Faculty of Natural and Applied Sciences Journal of Mathematics and Science Education
Print ISSN: 2814-0885 e-ISSN: 2814-0931
www.fnasjournals.com
Volume 3; Issue 2; March 2022; Page No. 33-43

TEACHER AND STUDENT VIEWS OF MATHEMATICS WORD PROBLEM-SOLVING TASK AT SENIOR HIGH SCHOOL LEVEL

Taley, B.I.
Department of Mathematics & ICT Education, Mampong Technical College of Education, GHANA

Corresponding author (email): bengre.isaac@gmail.com

Abstract
Due to the importance of word problems in mathematics, curriculum planners for high school mathematics in Ghana have recommended the inclusion of word problems in mathematics textbooks, teaching, and tests. Nevertheless, examination reports, research findings, and teachers' discourse show that high school students shy away from answering word problem tasks. Using a phenomenology enquiry, this study explored the teaching and learning experiences of teachers and students regarding the inclusion of word problems in the high school mathematics curriculum. Twenty-eight participants consisting of 12 mathematics teachers and 16 students were purposively sampled from four senior high schools in the Ashanti Region of Ghana. Semi-structured interviews were used to gather the views of the participants while thematic analysis and percentages were used to analyse the data. The study showed that both teachers and students appreciated the importance of word problems. Nonetheless, more students than teachers used word problems to bridge the wedge between mathematics concepts and real-life applications. Besides, more teachers than students used word problems to help students internalise mathematics concepts. Additionally, the study also showed that instructional-related and student-related factors caused about a third of senior high school students to dislike worded problems. Based on the findings in this study, it was recommended that teachers should consciously teach mathematics vocabulary, re-word and translate worded tasks where necessary. Consequently, students' dislike for word problem-solving may reduce.

Keywords: Word problems, internalise, actualise, instructional-related, student-related

Introduction

Mathematics teachers use exercises, problems, and investigations to complete the teaching process. Teachers often use investigations to train children in problem posing and self-directed inquiry. Teachers also use exercise to strengthen students' mathematical calculation skills, while teachers use problems to promote higher-order thinking skills. Without any form of prejudice, these three mathematics tasks are critical. However, mathematics researchers (Ahmad & Duskri, 2018; Nggaba, 2019) believe that students should solve more problems if they want to be critical thinkers.

Mathematics problems are sometimes linguistically framed (Verschaffel, et al., 2020), hence, recognised as word problems. According to mathematics literature (Pascual et al., 2018; Yazgan, 2015), word problems may be categorised as routine or non-routine tasks. Routine problems are tasks whose solutions are deduced from applying general mathematics concepts inferred from the problem situation. They are tasks that can be solved by duplicating previously taught procedures step-by-step. Non-routine problems, on the other hand, are those tasks that do not expressly propose a predictable, well-rehearsed route or solution pathway (Verschaffel et al., 2020; Woodward et al., 2012).

Irrespective of the type of word problem, they are included in school mathematics. Reasons for the inclusion of word problems in the mathematics curriculum are not farfetched. For example, Bullock (2015) has indicated that as students apply the knowledge gained in the mathematics classroom to solving real-life problems, they get introduced to mathematics in their everyday life activities by studying word problems. More so, Verschaffel, et al (2014) have argued that students are inspired to solve real-life problems mathematically through their ingenuity and creativity. As a result, Verschaffel et al. (2014) opined that students get inner satisfaction and motivation when successfully solving real-life problems mathematically. Besides, Ronhovde (2009) also showed that the significance of mathematics to students was manifested when the connection between word problems and students' daily activities was established. Accordingly, Verschaffel et al. (2020) intimated that word problems have become

Cite this article as:
Taley, B.I. (2022). Teacher and student views of mathematics word problem-solving task at senior high school level. *FNAS Journal of Mathematics and Science Education, 3*(2), 39-49.

essential in mathematics learning since they are used to mend the gap between mathematics and the natural world and promote mathematics problem-solving competence in students.

Despite the arguments that support the inclusion of word problems in the mathematics curriculum, word problems are the most dreaded, feared, and disliked part of mathematics (Bullock, 2015). Students' unparalleled dislike and anxiety for word problems worry mathematics teachers (Murray, 2012). Markedly, students' dislike for word problems defies the utility of mathematics (Ihu & Kyeleve, 2021). A study aimed at improving students' problem-solving skills conducted by Bottge, et al (2003) on 37 middle school graders showed that low- and average-achieving students were vocal in their dislike for word problems. Rembert, et al (2019) also observed that about 70% of students disliked word problems based on their inability to solve them or did not find word problems relevant to their interests and identity. Undoubtedly, high school students generally find it challenging to solve word problems (Adu, et al., 2015; Andam, et al., 2015; Chapman, 2002; Sepeng & Madzorera, 2014; West African Examination council [WAEC], 2017, 2018, 2019, 2020).

Evidence of high school students' difficulty in solving word problems in Ghana are well documented. For instance, the chief examiner for WAEC has continuously lamented students' inability to solve word problems in the West African Senior Secondary Certificate Examinations [WASSCE]. According to WAEC (2017, 2018, 2019, 2020), most students do not attempt word problem tasks. In rare instances, most of the few students who attempt these tasks do not produce appropriate algebraic expressions for the word problem tasks. The reports further revealed that the inability of the students to transform the worded tasks into algebraic expressions restrained them from providing accurate solutions. Adu et al (2015) examined errors high school students in Ghana committed when solving word problems in linear equations. Ten-word problem tasks were used in that study. A breakdown of students' difficulty in solving word problems, according to Adu et al. (2015), showed that between 75% to 84% of the 130 students examined committed various errors, including comprehension and transformation errors. Adu et al. (2015) further noted that though approximately 60% of the students attempted most of the questions, only two per cent produced correct answers, which underscored students' inability to comprehend and transform worded problems into equations. Hence, their inability to solve word problems.

Consequently, high school students in Ghana shy away from answering word problem tasks (Adu et al., 2015; Andam et al., 2015; WAEC, 2017, 2018, 2019, 2020). Nevertheless, a cursory study of Ghana's high school core mathematics showed that the core mathematics teaching syllabus, core mathematics textbooks and the WASSCE past questions in core mathematics are inundated with routine word problem tasks. The inundation of the core mathematics with word problems is based on the curriculum planners' recommendations. The planners of the mathematics curriculum recommend that mathematics teachers, textbook writers, and curriculum implementers incorporate word problems in all topics (Ministry of Education [MoE], 2010). Since high school students in Ghana dislike word problem tasks, which maybe attributed to the perceived difficulty in solving word problems (Rembert et al., 2019), it is not clear whether the students are aware of the importance of word problems in the study of high school mathematics. It was, therefore, against this background that this study explored the experiences of teachers and students regarding the inclusion of word problems in the high school mathematics curriculum.

Purpose and objectives of the study

The purpose of the study was to investigate teacher and student views of mathematics word problem-solving tasks at senior high school level. Specifically, the objectives of the study were to:

1. find out the justification mathematics teachers and students have to support the learning of mathematics word problems
2. determine the factors that account for students' dislike for word problems
3. find out the measures mathematics teachers and students proffer to remedy high school students' dislike for word problems

Research questions

The following research questions were answered.

1. What justification do mathematics teachers and students have to support the learning of mathematics word problems?
2. What factors account for students' dislike for word problems?
3. What measures do mathematics teachers and students proffer to remedy high school students' dislike for word problems?

Cite this article as:
Taley, B.I. (2022). Teacher and student views of mathematics word problem-solving task at senior high school level. *FNAS Journal of Mathematics and Science Education, 3*(2), 39-49.

Theoretical framework

Thorndike's theory of learning by selecting and connecting (Schunk, 2012) provides theoretical underpinnings for relating the curriculum provision of learning word problems and high school students' word problems learning experiences. This stimulus-response theory assumes that motives drive learning to the extent that stimuli that lead to the attainment of a motive are readily learned. In contrast, stimuli that do not provide a motive get eliminated gradually (Surur, 2021). The laws of readiness, effect and exercise propounded within Thorndike's theory of learning (Ni & Lu, 2020) provide a basis for explaining students' dislike for word problems. The law of readiness provides that students' readiness to study word problems does not come automatically because the curriculum has provided it. Instead, teachers should endeavour to expose students to the importance of studying word problems (Bulus, 2020). Besides, teachers should ensure that students are well-grounded in concepts underpinning various topics in the curriculum. Perhaps, a robust relational understanding, coupled with an appreciation of the critical role of word problems, will motivate students to take the learning of word problems seriously. By the law of effect, students are most likely to appreciate word problem learning if they find their learning experiences satisfying, meaningful, and rewarding. It behoves teachers to provide word problems that are meaningful and rewarding and relate to the activities students engage in. Such tasks will provoke students to frequently attempt to relate mathematics concepts to real-life situations or solve mathematics problems related to real-life situations. Consequently, the law of exercise provides that students who can solve more word problems learn to use word problems (Ni & Lu, 2020).

Materials and Methods

Research Design and Participants

This study was exploratory research that followed a phenomenology design (Saldaña, 2013; Wertz et al., 2011) in which interviews were conducted to seek participants' experiential knowledge in the learning and teaching of word problems. Twenty-eight participants made up of 12 mathematics teachers and 16 students from four high schools took part in this study. Permission was sought from the heads of the four high schools to conduct this study. Although no risk was envisaged in the study, the researcher prepared a consent protocol assuring participants of the confidentiality and anonymity of their person and the information they provided in the study. The 28 participants in the study were non-randomly sampled. The 12 teachers were selected based on their willingness to participate. In addition, purposive sampling was used to select the 16 students based on their active participation in mathematics lessons as recommended by the 12 volunteered teachers. Using this selection criterion, this study engaged participants who were articulate in sharing their word problem-solving experiences. The distribution of the participants in this study is presented in Table 1.

Table 1 Participants' gender, teaching experiences, and preference for word problems

Respondents' group	Levels		Students	Teachers
Gender	Male		11 (68.8%)	12 (100%)
	Female		5 (31.3%)	0 (0%)
Teaching experience	Low ($\leq 3\ yrs$)		-	3(25%)
	Medium ($4-9\ yrs$)		-	7(58.3%)
	High ($\geq 3\ yrs$)		-	2(16.7%)
Preference for word problems	Male	Yes	9(81.8%)	-
		No	2(18.2%)	-
	Female	Yes	1(20%)	-
		No	4(80.0%)	-

From Table 1, all 12 teachers were males with varying levels of high school mathematics teaching experience: About 25% had at most three years of experience, about 58% had between four and nine years of experience, whiles approximately 16.7% had at least ten years of experience. Table 1 further shows that almost 69% and 31% of student-respondents were males and females, respectively. Furthermore, 62.5% (N = 10) liked word problems whereas 37.5% (N = 6) did not like word problems.

Data collection

Semi-structured interview questions were phenomenologically framed and used to gather participants' thinking and experiences about word problems in three areas. These areas were the significance of word problems in mathematics, students' liking of word problems, and remedying students' dislike for word problems. As much as possible, the interview questions were interspersed with word problems. Besides, an interview protocol was prepared and used to guide the interview discussions, thus, ensuring uniformity in the questioning. Additionally, one mathematics educator and two high school mathematics teachers who were not part of the study examined

Cite this article as:
Taley, B.I. (2022). Teacher and student views of mathematics word problem-solving task at senior high school level. *FNAS Journal of Mathematics and Science Education, 3*(2), 39-49.

the interview protocol to check for the clarity of the questions. The feedback received from the reviewers were used to shape the questions.

The Institutional Review Board of the University of Cape Coast provided ethical approval for this study. Furthermore, the headmasters of schools where the study was conducted also granted permission for the conduct of the study. Participants agreed to sign consent forms that stressed their privacy and rights.

Ensuring Rigour

To minimise bias and increase the credibility and validity of the results of this study, Lincoln and Guba (1985) guidelines for conducting and reporting qualitative research were applied. Subsequently, the interview responses, which audio-taped and transcribed formed the primary data for this study. Besides, field-notes records of students' context, and teachers' presage factors and demeanour provided additional information for analysing the transcripts.

After transcribing the recorded interview, the transcriptions were sent back to the teachers for them to either confirm that the transcribed data was an accurate representation of the interview discussions. Using In vivo coding (Saldaña, 2013), the transcripts were inductively coded and themes developed from the codes. The themes were further examined and categorised into three areas relating to the research questions. The developed codes and themes were independently and thoroughly reviewed by an experienced professor in qualitative research. The data was organized using NVIVO 12 software. More so, I included in the presentation of my findings relevant quotes from participants to substantiate the study's findings (Maxwell, 2005).

Results

The results herein presented followed the research questions the study sought to answer. Additionally, the analysis of the transcribed interview data and representation of the results was guided by Creswell and Poth's (2018) approach for interpreting phenomenology inquiry. In the presentation, teacher and student participants are coded as TR and ST respectively.

Table 2 Participant preference for word problems

Respondents' group	Levels		Students	Teachers
Preference for word problems	Male	Yes	9(81.8%)	-
		No	2(18.2%)	-
	Female	Yes	1(20%)	-
		No	4(80.0%)	-

Table 2 shows that 62.5% (N = 10) liked word problems whereas 37.5% (N = 6) did not like word problems.

Justification for the Teaching and Learning of Word Problems

In the first research question, the study sought to explore participants' views on why the teaching and learning of word problems should be encouraged based on their experience in solving word problem tasks. A schematic representation of the codes and themes deduced from the analysis is presented in Figure 1.

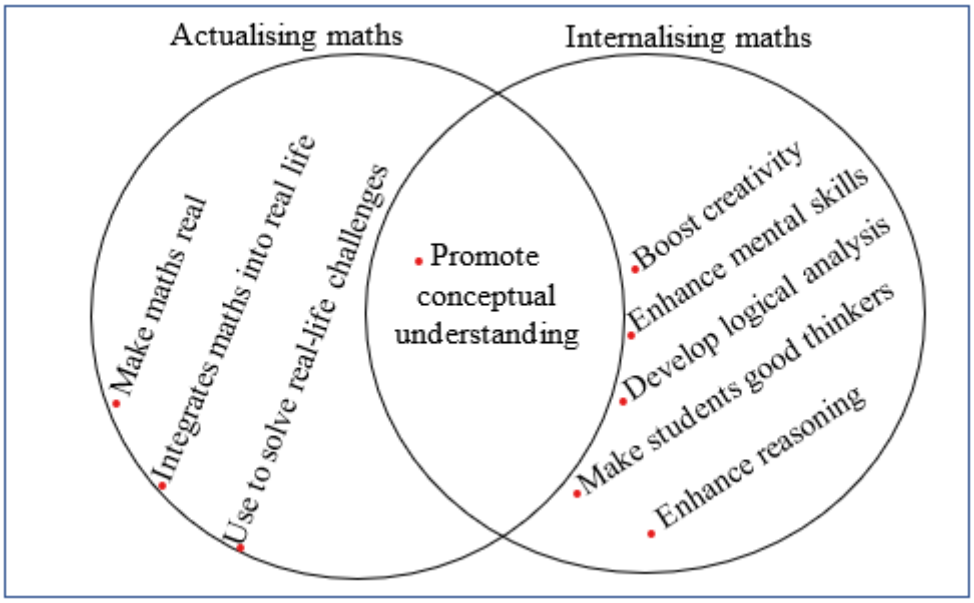

Figure 1 Schematic view of the connections among the reasons for studying word problems

From Figure 1, the overall reason the teaching and learning of word problems was for the promotion of conceptual understanding of mathematics concepts. This overarching reason was achieved based on two reasons (themes) for the teaching and learning mathematics of word problems as emerged from the responses provided by the participants. These were actualising mathematics and internalising mathematics. About 44.4% of the codes deduced from the data supported the actualisation roles of mathematics word problems. Meanwhile, 55.6% of the codes deduced from the data supported the internalisation roles of mathematics word problems.

Actualising mathematics

The participants commonly shared the view that word problems added to make mathematics meaningful and authentic, thus, actualising the mathematics taught and learned. Actualising maths connoted the use of word problems to make mathematics real, integrate mathematics into real-life situations, and to solve real-life challenges (Figure 1). For instance, a student indicated, "I like word problems because it is in our daily lives; everything deals with maths. The money, the market … all daily life in the world is about maths word problems. It reflects real-life problems" (ST6). Another student also claimed that word problems "are related to our environment" (ST8). Corroborating with the students, a medium experienced teacher opined that "word problems bring the subject [mathematics] to reality" (TR2). Similarly, a highly experienced teacher opinionated that word problems "give the real nature of maths to the students" (TR3).

Although both students and teachers shared this view, the participating groups (students and teachers) differed in using word problems to actualise mathematics. Approximately 37.5% of the teacher-participants and 62.5% of the student-participants believed that word problems make mathematics real. Comparatively, more students used word problems as a medium to connect classroom mathematics to their real-life activities. Suggestively, many of the teacher-participants believed that other approaches other than word problems are used to actualise mathematics. This observation was backed by the submission of a highly experienced mathematics teacher who said word problems "is one way we [teachers] can integrate the mathematics concepts with the real-life situations" (TR4).

Internalising mathematics

The data also points to using word problems to help students internalise the mathematics learnt. The internalisation of mathematics related to using word problems to challenge students to activate their mathematics cognition and develop students' relational learning. This connoted the use of word problems to aid students think, enhance reasoning, mental skills, boost creativity and develop logical analysis (Figure 1). More than 50% of the participants showed that word problems were valuable experiences for internalising mathematics. A medium experienced teacher claimed that "I [teacher] believe word problem is good, helpful to the students because, if you can analyse statements mathematically and draw mathematical equations and solve it out, that makes you a

Cite this article as:
Taley, B.I. (2022). Teacher and student views of mathematics word problem-solving task at senior high school level. *FNAS Journal of Mathematics and Science Education, 3*(2), 39-49.

genius student" (TR9). Similarly, another medium experienced teacher disclosed that "the inclusion of word problems in the curriculum is essential in the sense that, it helps to broaden students minds about a mathematical concept" (TR2). Additionally, a low experienced teacher also explained that "the best way to assess how well your students have understood the maths concept and be able to apply to their real-life situation is to solve word problems" (TR8). Corroborating the teachers, the student-participants said, "word problems in maths involve critical thinking before you can solve it" (ST16). Therefore, word problems "challenge you to think outside the box" (ST1). Despite the general agreement among the participants, the data showed that 60% and 40% of the teacher-participants and student-participants, respectively, shared the internalisation role of word problems. This result means that more teachers than students believed that word problems help students internalise mathematics.

Sources of Students' dislike for Word Problems

The computed frequencies of students who dislike word problems showed that 62.5% had a favourable preference for word problems, whilst 37.5% disliked word problems. In addition, more female students (66.7%) disliked word problems than male students (33.3%). The data showed that most of the students liked to solve word problem tasks. Regarding why students disliked word problems, two broad factors emerged from the thematic analysis – instructional-related factors and student-related factors.

Instructional-related factors arose from students' experience with the teaching of word problems. These factors included the teaching approach, the complexity in the instructional language, and the language used in framing the tasks. As alluded to by the students, teaching activities and examples sometimes used by teachers were alien and abstract to them. Consequently, the students could not make sense of the teaching, which caused their dislike for word problems. For instance, a participant, ST5, claimed that "Some of us [students] do not like them [word problems] because of some teachers". In clarifying the student's concern, a medium level experienced teacher said that "Sometimes, we [teachers] teach as if what we [teachers] are teaching is not real" (TR2). An admission that teachers' word problem lessons were neither practical nor relevant as emphasised by a highly experienced teacher, "We [teachers] do not use any practical thing to make the students get the true meaning of what the question demands" (TR3).

Closely related to the teaching approach, participants believed that the instructional language dampened students' liking for word problems. For example, ST12, claimed to be fluent in the English language but was deficient in the instructional language saying, "For me, I can read oo [sic], but I don't understand the maths English they [teachers] use … Some of the maths teachers do use unfamiliar English instead of simple ones when teaching the word problems" (ST12). Other students expressed dissatisfaction with the language used in framing the word problem tasks. As an illustration, a student said, "I do not like it because sometimes I do not understand how they put the word problem question" (ST13).

The second causative factor that contributed to students' dislike for word problems was the student-related factors, which included the psychology of students, students' context, and students' inability to formulate algebraic expressions. The psychological factor explained how students' mental and emotional disposition toward word problems influenced their liking for word problems. The psychological disposition of the students was expressed orally or with body language. Participants explained that students dislike word problems because of their preconceived notion that word problems are complex. For example, students claimed that "because me myself, I have that mentality that it is hard so once I see it, I know it is hard. I will say that myself, I have the mentality that maths is difficult that is why" (ST14). Because of this predisposition, students either evade word problem tasks or teachers do not teach students how to solve these tasks. This observation was teased out teachers:

> *most students have the mentality that word problems are difficult. They prefer exercises to real-life applications … throughout my eight years of teaching, I've realised that during exams, students try to skip questions related to word problems (TR2)*
>
> *they have conceived that word problems are difficult so, if they have the chance of picking a word problem question and a straightforward question, they will go for the straightforward rather than the word problem (TR4)*
>
> *most students have the mentality that word problems are difficult. I have taught in a remedial school before. And I don't teach the word problems at all. Because once you go there, it is like you confuse them with the concept you are teaching (TR1).*

Another student-related factor coded from the interview was students' context. Students' context factors are related to their deficiency in the medium of instruction, which is English. Students who are not fluent in English become deficient in comprehending instruction. Consequently, students became deficient in making

Cite this article as:
Taley, B.I. (2022). Teacher and student views of mathematics word problem-solving task at senior high school level. *FNAS Journal of Mathematics and Science Education, 3*(2), 39-49.

meaning of the instruction, which eventually heightened their dislike for word problems. A student said, “I do not like word problems because of the reading aspect of it” (ST1). In corroborating, teachers observed that “most students have difficulty in comprehending the English language so to convert a statement from English to a mathematical statement then you need to help the student understand the statement and he cannot understand a lengthy statement” (TR7). Another teacher also observed that "They [students] have difficulty speaking the English language, understanding certain terminologies in English, they [students] find it very difficult" (TR9) and TR4 disclosed that “even common communication is a problem let alone talking about interpreting mathematical terms".

Furthermore, it was realised from the interview transcripts that students' difficulty with the formulation of appropriate solution paths, partially explained students’ dislike for word problems. As noted, the solution to word problems usually begins with the algebraic formulation of equations and inequalities, hence, a student’s inability to start right was a sufficient basis to evade word problem tasks. From the interview, a student opinionated that

> *I don’t like word problems because of … and the setting of the equations. Like me, my friends also find setting out the equations a hard thing to do. We find it difficult to decode the language of maths to equations (ST1)*

Another student claimed that “I [student] do not like word problems because of the equations” (ST15). Teachers were also prevued to students’ difficulty formulating appropriate algebraic expressions for word problem tasks. “… their ability to translate English into maths is another. This for me make it difficult for them” (TR3). Moreover, another teacher, TR6, said, “The formulation of the maths expression is the problem”.

Remedying students’ dislike for Word problems

The third research question identified possibilities in overcoming students’ dislike of mathematics word problems. Participants proposed various measures to help students develop their understanding of the mathematics concept and terms taught. These measures included, firstly, rewording word problem tasks. In rewording the word problems, teachers suggested that when word problems are re-framed and broken down into more straightforward language, students turned to like the word problems. A medium experienced teacher, TR7 indicated that

> *I [teacher] have seen that most students have difficulty in comprehending the English language so to convert a statement from English to a mathematical statement, I help the students understand the statement and they [students] cannot understand a lengthy statement until you go step by step and simpler sentences (TR7).*

Another proposal was for teachers to translate word problems into students’ first language – TR3 claimed that

> *if they [students] can understand the language used in framing the question, they [students] will be able to get something. So, what sometimes I do for them [students] to get understanding is when I explain the question in the local language, it makes it easier for them [students] to get the concept (TR3)*

Additionally, the use of teaching resources and tasks relevant to students was found helpful in the teaching and learning of word problems. Teachers explained that using more instructional materials made lessons practical enough to engage students in solving word problems.

> *In teaching plane geometry and circles., I realised that when you read the question to them, and you do not draw or sketch something on the board, they sometimes do not get the concept (TR10). what I do, before going in to teach word problems, I try to make it practical. I make the sentence and variables practical and related to the students. If I say Kofi is standing here, I try to demonstrate that or sketch that for the student to know what I am referring to. … Sometimes when you look at the setting you are in, then you try to do something … I don’t impose something as it exists in the books to the students. Sometimes, I change names and variables in the tasks to those common to my students … I use names common to my students so that they can identify themselves with the tasks (TR7).*

Furthermore, participants indicated that students actively participated in the teaching and learning of word problems when they are psyched up to appreciate the significance of word problems. As exemplified by teacher TR6,

> *we teachers should be friendly to them, bring it to their level. Always I let students know that maths is not a monster and word problem is nothing but the daily activities is what we are trying to bring into our classroom. So, it is nothing. So, we teachers should try and make students like maths and even more into maths word problems (TR6).*

Cite this article as:
Taley, B.I. (2022). Teacher and student views of mathematics word problem-solving task at senior high school level. *FNAS Journal of Mathematics and Science Education, 3*(2), 39-49.

Moreover, teachers believed that they could get students to solve word problem tasks when mathematics terms are deliberately taught. For example, teachers TR7 and TR12 claimed that

> *Before I teach word problems, I write the statement one after the other then I try to make some of the students explain the statement and try to use variables to represent the statement they have written … then I think sometimes I also use cardboard. I write a statement and then the meaning of the statement on different cards. I then ask students in-turns to pick a statement and pick its corresponding mathematical statement (TR7).*
>
> *For me, I think looking at the story problem, taking a sentence by sentence and explaining to them what each word in the sentence means mathematically, helps them a lot. If you take, for instance, 2 more a certain number, 'what is the meaning of the more? I think some of the students turn to think it is just an English word but knowing the mathematical meaning of the word helps. Normally when it comes to the study of word problems, I explain to them some of the terms in the sentences (TR12).*

Besides, some teacher-participants alleged that consistent and persistent use of the English language in mathematics instruction helped students to develop their mathematics vocabulary in the long term

> *I think we need to start insisting on speaking the English language on campus. We maths teachers think that English is a different language … when it comes to word problems, … I think we should insist on the use of the English language (TR4).*

Discussion of findings

The study has shown that both teachers and students appreciate the importance of word problems in the high school core mathematics curriculum. Consistent with previous studies (Bullock, 2015; Verschaffel et al., 2014; Verschaffel et al., 2020), there was consensus among the study participants about the need to maintain word problems in the curriculum. Further classification of the importance of teaching word problems has revealed that word problems are useful for the actualisation and internalisation of mathematics. Between the two broad reasons, students supported the actualisation role more than the internalisation role of word problems. In contrast, teachers believed that word problems promoted the internalisation of mathematics concepts more than in bridging the wedge between mathematics concepts and real-life applications. Although the cause for the differences in the participants' reasoning is not theoretically grounded, it can be hypothesised that students are more often exposed to word problems that related to their real-life experiences.

Despite the perceived importance of word problems, a third of the student-participants did not like word problems. Similar to the findings of Pearce et al. (2013), students' dislike for word problems were premised on instructional-related factors and student-related factors.

Instructional-related factors included the teaching approach, the complexity in the instructional language and the language used in framing the tasks. This finding showed that students' dislike for word problems was linked to the alien nature of word problems and the inability of teachers to personalise word problems.

Student-related factors also included the mental and emotional predisposition of students toward word problems and students' weakness in the English language as a medium of instruction. The results thus showed students' weakness in comprehending word problems instruction was because the use of English language as a medium of instruction created deficiencies in students' ability to make meaning, as confirmed elsewhere (Agbenyega & Davis, 2015; Davis, 2010). Besides, the finding that students' inability to transform worded tasks into algebraic expressions caused the students to dislike word problems was consistent with the findings of Bishop et al. (2008). Bishop et al. (2008) have observed that translating worded tasks into appropriate algebraic expressions was the primary difficulty for students in solving word problems which was attributable to their limited understanding of mathematics terms.

To minimise students' dislike for word problems, this study supported the findings of Walkington and Bernacki (2015), which suggested that students' personal information and interest in formulating word problems make high school students interested in solving word problems tasks. Such personalised tasks made students felt the relevance of mathematics to their daily life activities. Consequently, students were inclined to verify the applicability of mathematics concepts in real-life activities such as buying and selling, construction and the like.

Secondly, to minimise students' dislike for word problems, the findings pointed to the re-wording of word problem tasks to remove the hurdle of students' deficiency in the English language. As it is with elementary students (Davis, 2010), not all high school students have adequately developed their mathematics language. Re-wording could therefore be helpful for students with limited mathematics vocabulary although this finding contradicted

Cite this article as:
Taley, B.I. (2022). Teacher and student views of mathematics word problem-solving task at senior high school level. *FNAS Journal of Mathematics and Science Education, 3*(2), 39-49.

Haghverdi and Wiest's, (2016) claim that re-wording was more effective for elementary students and not for high school students.

Furthermore, the results showed that the deliberate teaching of mathematics terms could improve students' mathematics lexicon, thereby reducing students' mathematics language deficiencies. This result was consistent with Ronhovde's (2009), and Moleko and Mosimege (2020) advocacy for discussing the meaning of mathematics terms and words with more than one meaning during word problem instruction. This is because Adu et al. (2015) have observed that students' challenge with mathematics terms due to the failure of teachers to ensure that students have mastered mathematics terms was the cause of their inability to solve word problems. Finally, the results suggested the need for teachers to emphasise the value of any mathematics topic to humanity. Consequently, students who did not like word problems because they dislike mathematics may develop a positive attitude towards studying word problems. As intimated by Otoo et al. (2018), students' interest in mathematics is heightened if they know the usefulness of learning mathematics.

Conclusion

In conclusion, the study has revealed that more students than teachers use word problems to bridge the wedge between mathematics concepts and real-life applications. However, more teachers than students use word problems to help students internalise mathematics concepts. Be as it may, the study has demonstrated that some high school students dislike solving worded problems. The transcripts also suggested that instructional- and student-related factors coined from students' limited knowledge of mathematics terms, deficiency in the English language as a medium of instruction, tasks alien to students, failure to transform worded tasks into algebraic expressions, and mental predisposition of students toward worded problems. To reduce students' dislike for word problems, this study points to the need for; deliberate teaching of mathematics vocabulary, re-wording and translation of worded tasks, use of relevant instructional activities and tasks, and positively psyching up the mentality of students toward word problems.

Limitations

The limitations of this study hinged on the use of interviews alone to gather the data for the study. Although interviews were wholly not an accurate representation of classroom practices, the comparison of teachers' self-report with students' responses, together with the researcher's experience in teaching and research assured that the data collected were representative of classroom instructional practices. Secondly, because only active students during classroom instruction were recruited for this study, other students might have had different views which might have influence the conclusion reached

Statement of interest

The author has no personal interest in this study; hence, no conflict of interest arose in the conduct of the study.

References

Adu, E., Assuah, C. K., & Asiedu-Addo, S. K. (2015). Students' errors in solving linear equation word problems: Case study of a Ghanaian senior high school. *African Journal of Educational Studies in Mathematics and Sciences*, *11*, 17–30.

Agbenyega, J. S., & Davis, E. K. (2015). Exploring the Intersection of the English Language as the Medium of Instruction and Inclusive Pedagogy in Primary Mathematics Classrooms in Ghana Examining the impact of teacher knowledge and inquiry on inclusive practices in different cultural contexts V. *International Journal of Whole Schooling*, *11*(2), 45–64.

Ahmad, A., & Duskri, M. (2018). Gender differences of mathematical critical thinking skills of secondary school students. *The 6th South East Asia Design Research International Conference (6th SEA-DR IC)*, 1–6. https://doi.org/10.1088/1742-6596/1088/1/012054

Andam, E., Okpoti, C., Obeng–Denteh, W., & Atteh, E. (2015). The Constructivist Approach of Solving Word Problems Involving Algebraic Linear Equations: The Case Study of Mansoman Senior High School, Amansie West District of Ghana. *Advances in Research*, *5*(1), 1–12. https://doi.org/https://doi.org/10.9734/air/2015/13932

Bishop, A., Filloy, E., & Puig, L. (2008). *Educational algebra: A theoretical and empirical approach*. Springer International Publishing.

Bottge, B. A., Heinrichs, M., Chan, S. Y., Mehta, Z. D., & Watson, E. (2003). Effects of video-based and applied problems on the procedural math skills of average-and low-achieving adolescents. *Journal of Special Education Technology*, *18*(2), 5–22. https://doi.org/https://doi.org/10.1177/016264340301800201

Bullock, G. P. (2015). *Algebra in words presents: word problems decoded* (1st ed.). SAGE Publications Inc.
Bulus, H. (2020). Teaching skills and science student teachers' micro-teaching achievement in Kaduna State College of Education. *Online Journal by League of Educational Researchers International*, *1*(10).
Chapman, O. (2002). High school mathematics teachers' perspectives of mathematical word problems. In S. Elaine & B. Davis (Eds.), *Proceedings of the 2002 Annual Meeting of the Canadian Mathematics Education Study Group* (pp. 91–98). CMESG/GCEDM.
Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design. Choosing among five approaches* (4th ed.). SAGE Publications Inc.
Davis, E. K. (2010). Linguistic influences on children's mathematical word problem solving strategies: Case study of two Average primary schools in Ghana. *Journal of Counselling, Education and Psychology*, *2*(1), 189–198.
Haghverdi, M., & Wiest, L. R. (2016). The effect of contextual and conceptual rewording on mathematical problem-solving performance. *The Mathematics Educator*, *25*(1), 56–73.
Ihu, E. ., & Kyeleve, J. . (2021). Effect of Newman Protocol Approach on students' performance in algebraic word problems in Zone C area of Benue State. *Psychological Rep.*, *6*(8).
Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage Publications, Inc.
Maxwell, J. A. (2005). *Qualitative research design* (2nd ed.). Sage Publications, Inc.
Ministry of Education [MoE]. (2010). *Core mathematics syllabus*. Curriculum Development and Research Division.
Moleko, M. M., & Mosimege, M. D. (2020). Teachers' and learners' experiences for guiding effective teaching and learning of mathematics word problems. *Issues in Educational Research*, *30*(4), 1375–1394.
Murray, H. (2012). Problems with word problems in mathematics. *Learning and Teaching Mathematics*, *2012*(13), 55–58.
Nggaba, M. E. (2019). Analysis of students critical thinking ability in solving trigonometric problems. *International Conference on Mathematics and Science Education 2019 (ICMScE 2019)*, 1–7. https://doi.org/10.1088/1742-6596/1521/3/032023
Ni, Y., & Lu, J. (2020). Research on Junior High School English Reading Class Based on the Principle of Timing and Thorndike's Three Laws of Learning. *Journal of Language Teaching and Research*, *11*(6), 962–969. https://doi.org/ol. 11, No. 6, pp. 962http://dx.doi.org/10.17507/jltr.1106.13
Otoo, D., Iddrisu, A. W., Kessie, A. J., & Larbi, E. (2018). Structural model of students' interest and self-motivation to learning mathematics. *Educational Research International*, *2018*, 1–10. https://doi.org/https://doi.org/10.1155/2018/9417109
Pascual, L. E., & San Pedro, A. B. (2018). Post secondary students' level of proficiency in solving real world problems in mathematics. *Journal of Applied Mathematics and Physics*, *6*(1), 198–214.
Pearce, D. L., Bruun, F., Skinner, K., & Lopez-Mohler, C. (2013). What teachers say about student difficulties solving mathematical word problems in grades 2-5. *International Electronic Journal of Mathematics Education*, *1*, 3–19.
Rembert, D. M., Mack, N. A., & Gilbert, J. E. (2019). Exploring the needs and interests of fifth graders for personalized math word problem generation. *Proceedings of the 18th ACM International Conference on Interaction Design and Children, IDC 2019*, 592–597. https://doi.org/10.1145/3311927.3325309
Ronhovde, F. E. (2009). Making Sense of Word Problems. In *Part of the Science and Mathematics Education Commons Ronhovde*.
Saldaña, J. (2013). *The coding manual for qualitative researchers* (J. Seaman (ed.); 2nd ed.). SAGE Publications Inc.
Schunk, D. . (2012). *Learning theories: An educational perspective* (6th ed.). Pearson.
Sepeng, P., & Madzorera, A. (2014). Sources of difficulty in comprehending and solving mathematical word problems. *International Journal of Educational Sciences*, *6*(2), 217–225. https://doi.org/https://doi.org/10.1080/09751122.2014.11890134
Surur, A. M. (2021). Thorndike's theory for improving Madrasah teacher's creative thinking and publication. *Proceedings of the International Conference on Engineering, Technology and Social Science (ICONETOS 2020)*. https://doi.org/10.2991/assehr.k.210421.119
Verschaffel, L, Depaepe, F., & Van Dooren, W. (2014). Word problems in mathematics education. In *Encyclopedia of mathematics education* (pp. 641–645). https://doi.org/https://b-ok.cc/book/2467975/976530
Verschaffel, L., Schukajlow, S., Star, J., & Van Dooren, W. (2020). Word problems in mathematics education: A survey. *ZDM - Mathematics Education*, *52*(1), 1–16. https://doi.org/https://doi.org/10.1007/s11858-020-01130-4

Walkington, C., & Bernacki, M. (2015). Students authoring personalized “algebra stories”: Problem-posing in the context of out-of-school interests. *The Journal of Mathematical Behavior*, *40*, 171–191. https://doi.org/https://doi.org/10.1016/j.jmathb.2015.08.001

Wertz, F. J., Charmaz, K., McMullen, L. M., Josselson, R., Anderson, R., & McSpadden, E. (2011). *Five ways of doing qualitative analysis: Phenomenological psychology, grounded theory, discourse analysis, narrative research, and intuitive inquiry.* The Guilford Press.

West African Examination council, [WAEC]. (2017). *Chief examiner’s report for core mathematics in WASSCE*.

West African Examination council, [WAEC]. (2018). *Chief examiner’s report for core mathematics in WASSCE*.

West African Examination council, [WAEC]. (2019). *Chief examiner’s report for core mathematics in WASSCE.*

West African Examination council, [WAEC]. (2020). *Chief examiner’s report for core mathematics in WASSCE.*

Woodward, J., Beckmann, S., Driscoll, M., Franke, M., Herzig, P., Jitendra, A., Koedinger, K. R., & Ogbuehi, P. (2012). *Improving mathematical problem solving in Grades 4 through 8: A practice guide.* National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. https://ies.ed.gov/ncee/wwc/Docs/PracticeGuide/MPS_PG_043012.pdf

Yazgan, Y. (2015). Sixth graders and non-routine problems: Which strategies are decisive for success? *Educational Research and Reviews*, *10*(13), 1807–1816.