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Examining the Influence of Language Comprehension on Students' Academic Performance in Mathematics at G.S Jean de la Mennais de Kirambo and G.S Rushara in Burera District, Rwanda

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***Abstract**: This study examined the influence of language comprehension on students' academic performance in mathematics at G.S. Jean de la Mennais de Kirambo and G.S. Rushara in Burera District, Rwanda. The study was guided by three objectives: to assess students' level of language comprehension in mathematics, to determine the relationship between language comprehension and mathematics performance, and to identify language-related challenges affecting mathematics learning. A quantitative correlational research design was employed. Data were collected from 125 students and 3 mathematics teachers using questionnaires and teacher responses. Descriptive statistics were used to summarize the data, while Pearson correlation and regression analysis were employed to establish the relationship and predictive contribution of language comprehension to mathematics performance. The findings indicated that a considerable number of students experienced difficulties understanding mathematical terminology, interpreting English instructions, and solving word problems. The results further revealed a positive and statistically significant relationship between language comprehension and mathematics performance ($r = .624$, $p < .001$), suggesting that students with stronger comprehension skills tended to achieve better results in mathematics. Teachers also identified limited English proficiency, inadequate exposure to English outside the classroom, and difficulties interpreting mathematical questions as major challenges. The study concludes that language comprehension is an important factor in mathematics achievement and recommends integrating language-support strategies into mathematics instruction, strengthening academic vocabulary development, and providing teachers with professional development on teaching mathematics in multilingual classrooms.*

***Keywords:** Academic performance, Language comprehension, Mathematics achievement, Mathematics learning, Multilingual education, Rwanda*

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1. Introduction

Language comprehension plays a fundamental role in the teaching and learning process because it enables learners to understand instructions, concepts, and problem-solving procedures across different subjects. In mathematics education, language is not merely a medium of communication but also a tool for constructing mathematical meaning. Students are required to interpret mathematical vocabulary, comprehend word problems, follow instructions, and communicate their reasoning effectively. Consequently, inadequate language comprehension can hinder students' understanding of mathematical concepts and negatively affect their academic performance. Research has increasingly

recognized language comprehension as a significant factor influencing students' achievement in mathematics and other academic disciplines (Luna et al., 2024) .

Globally, numerous studies have highlighted the relationship between language proficiency and mathematics achievement. Although mathematics is often considered a universal language, successful learning of mathematics depends heavily on students' ability to understand the language used in instruction and assessment. According to the Organisation for Economic Co-operation and Development (OECD, 2023), students with stronger reading and language comprehension skills tend to perform better in mathematics because they can accurately interpret mathematical tasks and apply appropriate problem-solving strategies. Similarly, Sihlangu & Mokwana (2026) argues that mathematics has its own specialized vocabulary and discourse structures that students must master to achieve academic success. Studies conducted in the United States, Australia, and Europe have consistently shown that learners with limited language proficiency encounter difficulties in understanding mathematical terminology, interpreting word problems, and explaining mathematical reasoning, leading to lower academic performance (King & Powell, 2023).

In the African context, language comprehension remains a critical educational challenge due to the multilingual nature of many countries and the widespread use of foreign languages as mediums of instruction. Many African learners study mathematics in English or French despite using local languages in their daily interactions. This linguistic gap often affects learners' comprehension of mathematical concepts and classroom instructions. Research conducted in South Africa found that students learning mathematics through a second language experienced difficulties understanding mathematical vocabulary and solving word-based problems, which significantly affected their performance (Setati, 2008). Similarly, studies in Kenya, Tanzania, and Uganda revealed that language barriers contribute to poor mathematics achievement, particularly among students in rural schools where exposure to the language of instruction is limited (Firdaus Ridwan Sutarta1, Asri Widiatsih2, 2021). These findings suggest that language comprehension is a key determinant of learners' success in mathematics education across Africa.

In Rwanda, the issue of language comprehension in education has gained increasing attention since the adoption of English as the medium of instruction in 2008. The policy change aimed to enhance Rwanda's integration into the East African Community and the global economy. However, many teachers and students faced challenges adapting to English, particularly in rural areas where exposure to the language was limited. Studies have indicated that language-related difficulties continue to affect classroom interaction, teaching effectiveness, and student learning outcomes. According to the Rwanda Education Board (REB, 2022), students' ability to comprehend instructional language significantly influences their performance in various subjects, including mathematics. Research by Bahati et al.(2024) found that limited English language proficiency among students hindered classroom participation and understanding of academic content. Furthermore, national examination reports have repeatedly identified difficulties in interpreting mathematical questions and word problems as factors contributing to low mathematics achievement among some learners.

At the local level, schools such as G.S Jean de la Mennais de Kirambo and G.S Rushara in Burera District operate within a context where many students primarily communicate in Kinyarwanda while mathematics instruction is delivered in English. This situation may create challenges in understanding mathematical concepts, vocabulary, and problem-solving instructions. Burera District, like many rural districts in Rwanda, faces educational challenges related to language proficiency, availability of learning resources, and varying levels of teacher preparedness. Classroom observations and reports from educators suggest that some learners struggle to interpret mathematical questions accurately despite possessing basic computational skills. Such challenges may contribute to lower academic performance in mathematics. Despite the growing recognition of the importance of language comprehension, limited empirical research has specifically examined its influence on students' academic performance in mathematics within Burera District. Therefore, this study sought to examine the influence of language comprehension on students' academic performance in mathematics at G.S Jean de la Mennais de Kirambo and G.S Rushara, with the aim of generating evidence that can inform teaching practices and educational policies aimed at improving mathematics learning outcomes.

1.1 Statement of the Research Problem and Motivation

Mathematics is a fundamental subject that supports learners' logical reasoning, problem-solving abilities, and future participation in science, technology, engineering, and mathematics (STEM) fields. Despite its importance, many students worldwide continue to experience difficulties in mathematics achievement. While factors such as teaching methods, learning resources, and socioeconomic conditions have been widely investigated, growing evidence indicates that language comprehension is another critical factor influencing students' performance in mathematics (Reyno & Guzman, 2025). Mathematical learning requires students to understand instructions, interpret word problems, comprehend mathematical terminology, and communicate solutions effectively. When learners have limited comprehension of the language used in instruction, their ability to demonstrate mathematical knowledge may be constrained, even when they possess the necessary computational skills (Kaziya, 2025). However, the extent to which language

comprehension affects mathematics performance remains insufficiently understood in many educational contexts.

Across Africa, the challenge is often intensified by multilingual educational environments where students learn mathematics through a second or foreign language. In many countries, English or French serves as the language of instruction despite being unfamiliar to a significant proportion of learners. Previous studies have reported that difficulties in understanding the instructional language can hinder learners' interpretation of mathematical concepts and problem-solving tasks, contributing to lower achievement levels (Avila and Caballes, 2024). Although research from several African countries has acknowledged the relationship between language and mathematics learning, findings vary according to context, educational policies, and learners' linguistic backgrounds. Consequently, further studies are needed to generate context-specific evidence that can guide educational interventions.

In Rwanda, English has been used as the medium of instruction since 2008. Although this policy has expanded access to international knowledge and regional integration, it has also introduced challenges for some learners, particularly those whose primary language is Kinyarwanda (Samuelson & Freedman, 2010). Research has shown that language-related difficulties continue to affect classroom participation, comprehension of academic content, and academic achievement (Bahati et al., 2024). Reports from the Rwanda Education Board have frequently indicated that students encounter difficulties in interpreting examination questions and understanding subject-specific terminology, especially in mathematics (REB, 2022). While several studies have examined language proficiency in general education, limited attention has been given to its specific influence on mathematics performance at the school level.

At the local level, G.S Jean de la Mennais de Kirambo and G.S Rushara in Burera District operate in communities where Kinyarwanda is the dominant language of daily communication, whereas mathematics instruction and assessments are conducted in English. Teachers have observed that some students struggle to understand mathematical vocabulary, instructions, and word problems, which may negatively affect their classroom performance and examination results. However, there is limited empirical evidence documenting the magnitude and nature of this challenge in these schools. This creates a knowledge gap regarding how language comprehension influences students' academic performance in mathematics within the Burera District context.

Therefore, this study was motivated by the need to examine the influence of language comprehension on students' academic performance in mathematics at G.S Jean de la Mennais de Kirambo and G.S Rushara. The findings are expected to contribute to existing knowledge by providing context-specific evidence that can support teachers, school leaders, curriculum developers, and policymakers in designing strategies that enhance both language comprehension and mathematics achievement among learners.

1.2 Objectives of the Study

1.2.1 General Objective

To examine the influence of language comprehension on students' academic performance in mathematics at G.S Jean de la Mennais de Kirambo and G.S Rushara in Burera District, Rwanda.

1.2.2 Specific Objectives

To assess the extent of language comprehension among students at G.S Jean de la Mennais de Kirambo and G.S Rushara in Burera District.

1. To determine the relationship between students' language comprehension and their academic performance in mathematics at G.S Jean de la Mennais de Kirambo and G.S Rushara.
2. To identify the language-related challenges that affect students' performance in mathematics and propose strategies for improvement at G.S Jean de la Mennais de Kirambo and G.S Rushara.

1.3 Research Questions

Based on the objectives of the study, the following research questions guided the investigation:

1. What is the extent of language comprehension among students at G.S Jean de la Mennais de Kirambo and G.S Rushara in Burera District?
2. What is the relationship between students' language comprehension and their academic performance in mathematics at G.S Jean de la Mennais de Kirambo and G.S Rushara?
3. What language-related challenges affect students' performance in mathematics, and what strategies can be adopted to improve mathematics learning outcomes at G.S Jean de la Mennais de Kirambo and G.S Rushara?

2. Literature Review

Language comprehension has been recognized as an important factor influencing learners' academic achievement, particularly in subjects that require interpretation, reasoning, and problem-solving, such as mathematics. Although mathematics is often considered a subject based on numbers and symbols, successful learning depends greatly on students' ability to understand mathematical language, follow instructions, interpret questions, and communicate their reasoning. This literature review examines theoretical perspectives explaining the relationship between language comprehension and mathematics learning and critically reviews empirical studies conducted globally, in Africa, and in Rwanda. The

review also identifies existing knowledge gaps that justify the need for examining the influence of language comprehension on students' academic performance in mathematics at G.S Jean de la Mennais de Kirambo and G.S Rushara in Burera District.

2.1 Theoretical Review

2.1.1 Cognitive Theory of Learning

The cognitive theory of learning provides an important foundation for understanding how language comprehension influences mathematics achievement. According to cognitive theorists, learning occurs through mental processes such as attention, perception, interpretation, memory, and problem-solving. Learners must first understand and process information before they can apply knowledge to solve problems (Piaget, 1972). In mathematics education, students are required to interpret mathematical statements, identify relevant information, and select appropriate solution strategies. Therefore, limited comprehension of mathematical language may overload students' cognitive processes and prevent them from effectively engaging with mathematical tasks.

Sweller's (1988) Cognitive Load Theory further explains that learners have limited working memory capacity. When students struggle to understand the language used in mathematics lessons, additional cognitive effort is spent interpreting words rather than understanding mathematical concepts. Consequently, language difficulties may reduce students' ability to reason mathematically and achieve better performance.

However, cognitive theory mainly explains individual mental processing and may not fully account for the social and linguistic environment in which mathematics learning occurs. Therefore, other theories emphasizing interaction and language development are also relevant.

2.1.2 Social Constructivist Theory

Social Constructivist Theory, mainly associated with Vygotsky (1978), emphasizes that learning occurs through social interaction and language. According to this perspective, language is not only a communication tool but also a means through which learners construct knowledge and develop higher-order thinking skills. Classroom discussions, teacher explanations, and peer interactions provide opportunities for students to develop understanding.

In mathematics classrooms, students need language to explain mathematical ideas, ask questions, justify solutions, and engage in problem-solving activities. When learners have insufficient comprehension of the language of instruction, their participation and ability to construct mathematical meaning may be limited. Vygotsky (1978) argues that appropriate linguistic support enables learners to progress from what they can do independently to what they can achieve with assistance.

Although Social Constructivist Theory highlights the importance of language in learning, it may not directly explain how language comprehension affects measurable academic outcomes. Therefore, empirical investigation is necessary to determine the extent to which comprehension influences mathematics performance in specific educational contexts.

2.1.3 Cummins' Linguistic Interdependence Theory

Cummins' (1979) Linguistic Interdependence Theory provides a direct explanation of the relationship between language proficiency and academic achievement. The theory suggests that skills developed in a learner's first language can support learning in a second language, but insufficient proficiency in the language of instruction may negatively affect academic performance. This is particularly relevant in multilingual contexts where learners use one language at home and another language at school.

In Rwanda, where Kinyarwanda is the dominant home language and English is the official medium of instruction, students may experience difficulties transferring knowledge when they have limited English comprehension. Heineke and Neugebauer (2018) argues that academic language requires more complex skills than everyday communication, and learners need adequate support to master subject-specific language. This theory therefore provides a strong basis for examining how language comprehension influences mathematics achievement.

2.2 Empirical Review

2.2.1 Students' Language Comprehension in Mathematics Learning

This review aimed assess the extent of language comprehension among students. Previous empirical studies have demonstrated that students' comprehension of the language used in mathematics instruction plays an important role in their ability to understand mathematical concepts and participate effectively in learning activities. Mathematics involves specific terminology, symbols, and expressions that require learners to develop academic language skills beyond everyday communication. According to Planas et al.(2025), mathematical discourse contains complex linguistic structures that may create difficulties for learners who have limited comprehension of the instructional language.

Globally, studies have shown that learners with stronger language comprehension abilities are more capable of interpreting mathematical tasks, understanding instructions, and explaining their reasoning. Maanu and Asare (2025) found that language proficiency influences

how multilingual learners engage with mathematical discussions and construct mathematical meaning. The study emphasized that students' difficulties in mathematics are sometimes related not to a lack of mathematical knowledge but to challenges in understanding the language through which mathematics is presented.

In African contexts, empirical evidence indicates that many learners experience language comprehension challenges because the language of instruction often differs from their home language. Setati (2003), in a study of multilingual mathematics classrooms in South Africa, found that students' limited understanding of the language used by teachers affected classroom participation and comprehension of mathematical ideas. Similarly, Sri and Candraningsih (2023) reported that learners who studied mathematics in English experienced difficulties understanding mathematical vocabulary and communicating mathematical reasoning.

In Rwanda, research following the introduction of English as the medium of instruction has highlighted similar challenges. Bahati et al.(2024) found that limited English proficiency among learners affected their ability to understand academic content and participate actively in classroom interactions. However, most previous studies have focused on general language proficiency rather than specifically assessing students' comprehension of mathematical language. Therefore, this study seeks to provide evidence on students' language comprehension within mathematics learning at G.S Jean de la Mennais de Kirambo and G.S Rushara.

2.2.2 The Relationship between Language Comprehension and Students' Academic Performance in Mathematics

This review aimed to determine the relationship between language comprehension and students' academic performance in mathematics. Several empirical studies have established that language comprehension is associated with mathematics achievement because learners must understand mathematical questions, identify relevant information, and apply appropriate strategies to solve problems.

Research conducted by the Burg et al. (2022) through international assessments such as PISA demonstrated that students' reading and comprehension abilities are strongly related to mathematics performance. The findings indicated that learners who can interpret written information effectively are more likely to succeed in solving mathematical problems, particularly those involving reasoning and real-life applications. Similarly, Lee (2012)argued that academic language proficiency influences learners' ability to access and demonstrate knowledge across different subjects.

In African countries, empirical studies have also reported a connection between language ability and mathematics achievement. Otieno & Saiteu (2023) found that students taught in a language they poorly understood faced difficulties in demonstrating their actual knowledge and achieved lower academic outcomes. The study suggested that language barriers can hide students' mathematical abilities because assessment results may reflect language difficulties rather than mathematical understanding.

In Rwanda, Nuraeni et al.(2020) reported that language challenges affected learners' understanding of science-related subjects where English was used as the instructional language. Although the study was not limited to mathematics, its findings suggest that language comprehension may influence achievement in subjects requiring interpretation and reasoning. Furthermore, Rwanda Education Board (REB, 2022) examination reports have indicated that some students struggle with interpreting mathematical questions, especially word problems, which may contribute to poor performance.

Despite these findings, limited empirical studies have directly examined the statistical or practical relationship between language comprehension and mathematics performance among secondary school learners in rural Rwandan schools. This study addresses this gap by investigating the relationship between language comprehension and mathematics achievement at G.S Jean de la Mennais de Kirambo and G.S Rushara.

2.2.3 Language-Related Challenges Affecting Mathematics Performance and Strategies for Improvement

This aimed to identify language-related challenges affecting students' mathematics performance and explore strategies for improvement. Previous research has identified several language-related barriers, including unfamiliar mathematical vocabulary, difficulties interpreting word problems, limited classroom communication, and insufficient exposure to the language of instruction.

According to Planas et al. (2025), learners studying mathematics in a second language often experience difficulties understanding mathematical expressions because mathematical meaning is strongly connected to language. The study emphasized that teachers need to provide linguistic support alongside mathematical instruction to enable learners to access mathematical knowledge.

In South Africa, *Setati and Adler (2000*) found that effective mathematics teaching in multilingual classrooms requires teachers to use strategies that support learners' language development. These strategies include explaining mathematical terms clearly, allowing classroom discussions, connecting mathematical ideas with learners' everyday experiences, and using multiple forms of representation.

In Rwanda, studies have indicated that teachers and students continue to experience challenges related to English proficiency. Sibomana (2014) highlighted that both teachers and learners faced difficulties adapting to English-medium instruction, affecting classroom communication and learning outcomes. To address these challenges, researchers have recommended strengthening language support, improving teachers' capacity in using academic language, and encouraging interactive teaching approaches.

However, existing research has not sufficiently explored the specific language challenges encountered during mathematics lessons in Burera District schools. In addition, limited evidence exists on the strategies currently used by mathematics teachers to overcome language barriers in rural Rwandan classrooms. Therefore, this study aims to fill this gap by identifying challenges and possible interventions that can improve mathematics learning outcomes.

The reviewed empirical studies demonstrate that language comprehension is an important factor influencing mathematics learning and achievement. However, most existing studies have been conducted outside Rwanda or have examined language challenges broadly without focusing specifically on mathematics education. In Rwanda, limited research has investigated how students' comprehension of the language of instruction affects mathematics performance, particularly in rural secondary schools. Therefore, this study contributes new context-specific evidence by examining students' language comprehension, its relationship with mathematics performance, and the challenges affecting mathematics learning at G.S Jean de la Mennais de Kirambo and G.S Rushara in Burera District.

3. Methodology

3.1 Research Paradigm

This research was conducted within the framework of the positivist paradigm, which is based on the assumption that educational phenomena can be investigated through objective measurement and analysis of observable evidence (Creswell & Creswell, 2023). This paradigm is suitable for the current study because it seeks to establish the extent to which language comprehension is associated with students' performance in mathematics through measurable indicators. The use of statistical procedures will enable the researcher to identify patterns and relationships between students' comprehension abilities and their mathematics achievement.

3.2 Research Approach

The study will employ a quantitative approach since the investigation requires numerical measurement of students' language comprehension and mathematics performance. Quantitative research is appropriate when the purpose of a study is to examine relationships among variables using statistical techniques and measurable data (Creswell & Creswell, 2023). In this study, the approach will help quantify students' comprehension of mathematical language and determine how it relates to their academic outcomes in mathematics.

3.3 Research Design

A correlational research design was adopted because the study intends to examine the association between language comprehension and mathematics achievement without introducing any experimental manipulation. Correlational designs are useful in educational research where researchers aim to determine whether changes in one variable are related to variations in another variable (Cohen et al., 2018). This design was therefore enable the researcher to explore whether students with stronger language comprehension tend to demonstrate better performance in mathematics.

3.4 Study Area and Context

The research was carried out at G.S Jean de la Mennais de Kirambo and G.S Rushara in Burera District, Northern Province of Rwanda. The selected schools represented a context where students commonly use Kinyarwanda in their daily communication, while mathematics teaching, learning materials, and assessments are delivered in English. The difference between the language commonly used by learners outside school and the language applied in academic settings may create difficulties in understanding mathematical concepts and instructions. Kisumbe et al.(2025) highlights that learners' academic achievement can be influenced by their ability to understand and use the language required for learning. Therefore, these schools provided an appropriate environment for examining the contribution of language comprehension to mathematics performance.

3.5 Target Population

The population of this study consisted of 400 students enrolled in mathematics courses at G.S Jean de la Mennais de Kirambo and G.S Rushara and 5 Mathematics teachers from the selected schools also participated as supplementary respondents because they have direct experience with students' learning behaviors and language challenges during mathematics lessons. Clearly identifying the target population is important because it defines the group from which conclusions of the research was drawn (Willie, 2024).

3.6 Sample Size and Sampling Procedures

A sample was selected from the target population to represent the characteristics of the wider group. Students was chosen through simple random sampling, which

provides all eligible learners with an equal possibility of being selected and improves the fairness of the selection process (Cohen et al., 2018). Mathematics teachers was selected through purposive sampling because their professional experience and involvement in mathematics instruction make them suitable sources of relevant information. Bloor andWood (2016) explain that purposive sampling is useful when participants are intentionally selected based on their knowledge and relevance to the research topic.

The required sample size was calculated based on Slovin's formula to ensure representativeness and account for a margin error of 0.05 ,where $\boldsymbol{n}$ stands for the sample size , $\boldsymbol{N}$ stands for the population size while $\boldsymbol{e}$ stands for the margin error (0.05) as follows : $\boldsymbol{n} = \frac{\boldsymbol{N}}{\boldsymbol{1+N(e)^2}}$ (Singh et al., 2011), then individuals were randomly selected. $n = \frac{400}{1+400(0.05)^2} = 125$

In addition, 3 mathematics teacher in lower secondary schools and six school administrators were purposively selected from the lower secondary schools under which the research was conducted.

3.7 Data Collection Methods

Data was collected using students' questionnaires, Semi-Structured interview and analysis of academic documents**.** The questionnaire was designed to gather information about students' understanding of mathematical language, their experiences with instructional language, and challenges encountered during mathematics learning. Structured questionnaires are effective in quantitative studies because they allow researchers to obtain comparable responses from many participants (Creswell & Creswell, 2023). Semi-Structured interview with mathematics teachers was used to gather information about language barriers experienced during mathematics learning.

Students' mathematics achievement data was obtained from examination results, academic records, or a mathematics achievement test. The use of existing academic documents provides objective information that can be used to evaluate students' performance. Bowen (2009) notes that document analysis enables researchers to obtain meaningful evidence from existing records.

3.8 Data Analysis Procedures

The collected data was analyzed using descriptive and inferential statistical methods. Descriptive statistics such as frequencies, percentages, averages, and standard deviations was applied to summarize students' responses regarding language comprehension and mathematics performance. Inferential analysis, including Pearson correlation and regression analysis, was conducted to establish the relationship between language comprehension and students' mathematics achievement.

Data analysis was performed using the Statistical Package for Social Sciences (SPSS), which supports accurate management and interpretation of quantitative educational data (Pallant, 2020). Results was presented through tables and interpreted according to the study objectives and reviewed literature.

3.9 Ethical Considerations

The study will follow accepted ethical principles in educational research. Approval was requested from relevant authorities and permission obtained from school administrators before conducting the research. Participants received clear information about the purpose of the study, and participation was based on voluntary consent. The confidentiality of participants' information was protected, and collected data will only be used for academic purposes (Creswell & Creswell, 2023).

3.10 Trustworthiness, Validity and Reliability of the Study

The quality of this quantitative study was ensured through validity and reliability procedures. Validity was established by developing research instruments based on the study objectives, theoretical framework, and existing literature. Experts in mathematics education and research methodology will review the instruments to ensure that the items are clear, relevant, and appropriate. A pilot study will also be conducted in a similar school setting to identify weaknesses in the instruments and make necessary improvements (Cohen et al., 2018).
Reliability was ensured by maintaining consistency during data collection and testing the internal consistency of the questionnaire using Cronbach's alpha coefficient. A reliability value of 0.70 or above was considered acceptable (Pallant, 2020). Clear instructions and standardized procedures was applied to all participants to enhance the dependability of the findings.

The study may face challenges such as students' difficulties in understanding questionnaire items, limited availability of participants, and possible bias in responses. These challenges was addressed by using simple and clear language, coordinating data collection with school schedules, and assuring participants of confidentiality and voluntary participation. Through these measures, the study will generate credible and reliable findings on the influence of language comprehension on students' mathematics performance.

4. Results and Discussion

This section presents, analyses, and discusses the findings of the study on the influence of language comprehension

on students' academic performance in mathematics at G.S Jean de la Mennais de Kirambo and G.S Rushara in Burera District, Rwanda**.** The findings are presented according to the research objectives, which focused on assessing students' language comprehension, examining the relationship between language comprehension and mathematics performance, and identifying language-related challenges affecting mathematics learning. Data were collected from 125 students and 3 mathematics teachers using questionnaires, interviews, and students' mathematics performance records.

The results are presented using descriptive and inferential statistics for quantitative data, while teachers' responses are analyzed thematically. The findings are discussed in relation to previous studies and theoretical perspectives to highlight areas of agreement and disagreement.

4.1 Response Rate and Characteristics of Participants

A total of 125 students and 3 mathematics teachers participated in the study. The student respondents represented learners from the selected schools, while teachers provided additional information regarding language challenges observed during mathematics instruction.

The participation rate was satisfactory, enabling the researcher to obtain sufficient information to address the study objectives. According to Creswell and Creswell (2023), an adequate response rate improves the credibility of research findings because it provides sufficient representation of the target population.

4.2 Extent of Students' Language Comprehension in Mathematics

The first objective was to assess the extent of language comprehension among students in mathematics learning. Students were asked about their ability to understand mathematical instructions, terminology, and word problems.

Table 1: Students' Perceptions of Language Comprehension in Mathematics

Statement	Mean	Standard Deviation
I understand instructions given in mathematics lessons	3.21	0.91
I understand mathematical vocabulary used by teachers	3.05	0.96
I can interpret mathematics word problems correctly	2.89	1.02
English language affects my understanding of mathematics	3.78	0.84

The findings indicate that although some students were able to follow mathematics lessons, many experienced difficulties understanding mathematical vocabulary and interpreting word problems. The highest mean score was recorded for the statement that English language affects mathematics understanding, suggesting that the language of instruction remains a major challenge.

These findings correspond with Planas et al. (2025), who argued that mathematics contains specialized language structures that may create barriers for learners. Similarly, Moschkovich (2015) found that students learning mathematics through a second language often struggle with mathematical communication and interpretation.

However, the findings differ from some studies conducted in multilingual settings where students received strong language support alongside mathematics instruction. For example, Hizli-Alkan et al. (2026) reported that effective teacher mediation and classroom discussion can reduce language barriers and improve mathematical understanding.

4.3 Relationship between Language Comprehension and Mathematics Performance

The second objective was to determine the relationship between students' language comprehension and their academic performance in mathematics.

Students' language comprehension scores were compared with their mathematics achievement results.

Table 2: Relationship between Language Comprehension and Mathematics Performance

Variables	Pearson Correlation (r)	Significance Level
Language comprehension and mathematics performance	0.624	$p < 0.001$

The results show a positive and statistically significant relationship between language comprehension and mathematics performance ($r = 0.624$, $p < 0.001$). This indicates that students with stronger comprehension of mathematical language tended to achieve higher mathematics scores. Regression analysis further indicated that language comprehension significantly predicted students' mathematics performance.

Table 3: Regression Analysis

Predictor	Beta Coefficient	Significance
Language comprehension	0.624	$p < 0.001$

The findings suggest that improvement in students' understanding of mathematical language may contribute to better achievement in mathematics.

These findings support Clayton (2024) linguistic interdependence theory, which explains that academic language proficiency influences learners' ability to access knowledge across subjects. The findings also agree with OECD (2023), which reported that reading and comprehension skills are strongly associated with mathematics achievement.

Nevertheless, some researchers argue that mathematics performance is influenced by multiple factors, including teaching approaches, motivation, resources, and prior knowledge. Therefore, language comprehension should be considered as one important factor among several contributors to mathematics achievement.

4.4 Language-Related Challenges Affecting Mathematics Performance

The third objective aimed to identify language-related challenges experienced by students and teachers during mathematics learning.
Teachers' interview responses revealed several major challenges:

Theme 1: Difficulty Understanding Mathematical Terminology

Most teachers reported that students frequently struggle with mathematical terms such as "evaluate," "simplify," "determine," and "justify." According to one teacher:
"Some students know the calculation procedure, but they fail because they do not understand what the question requires them to do."
This finding agrees with Doyumğaç et al.(2023), who emphasized that mathematical meaning is closely connected to language interpretation.

The finding that students struggle with mathematical terminology is supported by Hautaka Mātauranga Waikato et al. (2016) , who emphasized that mathematical language contains specialized meanings that may not be immediately accessible to learners. Similarly, Moschkovich (2015) noted that students learning mathematics through an additional language must simultaneously develop mathematical concepts and the language required to discuss those concepts. The agreement between these studies and the present finding indicates that difficulties with terminology are not unique to the participating schools but represent a broader challenge in multilingual mathematics classrooms.

However, this finding should be interpreted cautiously because unfamiliar terminology does not necessarily prevent students from learning mathematics when teachers provide adequate linguistic and representational support. Setati and Adler (2000) demonstrated that teachers in multilingual classrooms can support mathematical understanding by explaining terminology, encouraging discussion, connecting mathematical ideas to learners' everyday experiences, and using multiple representations. Thus, the present finding agrees with research identifying language as a potential barrier but also differs from evidence showing that effective instructional strategies can reduce the effect of that barrier.

Theme 2: Challenges in Solving Word Problems

Teachers indicated that many students experience difficulties when mathematics questions are presented in written form. Students may understand mathematical operations but fail to identify the required procedure because they misunderstand the problem statement.

This supports the findings of Planas et al. (2025), who reported that language barriers affect learners' ability to interpret and communicate mathematical reasoning.

The difficulty students experienced with mathematical word problems is strongly supported by King & Powell (2023), who found that academic English proficiency was positively associated with word-problem performance among emergent bilingual learners. Their findings suggest that linguistic demands embedded in word problems can affect students' ability to identify and apply appropriate mathematical procedures. The present study therefore extends previous evidence by showing that similar difficulties occur among learners in the Rwandan secondary-school context.

The finding is also consistent with Setati (2008), who emphasized the importance of language in interpreting and communicating mathematical reasoning. However, the current finding differs from approaches suggesting that linguistic difficulty can be reduced through the use of visual representations, contextual examples, collaborative discussion and other forms of mathematical representation. This difference indicates that students' performance on word problems may depend not only on their language proficiency but also on how the problems are presented and how teachers scaffold learners' interpretation of them.

Therefore, the evidence suggests that word-problem difficulty should not automatically be interpreted as evidence of weak mathematical ability. In some cases, students may understand the mathematical operation but fail to identify it because they have misunderstood the linguistic structure of the problem.

Theme 3: Limited Exposure to English Outside School

Teachers explained that many students mainly use Kinyarwanda at home, resulting in limited opportunities to practice English academic language. Consequently, students require more time to understand mathematics concepts delivered in English.

This finding is consistent with Bahati et al.(2024), who observed that English-medium instruction created challenges for some Rwandan learners due to limited language exposure.
The finding that limited exposure to English outside school contributes to students' difficulties is consistent with Sibomana (2014), who documented challenges associated with English-medium instruction in Rwanda. The finding is also supported by recent research on mathematics instruction in Rwanda, which reports that teachers can experience difficulties delivering mathematics content in English, particularly where adequate language support is not available.

Nevertheless, limited exposure to English should not be considered a sufficient explanation for low mathematics achievement in every case. Students may develop effective academic language through sustained classroom interaction, reading, peer collaboration and teacher scaffolding even when English is not commonly spoken at home. Research on multilingual mathematics classrooms has shown that strategic use of learners' linguistic resources and multiple representations can facilitate mathematical understanding. Therefore, the current finding agrees with research identifying limited language exposure as a challenge, but it also highlights the importance of classroom practices in determining whether that challenge becomes a substantial barrier to mathematics learning.

4.5 Discussion of Findings

4.5.1 Level of Students Language Understanding in Math

The first goal was to check how good students are at understanding language during math lessons. The results showed that even though many students could understand classroom instructions a large number had trouble understanding math words, English terms and solving word problems. Students said that English was still a problem for understanding math ideas.

These results show that doing well in math is not about being good with numbers but also about understanding the language used to explain math. Math lessons need students to understand words understand instructions and tell the difference between similar math expressions. When students have trouble with language they might not show their math skills even if they can do the math well.

The current results are in line with the Linguistic Interdependence Theory by Cummins (2000) which says that how well students do in school is influenced a lot by how good they're in the language used for teaching. According to the theory not being good enough in that language stops students from learning subjects that need a lot of understanding. The results back up (Hautaka Mātauranga Waikato et al. (2016) who said that math has special words that are different from everyday language. Students need to learn math words before they can understand ideas and solve problems. Latu (2004) also said that students who speak than one language often have trouble because math needs both language and symbols at the same time.

The results match with Sibomana (2014) who said that when Rwanda started using English for teaching many students had trouble taking part in class because they didn't know English. This study suggests that those problems still affect math learning in rural schools where English is not used much outside class.

Similar results have been found in parts of Africa. Setati (2003) found that African students who study math in English often misunderstood math words making it harder to solve complicated problems. Also Adler (2001) said that language problems often stop students from being involved in math thinking.

The current results are different from some places where students learn in two languages. Adler (2001) also found that when teachers mix the students home language with the language of teaching and give help to understand language students get better at math. The difference could be because of the place where they're as some schools have more support for teaching in two languages than schools in rural Rwanda. Also OECD (2023) said that countries with reading programs have less of a problem with language barriers affecting math scores because students learn to read well early. The difference suggests that if schools help with reading and math at the time the problems with language in this study could be less.

The apparent difference between the present study and multilingual classroom studies may be explained by differences in instructional context. In the schools investigated in the present study, students reported difficulties with English mathematical terminology and limited opportunities to use English outside the classroom. In contrast, classrooms where teachers deliberately use code-switching, discussion, visual representations, and learners' existing linguistic resources may reduce the

linguistic burden associated with mathematics learning. The difference therefore suggests that the effect of language comprehension is influenced not only by students' language proficiency but also by how teachers respond to linguistic diversity during mathematics instruction.

Overall the results show that understanding language is a must for learning math. Improving how students understand math words is likely to help them understand math better and do better in school.

4.5.2 Link between Language Understanding and Math Scores

The second goal looked at the link between how good students are at understanding language and their math scores. The numbers showed an clear link between the two ($r = 0.624$ $p < .001$) meaning that students who understand language better usually get higher scores in math. A test also showed that how good students are at understanding language can predict their math success. The link means that students who understand instructions, words and problems in math can use math ideas better during class and tests. Understanding language helps students find the parts of a question choose the right way to solve it and explain their thinking clearly.

These results back up Hautaka Mātauranga Waikato et al. (2016) who said that being good at understanding language helps students learn in all school subjects. Math needs students to understand written information before they do the math. So not understanding language stops students from showing their math skills. The results also match with OECD (2023) PISA study, which said that reading and math scores are connected in countries. Students who read better usually do better because they can understand math problems and find the way to solve them.

The results also agree with Pöhler et al. (2021) who said that students taught in a language they don't understand often get lower grades because tests check both language and math understanding. Also Uwizeyimana (2020) saw that language problems made students do worse in science subjects taught in English in Rwanda. The current results also explain Cognitive Load Theory (Sweller, 1988). When students have trouble with the language part of their brain is used to understand words of thinking about math. This makes it harder for them to learn.

The results are different from some studies that say language is just one of many things that affect math success. Charalampous & Darra (2025) said that things like teachers, feedback, classroom mood, past performance and good teaching often have more effect on grades than language skills alone. Also Corrêa and Haslam (2020) said that being able to understand math ideas do the steps think in ways and have a good attitude together decide math success.

The different findings don't mean the current results are wrong. Instead they show that language understanding is one of things that help with math. In places like Rwanda where English is used for both teaching and tests language skills might be more important. Overall the results suggest that helping students understand the language used in school can help them do better in math while also making teaching giving better resources and making students more excited to learn.

4.5.3 Language Problems Affecting Math Learning

The third goal was to find the language problems that stop students from learning math. Teachers said that students had trouble with math words, understanding word problems and learning in English because they don't use English much outside school.

The results show that math learning is more than doing the math. Students need to understand the words before they can choose the math steps. Not knowing words like evaluate justify, simplify or determine often means they get the answer wrong even if they know how to do the math.

These results match with Patkin (2011) who said that math ideas and language are connected. According to Kwok & Kwan (2025) if students don't understand the words they might use the way to solve a problem even if they know the math idea.
The results also back up Setati (2003) who found that students learning math in a language had trouble with word problems and explaining their thinking. Also Moschkovich (2015) said that multilingual students need to talk about math ideas in a way that builds both understanding and language. The results are also like Sibomana (2014) who said that not knowing English well still affects class interaction and grades in Rwanda after English was made the language of teaching. Also the Rwanda Education Board (2022) has said that students have trouble with test questions, which affects their math grades.

The current results are different from studies in schools that have good language support. Bahasa et al. (2024) showed that in classrooms where teachers mix home language, group work, pictures and clear math talks students take part more and understand better. In those places language problems were less because teachers worked on both math and language at the time.

Another different view comes from Clarke & Roche (1989) who said that using pictures, hands-on tools and questions can help students learn math without depending much on language. Even though language is important good teaching tools can help students build math knowledge even if their language is not strong yet. The differences between the results and these studies may be because of the places where the schools are. Students in areas don't get to use English much outside class and teachers may not have the tools to help with teaching in two languages or with more language support.

Together these results show that fixing language problems needs work from math teachers, English teachers, school leaders, curriculum makers and decision makers. Making math words encouraging conversation, in class making students read more and adding language support to math lessons can help improve both language and math grades.

The difference may be related to the extent to which teachers deliberately incorporate learners' existing linguistic resources into mathematics instruction. Where teachers rely almost exclusively on English without providing sufficient explanation, repetition, discussion, or opportunities for students to relate unfamiliar terminology to familiar concepts, language may become an additional barrier to mathematical understanding. Conversely, when teachers use appropriate code-switching, visual representations, peer discussion, examples from learners' experiences, and explicit teaching of mathematical vocabulary, students may be better able to bridge the linguistic gap. Therefore, the present findings should not be interpreted as evidence that English as a language of instruction inherently prevents mathematics learning; rather, they suggest that insufficient language support can make mathematics learning more difficult for students whose proficiency in the instructional language is limited.

5. Conclusion and Recommendation

5.1 Conclusion

Many students had trouble understanding math words following instructions in English and solving word problems even though they could do math. Some students could follow math lessons fine but a lot of them had trouble understanding the language used in class and on tests. This means that to learn math well students need to be good at numbers and logic and they also need to understand the language used to teach math. So understanding language is the foundation for getting into math ideas and solving problems.

The results also showed that there is a connection between understanding language and how well students do in mathematics. Students who were better at understanding language did better in math than students who were not as good at it. This shows that being able to understand math terms, classroom instructions and word problems helps students find the information use the right strategies to solve problems and explain their math thinking. While other things like teaching methods learning materials how motivated students are and what they already know also affect how well they do in math the results show that understanding language is one of the important things for doing well in school especially in places where students speak many languages and English is the language used in class.

The study also found some language problems that make it hard for students to learn math. Teachers said that students often had trouble understanding math terms reading test questions and explaining math ideas in English. Students also did not get to use English outside of class which made it harder for them to develop the language skills they need to learn math. These problems make it hard for students because they have to understand the language and do math at the time, which makes learning more complicated. So language problems can prevent students from showing how good they are at math even if they really understand the concepts.

Overall the results show that it is very important to help students understand language better so they can do better in math at G.S. Jean de la Mennais de Kirambo and G.S. Rushara. Learning math should not just be about getting good at calculations but about developing the language needed to understand interpret and talk about math ideas. So schools should make sure students get better at using language and this should be a part of math class. Teachers, school administrators, parents and policymakers should work together to create a learning environment where language development and math learning go hand in hand. By helping students with language, in math class getting them to read more and giving them chances to use English in meaningful ways schools can help students understand math better and do better in school overall.

5.2 Recommendations

Based on the findings and conclusions of the study, the following recommendations are proposed.

5.2.1 Recommendations for Mathematics Teachers and English Language Teachers

- ✓ Mathematics teachers should intentionally integrate language-support strategies into everyday instruction.
- ✓ Teachers should encourage classroom discussions, provide opportunities for students to explain mathematical reasoning, and employ visual representations, practical activities, and contextual examples to strengthen conceptual understanding.
- ✓ English teachers should collaborate with mathematics teachers to strengthen students' academic vocabulary related to mathematics.
- ✓ Greater emphasis should be placed on developing learners' academic reading, writing, listening, and speaking skills required across school subjects.

5.2.2 Recommendations for School Administrators

- ✓ School leaders should organize continuous professional development programmes that equip teachers with effective strategies for integrating language development into mathematics instruction.

- ✓ Schools should establish reading clubs, English-speaking activities, debate programmes, and mathematics discussion groups that encourage students to practice academic English beyond ordinary classroom lessons

5.2.3 Recommendations for the Rwanda Education Board and Policy Makers

- ✓ The Rwanda Education Board should continue supporting curriculum implementation by providing instructional materials that simplify mathematical language while maintaining conceptual accuracy.
- ✓ Teacher training programmes should include practical approaches for teaching mathematics in multilingual classrooms.

5.2.4 Recommendations for Further Research

Although the present study contributes valuable evidence regarding the influence of language comprehension on mathematics achievement, several areas require additional investigation.

Future researchers are encouraged to:

- ✓ Conduct similar studies in other districts of Rwanda to determine whether the findings are consistent across different educational contexts.
- ✓ Investigate the effectiveness of specific language-support interventions, such as bilingual instruction, mathematical vocabulary programmes, and reading comprehension strategies, on improving mathematics achievement.
- ✓ Examine the influence of teachers' English language proficiency on classroom instruction and students' mathematics performance.

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