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From Perception to Error: A Study of Ghanaian Learners' Errors in Solving Algebra Tasks

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Abstract

The nature of algebraic word problems can make such tasks daunting for learners, and this can be further exacerbated by factors including their perceptions. This study explored Ghanaian Junior High School learners' perceptions of algebraic word problems, how these perceptions are reflected in their errors, and the factors influencing these perceptions and errors. A sequential explanatory mixed-method design was employed to collect data from 200 learners using a test, followed by semi-structured interviews with six learners: three high performers and three low performers. Stratified random sampling was used to recruit learners for the survey, while purposive sampling was applied in selecting learners for the interview. Data were analyzed using descriptive statistics and thematic analysis. The study found that many learners perceived algebraic word problems as "difficult," "confusing," or "tricky," which lowered their confidence and willingness to engage with such tasks. These negative perceptions were closely linked to high rates of comprehension errors (misinterpreting unknowns, 77.5%), transformation errors (reversing subtraction order, 60.5%), and process skill errors (ignoring negative signs, 73.5%). Influential factors included inadequate individualized support from teachers, limited practice, unavailability of textbooks, and large class sizes. It is suggested that mathematics teachers use small-group learning to provide targeted attention and integrate algebraic word problems into daily lessons and assessments. Heads of schools should liaise with Parent-Associations (PAs) to provide adequate textbooks for learners and split classes into streams to reduce overcrowding.

1. Introduction

1.1 Focus of the Study

Educational systems around the globe have consciously integrated Mathematics into their school curriculum as a tool to help learners become functional members of the society. In the view of Win and Win (2022), an individual's ability to be functional and meet the challenging demands of the our ever-evolving world is hinged on their mathematical proficiency. The study of mathematics serves as the catalyst for technological advancement, educational research and the economic growth of societies, as opined by Arthur et al. (2017). It is therefore not a surprise that due to the usefulness of the subject, it has become a mandatory subject at almost every stage of Ghana's educational system, where a credit pass is a prerequisite for gaining admission into any reputable tertiary institution in the country. However, it is disheartening to note that learners' interest and performance in the subject have been a global issue, causing many concerns among stakeholders of education. Ampadu and Anokye-Poku (2022) reported of high disinterest among learners towards the study of mathematics. This, they believe is the cause of learners' mass failure in the subject on various assessments such as the National Education Assessment (NEA) and Trends in International Mathematics and Science Study (TIMSS).

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One topic in Mathematics that could help explain the impaired performance in the subject is algebra. Algebra focuses on finding, generalizing and interpreting patterns and relationship (Korkor, 2022). Algebra tasks comes in two forms based on contexts: numerical and words. Algebraic tasks presented using words and numbers become word problems (Powell et al., 2022). Tasks presented in word problems involves translating from the language expressions to equations before deriving the final answers (Zong & Krishnamachari, 2023). They require learners to manipulate variables and symbols to get an equation or expression before finalizing the answer (Namkung & Bricko, 2021). Soneira et al. (2023) contend that learners cannot approach such tasks without pre-calculated steps. They must first learn to decode the relationships in the problems and present them as a mathematical set of relationships. They must also learn to assign letters to unknown quantities and form appropriate equations.

The skills learners develop in resolving these algebraic word problems empowers them in mathematics. Korkor (2022) contends that through algebraic word problems, learners develop critical thinking minds and find solutions to everyday life problems. The knowledge of solving algebraic word problems helps the learners to relate mathematics to real-life scenarios, understand relationships, improve their mathematical literacy and develop analytical problem-solving skills (Kenney & Ntow, 2024). For these reasons, Kenney and Ntow (2024) believe the performance of learners in mathematics could be improved if they are taught to gain a solid foundational knowledge of algebraic concepts. The Ghanaian Ministry of Education (2020) has emphasized that the inclusion of word problems in the new mathematics curriculum aims at promoting mathematical innovation, creativity, critical thinking, and problem-solving skills among learners.

Unfortunately, the mere sight of algebraic word problems causes trepidation, rigidities and intense difficulty among learners (Baidoo & Ali, 2023; McDonald & Smith, 2020). They perceived it as one of the most difficult topics in Mathematics (Verschaffel, et al., 2020). In Ghana, Kenney and Ntow (2024) found that Ghanaian learners get paralyzed when it comes to solving word problems in algebra. They exhibited comprehension inefficiencies, miscalculations, arithmetic flaws, over-reliance on memorization, and misinterpreting of problem statements. Baidoo and Ali (2023) similarly reported of how Ghanian learners struggle translating word problems to both mathematical and real-life contexts. The challenge was even more pronounced for female learners. Korkor (2022) also shared a research finding in which Ghanaian learners demonstrated an inability to translate and solve algebraic word problems due to a lack of understanding of the concept of word problem. The case is even worse at the Senior High School (SHS) level in Ghana. A study by Braimah (2020) found that Ghanaian SHS learners' performance in algebraic word problems were seriously marred by deficiencies in understanding the problem statement, misinterpretation of the problem, computational errors, and disuse of appropriate mathematical knowledge of algebra. A recent report by the Chief Examiner (West African Senior School Certificate Examination (WASSCE 2017, 2018, 2019 and 2020) indicated that most of the candidates were not able to translate word problems into mathematical statements not to talks of using these mathematical symbols to solve the given problems.

Effutu Municipality, as the study context offers a unique perspective for the study. The municipality is found in the Central Region of Ghana, where the majority of the populace (31.4%) are engaged in trading and fishing. This creates challenges for learners and teachers in balancing school life with the benefits derived from fishing activities. Despite this, the municipality boasts a rich educational environment and holds a comparative advantage over several other areas in the Central Region. It is home to the prestigious University of Education, Winneba, which provides frequent mentorship activities for teachers and hosts a variety of workshops for both teachers and learners. However, reports on learners' performance in algebra have consistently been poor, as found by Baidoo and Ali (2023) and Mills and Mereku (2016).

Though studies have examined learners' errors in solving algebraic word problems (Kenney & Ntow, 2024; Aforklenu & Bukari, 2023; Korkor, 2022; Braimah, 2020), an interesting observation made about these studies was that none of these studies considered learners in Effutu. For instance, Kenney and Ntow's study was done in Assin Central Municipality, Aforklenu and Bukari, in Tema Metropolis, Korkor, in Asutifi North District and Braimah, in Kwaebibirem Municipality. Again, none of these studies explored pupils' perceptions of such tasks and how that manifested in their written responses learners. Examining learners' perception of algebraic tasks is necessary because positive perceptions enhance self-efficacy and this could translate into enhanced performance (Karjanto & Acelajado, 2022). It is for these reasons that this current study aimed to explore the perceptions that Ghanaian junior high school (JHS) learners have about algebraic word problems and how this reflected in the errors they make while solving such tasks.

They study equally delved into the factors that influence their perceptions and errors in solving algebraic word problems. The findings of this study would provide valuable insights into the underlying reasons for common algebraic errors among JHS learners, offering a better understanding of how perceptions shape their problem-solving strategies. This could also help inform teaching practices and interventions aimed at improving learners understanding and performance in algebra. Specifically, the study sought answers to the following research questions:

1. How do JHS learners perceive algebraic word problems?
2. How do JHS learners' perceptions reflect their errors in solving algebraic word problems?
3. What factors influence JHS learners' perceptions and errors in solving algebraic word problems?

1.2 Theoretical framework

The study adopted the error analysis model of Newmann (1977) and the constructivist learning theory by Piaget and Vygotsky (1978). Based on research question two, this study analyzed and categorized learners' errors based on Newmann's theory, which classifies the types of learners' mathematical errors into reading error, comprehension error, transformation error, process skill error, and encoding error (Siskawati, 2021). Abakah and Brijlall (2022) describe Newman's model as structured into five distinct stages, each delineating specific requirements. Stage 1 involves reading errors, where learners are expected to accurately interpret sentences and mathematical symbols within given questions. Stage 2, comprehension errors, focuses on learners' ability to fully understand the questions presented. In Stage 3, transformation errors occur when learners struggle to select appropriate mathematical methods relevant to solving the given problems. Stage 4, process skill errors, requires learners to execute mathematical procedures correctly. Lastly, Stage 5, encoding errors, challenges learners to justify their proposed solutions based on their conjectures.

Similarly, to address research question one and three, the constructivist theory was used. The theory posits that learners actively construct knowledge based on prior experiences and their interpretation of new information. Atteh (2022) explains that in using this approach, learners try to integrate new information with their existing knowledge instead of them passively receiving such information, and this personalizes their understanding. In mathematics education, this approach emphasizes the importance of engaging learners in problem-solving and critical thinking activities that connect to their prior knowledge and real-life experience (Gyan et al., 2023). In the context of this study, learners' perceptions of algebraic word problems are shaped by their interactions with mathematical concepts, teaching methods, language used in problems, cultural contexts and real-life applications. These constructed perceptions influence how they approach and attempt to solve problems, potentially leading to either correct strategies or persistent errors.

Together these two theories helped to explain learners' perceptions of algebraic word problems, its reflection in their errors and what factors play roles in both their perception and errors.

2. Methods

This study used a sequential explanatory design. This design is one of the designs under the mixed-methods approach, guided by the pragmatist paradigm. According to Creswell and Clark (2018), the sequential explanatory mixed methods design allows researchers to use the quantitative findings to guide the qualitative exploration. The design helped to examine errors in algebraic word problem-solving at one phase and delve deeper into the numerical figures at another phase. In using this design, the study first gathered quantitative data from 200 learners using a survey to identify common errors. Proportionate stratified sampling was used at this stage to select learners from schools in three different circuits: Winneba East, West, and Central. The choice of the study area and the participants was informed by the findings of an earlier study by Baidoo and Ali (2023) which indicated that most junior high school learners in the study area struggle with algebraic word problems. Once the survey results were analysed, the sample size was deliberately reduced from 200 to 6 learners for the qualitative phase. This reduction was purposeful: learners were first classified into performance categories based on their test scores, with low performers scoring between 0 and 5 and high performers scoring between 10 and 15. Using purposive sampling, three learners were then selected from each category, resulting in a total of six interviewees. This selection ensured that the qualitative data would capture perspectives from both ends of the performance spectrum, allowing for a deeper understanding of the causes of the identified errors.

In sourcing for these errors and the contributory factors, two instruments were used: a teacher-made achievement test and a semi-structured interview. The test, which lasted 20 minutes, included ten questions based on the 2020 NaCCA mathematics curriculum and a GES-approved textbook authored by Asiedu (2017). The interviews focused on three areas: perceived difficulty, familiarity with word problems, and contributing factors. To ensure validity and reliability, the test was reviewed by two mathematics lecturers and pre-tested in one school. The overall reliability was found to be 0.82, which proved that the instrument was reliable and good to be used in the actual study (Ekbatan et al., 2019). For the interviews, credibility was ensured by quoting participants directly, dependability through audio recordings, and confirmability by maintaining clear documentation. The study also considered transferability, acknowledging its context-specific nature (Nieuwenhuis, 2016). The entire data collection was done in collaboration with the learners' mathematics teachers and treated as an exam preparatory test prior to their end of term examinations. Afterward, the researcher interviewed selected learners at their school, following ethical procedures of consent, permission, confidentiality, and anonymity. Thematic analysis was used for the interview responses while content analysis was conducted on their written responses based on Newman Error Analysis (NEA) model.

3. Results & Discussions

3.1 Result

Research Question 1: How do JHS learners perceive algebraic word problems?

The first question aimed to explore the perceptions that junior high school learners have about the nature and solving of algebra tasks presented in word problem forms. Generally, majority (5 of 6) of the learners found such tasks to be cognitive demanding and engaging. They expressed confusion about the cognitive processes involved. Here are some excerpts from the interview.

Interviewer: How did you find the algebraic word problems that you worked on?

A learner cried out:

> *"Me dier (for me), I am not sure I can score just 4 questions mpo. It is not cheap koraa (at all)" (S4, Female, 15 years).*

Another learner lamented:

> *"Hmm, it is very difficult oo. Anyone I try biaa, I get confused and I say let me go to the next one" (S6, Male, 20 years).*

In the view of another learner:

> *"Me, I understand most of the questions, but some of them can trick you. But they are nice" (S2, Female, 12 years).*

These responses suggest that while some learners find algebraic word problems intriguing, many perceive them as challenging due to their complexity and tricky nature.

Research Question 2: How do JHS learners' perceptions reflect their errors in solving algebraic word problems?

To ascertain the manifestation of learners' perceptions of algebraic word problems in their errors in solving such task, the researcher examined some of the common errors found in their written responses and how that reflected in their verbal responses. The errors were analyzed based on the five stages of Newman's error analysis: *reading, comprehension, transformation, process skills* and *encoding*. In grouping the errors made by the learners, the researcher used the indicators provided by Newman as a basis for judging the specific type of error committed by the learner. In doing this, *Reading errors* occur when learners misinterpret or misunderstand the problem's requirements. *Comprehension errors* happen when learners fail to grasp essential algebraic concepts. *Transformation errors* arise when learners select incorrect formulas or operations for solving the word problems. *Process skills* errors involve learners knowing the

steps but making mistakes in the solving process. *Encoding errors* occur when learners solve the problem correctly but write down the wrong answer. The results are presented using frequency and percentages in Table 1.

Table 1. Newman's Categorization of Learners Errors

Types of Error		Specific Error	Error Status (Total number of learners= 200)	
			Frequency	Percentage
Comprehension error	1	Interpretating unknowns as constants and vice versa	155	77.5
	2	Interpretating multiplication as exponents and vice versa	137	68.5
	3	Inability to differentiate between inequality signs (> or <)	137	68.5
	4	Misinterpreting sharing as subtraction and vice versa	154	77.0
	5	Directly translating the word problem using the sentence order of the problem	29	14.5
	6	Misinterpretation of phrases in the word problem.	112	56.0
Encoding errors	1	Summing up constants and variables as a single answer	97	43.5
Process skills errors	1	Inability to apply PEDMAS/BODMAS rules	138	69.5
	2	Wrong calculations of final answers	125	62.5
	3	Ignoring negative signs when finding differences between numbers	147	73.5
Transformation errors	1	Reversing the order of subtraction sentences	121	60.5
	2	Getting correct answers without forming expression/equations	125	62.5
	3	Interpreting expression/equations as inequalities and vice versa	111	55.5

Source: Field work (2023)

The results in Table 1 shows that among the errors identified, comprehension errors are the most frequent. In this category of errors, learners frequently misinterpret key algebraic concepts, such as treating unknowns as constants (77.5%) or confusing multiplication with exponents (68.5%). Many also struggle to differentiate between inequality signs (68.5%) or misinterpret sharing as subtraction (77.0%). Some learners directly translate word problems by following sentence order (14.5%) without properly analyzing the mathematical relationships, while others misunderstand specific phrases in the problem (56.0%). The next common types of errors were transformation and process skills errors. In terms of process skills errors, learners face challenges applying the correct order of operations (69.5%), made mistakes in final calculations (62.5%), ignored negative signs when subtracting (73.5%). Transformation errors featured in instances where learners reversed the order of subtraction sentences (60.5%), failed to form proper expressions or equations (62.5%) or misinterpreted expressions as inequalities (55.5%). The least of these errors was encoding errors where learners summed up constants and variables as a single answer (43.5%).

Synchronising the findings from Research Questions 1 and 2, it is evident that the complexity and challenging nature of algebraic word problems, as perceived by the learners, directly influence the frequency and types of errors they commit. Many learners described algebraic word problems as "difficult," "confusing," or "tricky," reflecting a perception that aligns closely with the comprehension, transformation,

and process skills errors identified. For example, their struggle to interpret unknowns correctly (77.5%), confusion between multiplication and exponents (68.5%), and misinterpretation of inequality signs (68.5%) suggest that the complexity they perceive often stems from misunderstanding fundamental concepts. Comments such as "I get confused" or "it is very difficult" illustrate how this perceived difficulty leads to misinterpretation of problem structures, such as treating unknowns as constants or following the order of sentences without analysing the relationships (14.5%). Similarly, the transformation errors like reversing subtraction order (60.5%) or misinterpreting expressions as inequalities (55.5%) are consistent with learners' claims that the questions are "tricky" or "can trick you if you are not careful." These perceptions appear to cause them to overlook important details, leading to structural misrepresentation of problems. Process skills errors, such as ignoring negative signs (73.5%), applying operations incorrectly (69.5%), or making calculation mistakes, often stem from a lack of confidence and uncertainty, as indicated by remarks like "I am not sure I can score just 4 questions." Even those who found the problems "nice but tricky" still showed signs of misapplication of algebraic rules, suggesting that their perceptions of difficulty and trickiness not only influence but also reinforce their error patterns.

Research Question 3: What factors influence JHS learners' perceptions and errors in solving algebraic word problems?

The last research question explored the factors influencing learners' errors in solving algebraic word problems. Learners were asked to share their views on what accounted for the challenges they faced in solving the questions that resulted in the errors identified. Responses revealed that learners blamed themselves, their teachers, parents, and classroom conditions for their difficulties with algebraic word problems. These factors served as the themes for the discussion of the interview results, as follows.

1. Learner Factor

From the responses provided, learners' challenges were linked to their inability to translate word problems into mathematical forms, difficulty understanding some vocabulary, making careless mistakes, perceiving questions as tricky, needing more time to think, and using problem-solving approaches different from those emphasized by their teachers. Below is a conversation that transpired on this theme:
Interviewer: Why were you having difficulties when solving the task given?

A learner shared:

> *"When I solve maths now and today I understand, I can do it. But if no one is here to work with me, I cannot do it again" (S1, Male, 18 years).*

Another learner added:

> *"I understand the words, but the style I will use to get the formula dierr, hmmm!" (S3, Female, 17 years).*

Lastly, one other learner revealed:

> *"I does [do] not understand some of the words like 'de-crease' [decrease], 'multiply by,' 'apples,' 'expression,' 'solve'" (S6, Male, 20 years).*

The responses indicate that learners face difficulties in solving algebraic word problems due to issues with translating word problems into mathematical forms, understanding specific vocabulary, making careless mistakes, and using problem-solving methods that differ from what is taught in class.

2. Teacher factor

While acknowledging their own struggles, learners also attributed some of their difficulties to their teachers. They blamed teachers for a lack of individualized support during lessons, insufficient tasks and practice on word problems, reliance on instructional approaches that do not meet their learning needs, and an overall lack of emphasis on word problems in teaching. Below is an excerpt of the conversation that took place on this theme.

Interviewer: Why were you having difficulties when solving the task given?

One learner remarked:

> *"Our teachers too, when they teach and you ask them questions, they don't mind you" (S2, Female, 12 years).*

Another learner had this to say:

> *"We solve only one or two in class, and our teacher says, 'when you go home, go and solve more'" (S4, Female, 15 years).*

A third learner shared:

> *"Our teacher have [has] not teach [taught] us. Maybe they will teach us, we are in first term so maybe in second term" (S5, Male, 13 years).*

The insight gained from the responses was that the junior high school learners expressed that their teachers' lack of individualized support, insufficient practice on word problems, and reliance on instructional methods that did not align with the learners' own learning needs contributed to their difficulties in solving algebraic word problems.

3. School-Related Factors

The third factor identified was related to the school environment, including the unavailability of learners' textbooks, the nature of assessments, and the time allocated for mathematics lessons. Additionally, one of the interviewees mentioned how large class sizes hinder their ability to learn algebraic word problems effectively. Below is an excerpt from the interview.

Interviewer: Why were you having difficulties when solving the task given?

One of the learners replied:

> *"Our class is many, so if you don't understand anything, you will not ask" (S1, Male, 18 years).*

A second learner said:

> *"Sometimes, our teacher go very fast because we are many, and we don't even get time to ask questions" (S2, Female, 12 years).*

Another learner added up:

> *"In exams, I see some questions I don't understand, but in class, I don't ask because I feel shy" (S4, Female, 15 years).*

The general concern here was that the junior high school learners blamed large class sizes, limited time for mathematics lessons, and lack of textbooks as hindering their ability to learn algebraic word problems, with many feeling too shy to ask questions in class.

4. Other-Related Factors

Other factors affecting learners' ability to solve algebraic word problems were linked to parents and textbook publishers. Some learners revealed that their parents had not purchased the necessary mathematics textbooks for their studies at home. Additionally, some textbooks lacked sufficient word problem exercises, making it difficult for learners to practice adequately. Below is an excerpt from the interview.

Interviewer: Why were you having difficulties when solving the task given?

A learner responded:

> *"Our teachers told us to go and learn the rest, but I don't have any textbook" (S6, Male, 20 years).*

Another learner revealed:

> *"The questions I solve in the textbook are not like this. They are simple" (S3, Female, 17 years).*

A third learner complained:

"My father said he will buy the book later, but up till now, I don't have it" (S5, Male, 13 years).

These responses suggest that these learners attributed their difficulties in solving algebraic word problems to the lack of access to textbooks, with some unable to study independently due to the unavailability of learning resources.

3.2 Discussion

This study has raised critical issues with regards to the perceptions and errors of Ghanaian junior high school learners when solving algebraic word problems in mathematics. These key issues were; First, Ghanaian junior high school learners perceive algebraic word problems as challenging. The findings from this study show that many Ghanaian Junior High School learners perceive algebraic word problems as particularly challenging. Learners described such problems as cognitively demanding and confusing, especially when they had to interpret the question and decide what steps to take. This perception is not surprising, as similar difficulties have been documented in previous studies. For instance, Khanal (2018) observed that learners consistently find algebraic word problems difficult, often due to the mental effort required to translate real-life situations into mathematical expressions. Baidoo and Ali (2023) also highlighted that learners in Ghana, especially those at the Junior High School level, struggle significantly with algebraic word problems. According to their findings, the problem lies not only in computation but also in a lack of conceptual understanding, particularly when word problems are presented in real-life contexts that learners cannot easily relate to. This issue was further echoed in the work of Julius et al. (2018), who emphasized how such challenges are widespread and rooted in how learners are introduced to algebraic thinking. The seems to suggest that learners in the Effutu Municipality may be learning algebra more as a set of procedures rather than as a tool for reasoning and problem-solving. This shallow engagement may explain the high frequency of errors made in their work, as noted by Sarimanoğlu (2019), who reported that learners often commit errors when trying to make sense of difficult algebraic tasks. If learners are merely memorizing steps without understanding the concepts behind them, they are more likely to become confused when presented with word problems that deviate from familiar patterns. It is therefore suggested for Mathematics teachers in Effutu to prioritize using teaching approaches that go beyond rote learning. Teachers should focus on developing learners' conceptual understanding by using familiar, real-life contexts and encouraging classroom discussions that help learners explain their reasoning.

Secondly, the perceptions of JHS learners about algebraic word problems reflect directly on the errors they make when solving them. The findings indicated that their difficulty in understanding algebraic word problems led to comprehension and process errors, and their confusion contributed to incorrect transformations of algebraic expressions. The findings resonate with previous studies. or instance, the difficulties that learners face in understanding algebraic word problems align with the findings of Baidoo and Ali (2023), who noted that Ghanaian learners often experience challenges when translating word problems into mathematical expressions. Similarly, the confusion around algebraic concepts like treating unknowns as constants and confusing multiplication with exponents is supported by Verschaffel et al. (2020), who argue that learners' perceptions of algebra as difficult often lead to errors in basic concept recognition. The transformation errors identified, such as reversing subtraction sentences and misinterpreting expressions as inequalities, reflect the findings of Kenney and Ntow (2024), who found that comprehension inefficiencies, such as misinterpretation of problem structures, are widespread among learners. Additionally, the errors related to the order of operations and calculation mistakes echo the work of Korkor (2022), who emphasized that the lack of solid algebraic knowledge impedes learners' ability to solve problems accurately. Similarly, the uncertainty and lack of confidence expressed by the learners are consistent with the conclusions of Soneira et al. (2023), who argued that learners must first decode the relationships in algebraic word problems before attempting solutions. The study highlights the importance of addressing learners' negative perceptions to improve their problem-solving abilities in algebra, as also noted by McDonald and Smith (2020), who stress the need for effective instruction to mitigate the challenges learners face.

Lastly, junior high school learners' perceptions and errors in solving algebraic word problems are shaped by interconnected factors involving learners, teachers, and the school environment. Learners face challenges such as difficulty translating word problems into mathematical forms, limited understanding of vocabulary, careless mistakes, perceiving questions as tricky, needing more time to think, and using

problem-solving approaches different from those taught. Teachers influence performance through the level of individualized support provided, the adequacy of practice on word problems, the choice of instructional strategies, and the emphasis placed on word problems during lessons. The school environment further contributes to these difficulties through the unavailability of textbooks, the nature of assessments, limited time allocated for mathematics lessons, and large class sizes, all of which restrict opportunities for learners to develop accuracy and confidence in solving algebraic word problems. These findings align with research by Jung (2015), Ibrahim et al. (2020), and Kolovou (2020), who identified similar difficulties, as well as Kaur and Leong (2021), who noted that learners often need more time to process problems and tend to use different methods than those taught by their teachers. Teachers were also seen as contributing to these challenges, with learners blaming them for not providing enough individualized support, insufficient practice on word problems, and using instructional approaches that don't meet learners' needs. This aligns with Ibrahim and Yaw (2019), Li and Schoenfeld (2019), and Barbieri et al. (2020), who found that a lack of sufficient problem-solving instruction and teachers' limited content knowledge hinder learners' understanding of algebraic word problems. Another significant factor is the school environment, particularly large class sizes, lack of textbooks, and inadequate time for mathematics lessons. These findings support Sa'ad, Adamu and Sadiq (2014) who noted that large classes limit learner engagement and access to personalized support. They also highlighted how overcrowded classrooms reduce individual attention, affecting learners' confidence in learning. Parental involvement and textbook quality were also identified as contributing factors. Some learners did not have necessary textbooks at home, and textbooks often lacked sufficient word problem exercises. These issues are consistent with studies by Barbieri et al. (2020) and Van Den Ham and Heinze (2018), who found that inadequate learning materials and lack of parental support can hinder learners' learning. To address these challenges, it is recommended that mathematics teachers in Effutu and beyond provide more individualized support and focus more on word problems in their teaching. Parents should also support their children's learning at home, and the Effutu Municipality should consider addressing the issue of large class sizes. Finally, it is suggested that textbook publishers dedicate sections to word problems for each topic to better support learners.

4. Conclusion

Regarding the first research question on how JHS learners perceive algebraic word problems, the study found that many learners view them as overly complex or "tricky." Such perceptions can reduce motivation and willingness to attempt these problems, which over time limits learners' problem-solving experience and deepens their difficulties. To address this, Mathematics teachers should deliberately increase learners' exposure to algebraic word problems, starting with simpler, relatable examples before progressing to more complex ones, while celebrating correct attempts to build learners' confidence.

For the second research question on how these perceptions reflect learners' errors, the findings revealed that negative views of algebraic word problems as "difficult," "confusing," or "tricky" were closely linked to high rates of comprehension errors (e.g., misinterpreting unknowns, 77.5%; misreading inequality signs, 68.5%), transformation errors (e.g., reversing subtraction order, 60.5%; misinterpreting expressions, 55.5%), and process skill errors (e.g., ignoring negative signs, 73.5%; incorrect operations, 69.5%). Interview comments such as "I get confused" and "it can trick you" showed that these perceptions not only mirror but also reinforce the error patterns. To help address this, Mathematics teachers should supplement daily lessons with error analysis activities where learners explain and correct common mistakes.

Concerning the third research question on factors influencing these perceptions and errors, the results indicated that they are not solely the result of learners' cognitive challenges but are also shaped by teachers' failure to provide individualized support and inadequate practice of word problems. School environmental conditions, such as the unavailability of textbooks and large class sizes, were also influential. Mathematics teachers should integrate algebraic word problems into daily lessons and assessments and adopt small-group or peer tutoring approaches to ensure learners receive targeted assistance, even in large classes. Heads of schools should collaborate with Parent-Associations (PAs) and Non-Governmental Organizations (NGOs) to secure adequate textbooks for learners and adjust class groupings into streams to address overcrowding.

A major limitation of the study is the use of only learners in basic eight from randomly sampled schools in Effutu. Hence, it would be more comprehensive if future studies consider using all the junior high school learners in the municipality.

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