Original Article

Influence of Reading Fluency and Comprehension on Students' Rapid Mathematics Assessment Performance

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Abstract. Despite global efforts to improve education, many countries continue to struggle with low levels of literacy and numeracy, reflecting a persistent challenge in foundational learning skills; thus, this study examined the relationship between students' reading profiles and mathematical proficiency among Grade 10 public high school students in the Digos City Division during School Year 2025–2026. Using secondary data from the Philippine Informal Reading Inventory (Phil-IRI) and the Rapid Mathematics Assessment (RMA), the study determined students' reading fluency, reading comprehension, and mathematical proficiency, as well as the relationship between reading profiles and mathematics performance. Results showed that students were at the instructional level in reading fluency ($M = 90.64$, $SD = 8.29$) and at the frustration level in reading comprehension ($M = 36.61$, $SD = 16.67$), while their mathematical proficiency was classified as Emerging (Not Proficient) ($M = 7.57$, $SD = 4.57$). Pearson correlation analysis revealed a moderate positive relationship between reading profile and mathematical proficiency ($r = .547$). Regression analysis indicated that reading fluency and comprehension jointly accounted for 37.5% of the variance in mathematical proficiency ($R^2 = .375$, $p = .000$), with reading fluency having a stronger effect than reading comprehension. The findings highlight the significant role of reading skills in mathematics learning, suggesting that difficulties in understanding text, instructions, and word problems may hinder students' mathematical performance.

Keywords: Comprehension; Fluency; Mathematical proficiency; Reading profile.

It is recognized that literacy and numeracy play important roles in students' cognitive development. These abilities serve as the foundation of lifelong learning and significantly contribute to students' academic achievement (Husain, 2022). Globally, the link between reading comprehension and mathematics skills has been established by numerous studies. A meta-analysis of 49 studies with over 37,000 participants found that reading comprehension significantly affects mathematics performance, particularly in problem-solving contexts (Akin, 2022). However, the results reveal a pressing global challenge: many countries are struggling with literacy and numeracy. A significant factor contributing to these low scores is learners' struggles with reading proficiency, which directly affects their numeracy and overall academic performance (Idulog et al., 2023). Furthermore, emerging evidence suggests that these two domains do not operate in isolation: rather, the ability to read, comprehend, and process language appears to support mathematical and numerical learning in meaningful ways.

In ASEAN countries, including the Philippines, the Program for International Student Assessment (PISA) consistently reports low performance in reading and mathematics, indicating a strong correlation between these skills (Acido & Caballes, 2024). Specifically, the Philippines ranked among the lowest in reading and mathematics in the PISA 2018 and 2022 assessments, revealing persistent challenges in literacy and numeracy education. In 2018, the country scored 340 in reading and 353 in mathematics, and in 2022, it remained near the bottom with scores of 347 and 355, respectively (OECD, 2023). The study suggests that poor reading comprehension is a major barrier to effective problem-solving in mathematics.

In the Grade 10 National Achievement Test (NAT) for S.Y. 2022–2023, students' Mathematics performance was low, with national MPS of 36.06% in Problem-Solving, 36.05% in Informational Literacy, and 36.03% in Critical Thinking. Moreover, the Regional and Digos City Division scores were slightly lower, and Grade 12 students also performed poorly, with MPS ranging from 33.06% to 45.14%, all at the low proficient level (DepEd Region XI, 2024). This trend was mirrored in the 2024 Regional Achievement Test (RAT), where Math performance declined across higher grade levels—from 40.36% in Grade 4 to 28.29% in Grade 8, and around 25% in Grades 11 and 12— indicating persistent difficulties in problem-solving, information management, and understanding mathematical concepts in senior high school (DepEd Region XI, 2024).

This research aligns with Sustainable Development Goal 4 (Quality Education), which emphasizes inclusive and equitable education and lifelong learning opportunities for all. By focusing on integrating literacy and numeracy, the study helps improve foundational skills essential to sustainable development. While international and national studies confirm the link between reading skills and math performance, few local studies have explored this relationship using PHIL-IRI and RMA data. This study addresses that gap by examining how reading profiles relate to numeracy skills among Filipino learners.

This study was anchored in Piaget's (1952) Cognitive Development Theory and posits that learners actively construct knowledge through interactions with their environment. In this research, students' reading abilities were a critical tool for understanding and internalizing mathematical concepts. By understanding written instructions and word problems, students can better engage in problem-solving and reasoning, demonstrating how language-shaping cognitive processes influence numeracy development.

This study sought to determine the influence of students' reading profiles on their numeracy skills. Specifically, it determined the level of students' reading profiles based on the Philippine Informal Reading Inventory (PHIL-IRI) in terms of fluency, accuracy, and comprehension; assessed the level of students' numeracy skills using the Rapid Mathematics Assessment; examined the relationship between students' reading profiles and their numeracy skills; and determined whether reading profiles significantly contribute students' numeracy skills.

Methodology

Research Design
This study employed a descriptive-correlational research design, a quantitative approach used to determine the degree and nature of relationships among two or more variables. According to Creswell (2014), correlational research is appropriate when the primary goal is to describe and measure the association among variables without manipulating them. Likewise, Gay, Mills, and Airasian (2012) assert that correlational designs are used when researchers seek to identify patterns in relationships and draw inferences from naturally occurring data. In this study, the correlational design was appropriate because it aimed to examine the relationship between reading level, as measured by the Philippine Informal Reading Inventory (Phil-IRI), and mathematical proficiency, as assessed by the Rapid Mathematics Assessment (RMA).

Respondents and Sampling Technique
The respondents of this study were Grade 10 public high school students in the Digos City Division for the School Year 2025 – 2026. The study was conducted in a public secondary institution that regularly administers both the Philippine Informal Reading Inventory (Phil-IRI) and the Rapid Mathematics Assessment (RMA) as part of its literacy and numeracy evaluation programs. The study used secondary data from the results of the Philippine Informal Reading Inventory (Phil-IRI) and the Rapid Mathematics Assessment (RMA) administered by the school. The sample consisted of students with complete Phil-IRI and RMA records, using a total-population sampling technique because the number of qualified respondents was manageable and ensured full representation.

Research Instrument

This study used secondary data from the results of the Philippine Informal Reading Inventory (Phil-IRI) and the Rapid Mathematics Assessment (RMA) administered by the school. These tools were the primary instruments for measuring the two variables in the study—reading level and mathematical proficiency. The Phil-IRI is a standardized reading assessment developed by the Department of Education (DepEd) to determine students' reading levels. It measures reading proficiency through oral and silent reading tests, assessing both comprehension and fluency. Results were categorized as follows:

Table 1. *Reading Level: Phil – IRI*

Reading Level	Fluency	Comprehension	Description
Independent	97 – 100%	80 – 100%	The level at which readers function on their own, with almost perfect oral reading and excellent comprehension.
Instructional	90 – 96%	59 – 79%	The level at which readers profit most from teacher-directed instruction in reading.
Frustration	89% and below	58% and below	The level at which readers find reading materials so difficult that they cannot successfully respond to them.

The Rapid Mathematic Assessment used in this study was a 47-item numeracy test administered to Grade 10 students. The test was designed based on key competencies aligned with the K to 12 Mathematics Curriculum and the Rapid Mathematics Assessment (RMA) framework developed by UP NISMED. It was the standardized tool used by the Department of Education (DepEd) in the Philippines to measure learners' mathematical proficiency. Table 1 presents the numeracy skill levels used to interpret learners' performance based on their assessment scores.

Table 2. *Mathematical Proficiency Level: Rapid Mathematics Assessment (RMA)*

Score Range	Proficiency Level	Description
85 – 100%	At Grade Level (Highly Proficient)	Demonstrates strong mastery of grade-level mathematical concepts and skills; able to apply knowledge accurately and independently in varied problem-solving situations.
75 – 84%	Transitioning (Proficient)	Shows adequate understanding of most grade-level competencies; can solve routine problems with minimal guidance but may need support for complex tasks.
50 – 74%	Developing (Nearly Proficient)	Displays partial mastery of mathematical skills; requires guided practice and reinforcement to meet grade-level expectations.
25 – 49%	Emerging (Low Proficient)	Demonstrates limited understanding of fundamental concepts; needs substantial support and targeted intervention to improve performance.
Below 25%	Emerging (Not Proficient)	Shows minimal mastery of mathematical skills; requires intensive remediation and continuous instructional support.

Data Gathering Procedure

The data for this study were collected through secondary data analysis, using existing records from the Philippine Informal Reading Inventory (Phil-IRI) and the Rapid Mathematics Assessment (RMA) administered by a public high school teacher during School Year 2025 – 2026. Prior to data collection, a formal request letter was submitted to the school principal to secure permission to access the students' assessment results. Upon approval, the researcher coordinated with the English and Mathematics coordinators to obtain the official Phil-IRI and RMA results. The Phil-IRI results indicated students' reading levels (frustration, instructional, or independent), while the RMA results reflected their mathematical performance based on standardized score calculations. The researcher then encoded and organized the data into a database for analysis, ensuring confidentiality and adherence to ethical research standards by omitting any personal identifiers.

Data Analysis Procedure

The study involved retrieving, verifying, classifying, and tabulating data to prepare it for statistical analysis. To address the research objectives, several statistical tools were employed. The mean was used to present the students' reading levels and mathematical proficiency, providing a clear overview of their performance distribution. The Pearson Product-Moment Correlation Coefficient (r) was used to assess the degree and direction of the relationship between reading levels and mathematical proficiency, specifically examining students' reading fluency and comprehension, as well as their mathematical proficiency. Regression analysis was conducted to determine the significant influence of reading fluency and reading comprehension on students' performance in the Rapid Mathematics Assessment.

Ethical Considerations

This study complied with the ethical standards and guidelines of the School's Research Committee and was reviewed and approved by the Research Ethics Committee. The research utilized secondary data obtained with permission from the concerned institutions. No direct contact with human respondents occurred, and no new data were collected for this study. The datasets did not contain personally identifiable or sensitive information, ensuring anonymity and confidentiality. All data were used solely for academic purposes and were securely stored and accessed only by the researcher. Transparency, fairness, and academic integrity were upheld throughout the research process, and the researcher avoided data fabrication, falsification, or misrepresentation.

Results and Discussion

Level of Students' Reading Profile

Table 3 shows that students' reading profile is generally at the Frustration level, meaning they find reading materials so difficult that they cannot respond successfully. Specifically, the Reading Fluency (M = 90.64 and SD = 8.29) which mean the students at the instructional level, indicating readers profit the most from teacher directed instruction in reading, while Reading Comprehension (M = 36.61 and SD = 16.67) which means the students at the instructional level, indicating that find reading materials so difficult that they cannot successfully respond to them.

Table 3. *Level of Students' Reading Profile*

Reading Profile	M	SD	Description
Reading Fluency	90.64	8.29	Instructional
Reading Comprehension	36.61	16.67	Frustration

Level of Students' Mathematical Proficiency as Measured by Rapid Mathematics Assessment Performances

Table 4 presents students' performance in the Rapid Mathematics Assessment. The results show (M = 7.57 and SD = 4.57), placing students at an "Emerging (Not Proficient)" level. It shows minimal mastery of mathematical skills that require intensive remediation and continuous instructional support.

Table 4. *Level of Students' Mathematical Proficiency*

Mathematical Proficiency	M	SD	Description
Rapid Mathematics Assessment Performance	7.57	4.57	Emerging (Not Proficient)

Relationship Between Reading Profile and Mathematical Proficiency of Students

Table 5 shows the results of the correlation analysis between reading profile and students' mathematical proficiency. The analysis revealed a moderate positive correlation (r = 0.547, p = .000) between students' reading fluency and their mathematical proficiency, as measured by the Rapid Mathematics Assessment (RMA). This shows that as reading fluency increases, mathematical proficiency, as measured by RMA, also increases moderately. This finding suggests that improvements in reading fluency are associated with corresponding gains in mathematical performance, highlighting the interconnected nature of literacy and numeracy skills. Thus, there is a significant relationship between reading fluency and students' mathematical proficiency. Reading comprehension has also been identified as one of the most important factors in math achievement. Recognizing that many Filipino students are still struggling to meet early language, literacy, and numeracy targets, the Department of Education (DepEd) has urged all public schools to improve their reading advocacy. Language ability, parental involvement, the absence of learning disabilities, and reading ability were found to be important predictors of academic achievement (Lever et al., 2016).

Table 5. *Significance of the Relationship of Students' Reading Profile and Mathematical Proficiency*

Variables	p-value	Pearson's r value	Decision	Interpretation
Reading Fluency and RMA Performance	.000	.547	Reject H_{01}	Significant
Reading Comprehension and RMA Performance	.003	.392	Reject H_{02}	Significant

On the other hand, there is a low positive correlation (r = .392, p = .003) between students' reading comprehension and mathematical proficiency. This illustrates that as reading comprehension increases, the increase in mathematical proficiency, as measured by RMA, is low. Thus, there is a significant relationship between reading comprehension and students' mathematical proficiency. It supports the study by García-Madruga et al. (2014), which shows that reading comprehension is closely related to mathematics, as it is a cognitive skill that supports

students' smooth understanding of mathematical concepts and problem-solving.

Influence of Reading Profile on the Mathematical Proficiency of Students

Looking at the combined result, the findings show that students' reading profiles (R^2 = .375, p = .000), when combined as reading fluency and reading comprehension, significantly influence their performance on the Rapid Mathematics Assessment (RMA). This means that about 37.5% of students' math proficiency can be explained by their reading profile, and the association is statistically significant. On the other hand, the remaining 62.5% indicates that, in addition to reading profiles, other cognitive, instructional, and contextual factors influence students' mathematical proficiency. This suggests that reading ability plays an important role in how well students perform in mathematics, especially in assessments that require quick thinking and understanding. It corroborates Grimm's (2008) longitudinal study, which found that students with better early reading skills are more likely to achieve greater gains in mathematics. Moreover, reading ability is assumed to help with the linguistic-semantic characteristics and text complexity involved in problem comprehension (Boonen et al., 2016).

Table 6. *Significant Influence of Students' Reading Profile on Mathematical Proficiency*

	RMA Performance					
	Beta Coefficient (β)	*p*-value (Individual)	Constant β	R^2	*p*-value (Combined)	Interpretation
Reading Fluency	.266	.000	1.858	.375	.000	Significant
Reading Comprehension	.077	.016				

When the results are examined individually, both reading fluency and reading comprehension significantly influence students' RMA performance. Reading fluency has a stronger effect (B = .266, p = .000). This means that students who read faster and more smoothly tend to perform better on rapid math tasks. Reading comprehension also shows a significant influence, although it is smaller (B = .077, *p* = .016). This indicates that understanding what is read also helps in solving math problems. A student's mathematics skills and learning process can be influenced by reading comprehension, one of the most important predictors of academic performance (Bullen et al., 2020). Moreover, Wakhata et al. (2024) further note that students' struggles with comprehending word problems often lead to frustration and disengagement

The findings reported above indicate that problem-solving was more strongly influenced by reading comprehension. These results are not surprising since one of the most important phases of problem-solving is understanding the problem. It is the most important step for students to understand the problem, as solving it is unlikely without first understanding it (Ozturk et al., 2020). On the other hand, although strong links between reading and mathematics achievement are well established, this association does not establish a causal relationship. Research indicates the correlation may be explained by common underlying factors, such as shared cognitive skills (e.g., working memory) or a general intellectual ability that supports performance in both domains (Ashkenazi et. al., 2017).

Conclusion

This study examined the relationship between students' reading profiles—comprising reading fluency and reading comprehension—and their mathematical proficiency as measured by the Rapid Mathematics Assessment (RMA). The findings indicate that students generally performed at a frustration level in reading comprehension and at an emerging (non-proficient) level in mathematics, highlighting significant challenges in both literacy and numeracy. This study makes a significant contribution by empirically demonstrating the integrative role of reading skills in students' mathematical proficiency, particularly in contexts that demand rapid reasoning and comprehension.

These results emphasize that reading skills, particularly fluency, contribute meaningfully to students' ability to engage with and solve mathematical problems, especially in time-sensitive assessments. The study supports existing literature on the interconnectedness of literacy and numeracy, suggesting that enhancing reading proficiency may positively impact mathematical learning and problem-solving. Moreover, teachers are encouraged to incorporate explicit reading support within mathematics instruction, including strategies for unpacking mathematical language, interpreting word problems, and scaffolding comprehension.

For educators and curriculum designers, these findings advocate for integrated instructional approaches that

simultaneously develop reading and mathematical skills, particularly in early and remedial education. Future research could further explore causal mechanisms and investigate targeted interventions that leverage reading support to improve mathematical outcomes. Moreover, may explore additional cognitive and contextual variables that account for the remaining variance in mathematical proficiency, such as working memory, instructional approaches, and learner motivation. Longitudinal research designs can examine the developmental interplay between reading and mathematics over time and clarify potential causal pathways.

Contributions of Authors

Author 1: conceptualization, methodology, writing, reviewing, editing, data collection, supervision, data analysis
Author 2: checking, data analysis, formal analysis
Author 3: writing, reviewing, and editing
Author 4: writing, reviewing, and editing

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Conflict of Interests

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