded as acceptable since it was a new scale and, moreover, each execution component had only few performance items. However, all items fulfilled the EFA requirements and were theoretically significant for the measurement of mathematical reasoning, modeling, problem solving, communication, and tool usage.

Regarding the empirical assessment, the performance-based exercises were developed based on a four-level rating scale. The scores obtained from each domain in mathematics were averaged to obtain the mean score (M), ranging from a minimum value of 1.0 to a maximum value of 4.0. The classification intervals were created using the method of equal intervals. In particular, the value of the interval was found by the following formula: (maximum score - minimum score) / number of levels = $(4.0 - 1.0) / 4 = 0.75$. The application of this technique made it possible for the four levels to be equally spread throughout the range of the rating scale. Based on the mathematical competencies attained, and in accordance with Circular No. 22/2021/TT-MOET, the four levels of mathematical competency can be defined as follows:

Table 1. Levels of mathematical competency among secondary school students

Mean score (M)	Equivalent level	Proficiency Levels		
		Mathematical Comprehension	Mathematical Execution	Mathematical Competency
3.25 to 4.00	4	Evaluating	Mastery	Excellent
2.50 to < 3.25	3	Applying	Precision	Good
1.75 to < 2.50	2	Analyzing	Manipulation	Satisfactory
1.00 to < 1.75	1	Understanding	Imitation	Not achieved

The four-level classification of mathematical competency, namely Not achieved, Satisfactory, Good, and Excellent, was designed to align with the assessment of learning outcomes under Circular No. 22. This system reflects the developmental progression from comprehension and imitation to analysis, manipulation, application, precision, evaluation, and mastery. It also serves as a diagnostic tool for comparing students' school performance with their mathematical competency as measured by the proposed instrument.

4. Findings and discussion

4.1. Demographic information of the participants

Demographic information about the participants is described in Figure 3. The sample included 384 Grade 9 students and was nearly balanced by geographic representation across cities (49.7%) and suburbs (50.3%). The largest age group was 14 years and 8 months to 14 years and 11 months old (46.6%) while over half of their parents had attained upper secondary education (57%). Academically, the majority demonstrated good mathematical achievements (63.5%), only 0.8% failed to achieve passing standards. Regarding learning habits, 61.7% of students reported interest in learning mathematics, and 92.4% reported using AI for mathematical problem solving. In addition, 82.3% experienced high parental expectations, 66.1% engaged in private tutoring, and 83.3% spent fewer than 30 minutes on independent mathematics learning.

4.2. Students' level of mathematical comprehension

Students' levels of mathematical comprehension were investigated through 15 items, distributed across five distinct comprehension dimensions, as detailed in Table 2. The mean score of mathematical comprehension for secondary school students is $M = 2.59$ ($SD = 0.38$), which corresponds to the level of Applying. It shows that the students have already passed the foundational stages of basic recognition and understanding and demonstrate an emergent cognitive capacity to analyze mathematical declarative knowledge, algorithms, and relations. Mathematical comprehension is considered a compound concept consisting of five sub-competencies. One of these sub-competencies, namely comprehension of using mathematical tools, showed the highest average score of $M = 3.07$, followed by comprehension of mathematical communication ($M = 3.01$) and mathematical problem solving ($M = 2.73$). However, the two lowest average scores ($M = 2.26$ and $M = 1.87$) are related to mathematical modeling and reasoning respectively.

Table 2. Students' mathematical comprehension levels

Subscale	Indicators	M	SD	Frequencies across score levels (%)			
				1	2	3	4
Comprehension of mathematical reasoning	Comprehending the reasoning procedure	1.54	0.62	53.4	39.6	7.0	0.0
	Identifying valid and invalid reasoning sequences	2.52	0.83	10.7	37.8	40.4	11.2
	Identifying the logical validity within reasoning	1.57	0.67	52.6	38.0	9.1	0.3
	Overall Mean H1 = 1.87; Level 2: Analyzing; SD = 0.44						
Comprehension of mathematical modeling	Identifying situations requiring mathematical modeling	1.85	0.79	37.8	40.9	19.8	1.6
	Recognizing modeling approaches for mathematical problems	2.40	0.76	10.7	45.1	38.0	6.3
	Grasping the fundamental procedure of mathematical modeling	2.52	0.77	8.1	40.4	42.7	8.9
	Overall Mean H2 = 2.26; Level 2: Analyzing; SD = 0.46						
Comprehension of mathematical communication	Comprehending communicative actions in mathematical learning	2.88	0.75	3.6	24.2	53.1	19.0
	Using appropriate language to explain mathematical problems	2.79	0.81	5.2	29.7	45.8	19.3
	Interpreting the connotation of algebraic identities	3.36	0.68	0.5	10.2	42.2	47.1
	Overall Mean H3 = 3.01; Level 3: Applying; SD = 0.45						
Comprehension of utilizing mathematical tools	Recognizing the specific functions and uses of various mathematical tools	3.61	0.58	0.3	4.4	28.9	66.4
	Selecting basic mathematical software to represent mathematical concepts	2.95	0.75	2.6	23.2	50.8	23.4
	Knowing how to preserve mathematical instruments	3.32	0.67	0.8	9.4	46.9	43.0
	Overall Mean H4 = 3.07; Level 3: Applying; SD = 0.57						
Comprehension of mathematical problem-solving	Identifying the requirements and hypotheses of mathematical problems	3.60	0.58	0.0	4.9	30.2	64.8
	Identifying the relationship between problem requirements and available data to deduce missing variables	2.51	0.81	9.9	39.6	40.1	10.4
	Employing the working backwards heuristic to solve problems	2.09	0.75	21.9	49.0	27.1	2.1
	Overall Mean H5 = 2.73; Level 3: Applying; SD = 0.43						
Overall Mean for Mathematical Comprehension = 2.59; Level 3: Applying; SD = 0.38							

These findings reveal that the students' mathematical comprehension is uneven. Students appeared able to comprehend familiar mathematical information and procedures; however, they showed difficulty when tasks involved higher-order reasoning, relational analysis, or modeling. This finding is consistent with the international perspectives of mathematical competency, which

state that being competent means not only understanding the mathematics content but also the reasoning, modeling, problem-solving, communication, and tools used for doing mathematical work (Niss et al., 2011; OECD, 2019). It is important to note that good performance in communication and tools may be due to the fact that the communication and tools are commonly practiced in the classroom environment, especially in the use of textbooks, calculators, and understanding of standard algebraic forms. On the other hand, reasoning and modeling entail justification of ideas, uncovering of relations, and translating real or semi-real situations into mathematics.

The interview data provided additional contextual support for these findings. The majority of teachers found it true that Grade 9 students generally possess the ability to comprehend formulas, recognize given information, and apply known solution methods when the task is given in a normal form. Yet, they have trouble providing justification for the validity of the solution, formulating a mathematical model from a contextual problem, and solving a problem in an unconventional manner. This problem was associated by the teachers with students' reliance on solved samples, exam-focused learning approach, lack of experience in solving open-ended modeling problems, and apprehensions about committing errors while explaining mathematical ideas. Thus, the disparity between a higher level of comprehension of tools, communication, and problem requirements and a lower level of comprehension of reasoning and modeling is associated with students' cognitive difficulties, as well as the existing pattern of mathematics learning, which prioritizes procedure over reasoning and modeling.

Overall, the findings support the view that mathematical competency is a multidimensional construct rather than a single ability. According to Niss and Højgaard (2011, pp. 49-52), mathematical competency, which comprises reasoning, modeling, problem-solving, communication, representation and tool use, is described as inter-related but distinct competencies. In addition, the higher mean scores for communication and tools use, together with lower mean scores for reasoning and modeling, reveal uneven development across these subcomponents rather than a general lack of comprehension. This finding also aligns with PISA 2022's mathematical literacy framework, which views mathematical reasoning as the center and treats formulating real-world situation as the core process (OECD, 2023, pp. 23-28). In addition, results from teacher interviews show that students' reliance on worked examples and limited engagement with open-ended tasks may help explain why they recognized familiar information and procedure more easily than when they justified relations or constructed models. Thus, instruction should go beyond assisting the students in identifying the processes and getting the right answers. More emphasis needs to be made on activities which enable the students to explain their rationale, analyze the relations between data, develop models, and evaluate solution rationality.

4.3. Students' level of mathematical execution

As detailed in Table 3, the total mean score for the mathematical execution competency of the students is $M = 1.73$ ($SD = .40$; Level 1: Imitation). This suggests that the students can conduct basic mathematical operations, but in terms of mathematical execution competency, their performance remained unstable and largely dependent on familiar problem patterns. In terms of the five sub-components of mathematical execution competency, the mathematical tool use execution scored the highest ($M = 2.17$), followed by the mathematical communication execution ($M = 1.99$) and mathematical problem-solving execution ($M = 1.94$). Meanwhile, the mathematical reasoning execution ($M = 1.31$) and mathematical modeling execution ($M = 1.27$) received the lowest scores, which are all at the level of Imitation.

Table 3. Students' level of mathematical execution

Subscale	Indicators	M	SD	Frequencies across score levels (%)			
				1	2	3	4

Execution of mathematical reasoning	Applying reasoning knowledge to solve problems involving graphs of functions	1.26	0.46	75.0	24.2	0.8	0.0
	Applying reasoning knowledge to solve geometric problems	1.36	0.53	66.1	31.3	2.6	0.0
	Overall M L1 = 1.31; Level 1: Imitation; SD = 0.35						
Execution of mathematical modeling	Applying modeling knowledge to construct a distance-velocity-time (S, v, t) table from motion problems	1.22	0.43	79.2	20.1	0.8	0.0
	Applying modeling knowledge to construct geometric figures based on geometric problems	1.33	0.52	69.5	28.1	2.3	0.0
	Overall M L2 = 1.27; Level 1: Imitation; SD = 0.35						
Execution of mathematical communication	Applying knowledge to verbally articulate the content of a distance-velocity-time (S, v, t) table	1.80	0.65	32.3	55.7	11.5	0.5
	Applying knowledge to verbally articulate the content of geometric figures	2.18	0.66	12.2	59.4	26.6	1.8
	Overall M L3 = 1.99; Level 2: Manipulation; SD = 0.48						
Execution of utilizing mathematical tools	Applying knowledge of utilizing scientific calculators to verify the solutions of quadratic equations	2.35	0.68	8.1	52.6	35.4	3.9
	Applying knowledge of utilizing scientific calculators to execute operations finding common divisors of common multiples	1.97	0.64	21.4	60.4	18.0	0.3
	Overall L4 = 2.17; Level 2: Manipulation; SD = 0.46						
Execution of mathematical problem-solving	Solving quadratic equations utilizing alternative methods	2.31	0.71	10.4	51.8	33.9	3.9
	Executing tasks involving the calculation of angle measures within parallel line relationships	1.57	0.62	50.5	42.4	7.0	0.0
	Overall M L5 = 1.94; Level 2: Manipulation; SD = 0.49						
Overall M for Mathematical Execution = 1.73; Level 1: Imitation; SD = 0.40							

The lower level of the students' mathematical execution in comparison with their level of mathematical comprehension demonstrates the presence of a gap between the concepts "understanding mathematics" and "doing mathematics." Teacher interviews suggested several possible explanations for this gap. First, even though the 2018 General Education Mathematics Curriculum focuses on the development of competencies, the classroom learning process at Grade 9 continues to be driven by exam preparation and thus focuses mostly on common problems and standard procedures. Second, students are often taught to follow sample solutions, which means that they might be able to understand formulas and the conditions of a task but do not get an opportunity to choose their approaches, build a model, prove their reasoning, and convert the verbal information into the language of mathematics. Finally, Grade 9 students face certain pressure in terms of their transfer to the upper secondary education. Indeed, according to the results of the interview, many students were able to perform familiar tasks under teacher guidance, but they showed hesitation in justifying why a particular solution was right and in solving a problem.

Taken together, students' mathematical execution competency remained at the Imitation level. This suggests that students were able to perform only familiar or patterned mathematical

procedures, but had not yet demonstrated sufficient autonomy, precision, or cognitive flexibility in mathematical task execution. The observed gap between comprehension and execution suggests that many students can recognize or explain familiar mathematical content but had difficulty in choosing appropriate strategies, constructing models, and justifying solutions without patterned guidance from their teachers. This finding complements the work by Nguyen (2015), Vu (2022) and Nguyen (2023), who examined modeling, problem solving, and communication as separate competencies because it shows how these components assemble at task execution. These findings also suggest the necessity of strengthening instructional practices that foster reasoning, modeling, relational data analysis, procedural explanation, and multidirectional problem solving.

4.4. Overall assessment of students' level of mathematical competency

Mathematical competency of secondary school students in Ho Chi Minh City is demonstrated in Table 4 below. As can be seen from Table 4, students' mathematical competency had a mean score of $M = 2.16$, which was classified at Level 2: Satisfactory. Under this broader construct, the mathematical comprehension component scored $M = 2.59$, which is higher compared to the mathematical execution component at $M = 1.73$. This difference implies that students performed better on mathematical comprehension tasks than on mathematical execution tasks. A closer look at the mathematical comprehension category, the comprehension of mathematical tools utilization and comprehension of mathematical communication received high mean scores of $M = 3.07$ and $M = 3.01$ respectively, both ranked under Applying level. On the other hand, mathematical reasoning recorded the lowest average value of 1.88. Moving to the mathematical execution category, all components received low average scores, but execution of utilizing mathematical tools ranked highest ($M = 2.16$), whereas execution of mathematical modeling and mathematical reasoning were the lowest subcomponents with average values of 1.27 and 1.31 respectively (Imitation level).

Table 4. Students' overall mathematical competency

Subscale	Component	Mean	Level	SD
Mathematical Comprehension M = 2.59; Level 3: Applying	Comprehension of mathematical reasoning	1.88	(2) Analyzing	0.44
	Comprehension of mathematical modeling	2.26	(2) Analyzing	0.47
	Comprehension of mathematical communication	3.01	(3) Applying	0.46
	Comprehension of utilizing mathematical tools	3.07	(3) Applying	0.57
	Comprehension of mathematical problem-solving	2.73	(3) Applying	0.44
Mathematical Execution M = 1.73; Level 1: Imitation	Execution of mathematical reasoning	1.31	(1) Imitation	0.36
	Execution of mathematical modeling	1.27	(1) Imitation	0.35
	Execution of mathematical communication	1.99	(2) Manipulation	0.49
	Execution of utilizing mathematical tools	2.16	(2) Manipulation	0.47
	Execution of mathematical problem-solving	1.94	(2) Manipulation	0.49
Overall Mathematical Competency		2.16	Level: (2) Satisfactory	

Inferential statistics indicate that students' mathematical competency varied significantly across different demographic sub-groups ($p < .05$). First, it was found that urban students had a significantly higher mean value of mathematical competency when compared with their suburban peers ($t = 4.6$; $p < .001$). Second, it was noted that the group of students that had a positive attitude towards mathematics performed better than students without such an attitude ($t = 7.04$; $p < .001$). Third, the group of students whose parents expected high mathematical execution from them demonstrated higher means as well ($F = 5.42$; $p < .001$). These results suggest that students' mathematical competency is associated with school context, learning attitude, and parental expectations. Meanwhile, no statistically significant differences

in mathematical competency were detected by gender, age group, playing cognitive games, attending shadow education, and socio-economic status of families ($p > .05$).

In short, group comparison results show that mathematical competency there is no statistically significant difference across students' gender, age, participation in private tutoring or thinking games. In contrast, mathematical competency is associated with educational environment, family support systems, as well as learner autonomy in learning mathematics. This result supports the conclusion by Dang (2012) and Hoang (2015), who stated that competency is not a fixed personal trait but develops and is reflected in participation in context-specific activities. Nevertheless, the study found no statistically significant difference was observed between students who did and did not report private tutoring. This suggests that more instructional time may not be effective if learning remains centered on familiar procedures. Instead, instruction should also emphasize independent reasoning, modeling, and explanation so that students can achieve a more balanced level of mathematical competency.

5. Conclusion

This study aimed to investigate the current status of mathematical competency among 384 Grade 9 students in Ho Chi Minh City. Data analysis reveals that students' overall competency was at the mean score of 2.16 - Satisfactory level whereas mathematical comprehension was at $M = 2.59$ - Applying level, and mathematical execution was at $M = 1.73$ - Imitation level. This result shows that students performed relatively better in communication, tool use, and problem solving, but showed clear limitations in reasoning and modeling, especially when required to move from understanding to independent task execution. Significant differences were found by school location, interest in mathematics, and parental expectations, whereas gender, age group, private tutoring, thinking games, and family economic status showed no significant differences. These findings suggest that mathematics teaching should place greater emphasis on reasoning, modeling, explanation, and independent problem solving. This study has several limitations. First, it used a quota-based non-probability sample and a cross-sectional design. Second, some execution subscales had relatively low reliability. Third, comprehension and execution were assessed with different item formats and were not placed on a common scale, so the comprehension-execution difference is confounded with task format and difficulty. Future studies should expand the sample, examine predictive mechanisms, test pedagogical interventions, and assess both dimensions with parallel content and comparable formats, using scaling methods such as item response theory to place them on a common metric.

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Conflict of interest: *The authors declare no conflicts of interest.*

Acknowledgments: *The authors would like to express their profound gratitude to the School Administration Boards and all the students from the six lower secondary schools in Ho Chi Minh City for their enthusiastic support and participation in the survey.*

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