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The relationships between English literacy skills and learner academic performance in Mathematics

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Abstract
The study investigated the relationship between English literacy skills and learner academic performance in Mathematics. The researcher used a quantitative research approach in this study. The study's design was a non-experimental quantitative research design focusing on a survey design. The overall population of the study amounted to sixty-nine (69) Grade nine learners sampled from a bilingual high school in the Motheo district. The instrument used to collect data for this study was an online survey designed on Google Forms. The survey consisted of demographical questions, as well as a Likert scale in order to collect the general level of agreement or disagree which the learners had toward the statements made. The results were presented in the form of graphs such as pie charts and bar graphs. The findings helped to reveal the relationship between English literacy skills and learner academic performance in Mathematics. The study found that there is a definite relationship between English literacy skills and learner academic performance in Mathematics. The proven relationship exhibits that learners who consist of the necessary literacy skills, obtain an academic performance in Mathematics which mirrors the extent of these literacy skills. The study recommended that there should be more emphasis on the enhancement of literacy skills in school, since this fact will lead to an overall better academic performance in Mathematics.

Key words: Literacy, language proficiency, multilingual, learners, mathematics

Introduction

Mathematics is considered a very important subject in the lives of people because of its utility value in everyday processes and transactions. The above is alluded to by UNESCO (2012) which avers that there is a general understanding among people that mathematics is omnipotent (mathematical fallibilism in which mathematics is viewed as an everyday human activity) in today's world as evidenced by its application in everyday exchange and communication processes. However, the way it is sometimes taught has led some people to doubt this valuable role it plays and at worst, has made other people to have a negative attitude towards it. Kaptan and Timurlenk (2012) aver to the fact that there are two contradictory issues around the teaching and learning of mathematics and science. They argue that on one hand, while mathematics as a science seeks to demonstrate its liberatory power through a combination of the excitement and thrill that comes with discovering new mathematical knowledge and insights that mathematics provides, on the other hand, the teaching methods used to achieve this aim often seem to rely on dogmatic and authoritarian

approaches in which students must accept what they are taught as uncontested, unequivocal and unquestioned. Extant literature indicates that such a teacher-centered approach has caused even the most brilliant of students to start questioning whether mathematics is indeed their line of learning. Kadbey et al (2015) argue that to be able to motivate students to learn mathematics better and in a way that motivates and develops in them critical thinking skills, a shift from traditional didactic teacher-centered approaches to an approach that is active and learner-centered is needed. Rudhumbu (2014) and also Posamentier (2017) argue that motivating mathematics students to want to learn mathematics is one of the most critical elements of effective implementation of the mathematics curriculum.

Background to the Study

A number of studies on Mathematics education (Adler, 2001; Setati & Barwell, 2006; Webb & Webb, 2008a) offered a variety of interpretations or explanations for the low Mathematics achievement found among English second language learners. The belief regarding low Mathematics performance among learners is related to the fact that learners cannot read and write in English and do not understand their schools' medium of instruction provides a unifying thread throughout.

Stoffelsma and Spooren (2019) advocates the view that, "profound mastery of language skills and reading proficiency are indispensable for students who are studying Mathematics." The Carnegie Council on Advancing Adolescent Literacy of 2010 (Stoffelsma & Spooren, 2019) provided compelling evidence of an effective relationship between a literacy skill such as reading proficiency and academic performance in Mathematics education. Stoffelsma and Spooren (2019) continue by stating that disciplinary literacy or content-area specific literacy is constructed by knowledge that supports the learners' comprehension of concepts, as well as, literacy skills related to the particular field of study, it being Mathematics, in this case.

An analysis of a study conducted by Howie (2003) on the performance of South African learners in the Third International Mathematics and Science Study (TIMSS) of 1995, identified learner proficiency in English as a strong predictor of success in Mathematics. Contrary to the findings of Howie, recent reports suggest that poor performance in Mathematics cannot be solely attributed to the learners' limited proficiency in English in isolation from the pedagogic issues specific to Mathematics, as well as, the wider social, cultural and political factors that ingrain schooling (Setati et al, 2009).

Bohlmann and Pretorius (2008) identify two factors which critically impact the mathematic academic performance of learners such as the language of learning and teaching (LoLT) and secondly, the qualifications of the teacher. Bohlmann and Pretorius (2008) reinforce the debate on the importance of literacy skills by saying that "without well-developed reading and language skills, learners will not be able to develop mathematical thinking skills such as generalising, explaining, describing, observing, inferring, specializing, creating, justifying, representing, refuting and predicting".

Problem Statement

The researcher believes that due to the fact that many of the learners in South Africa are schooled in English (in most cases a second language for the learners), there is a chance that learners are not performing as well academically in Mathematics due to change in language of learning and teaching (LoLT) as they progress from one stage to another. The background of the study has suggested that there is a relationship between a learner's English literacy skills and the learner's academic performance in Mathematics and it is hope that through research, this relationship will be established. The researcher teaches both English and Mathematics and it was noted that there seemed to be a pattern where the learners who were performing well academically in English also seemed to be performing well in Mathematics. Due to this observation, the researcher would like to investigate the relationship between English literacy skills and academic performance in Mathematics to determine whether the observation made was true, hence the current study.

Research Question

The main research question for this study is:
What is the relationship between English literacy skills and academic performance in Mathematics of Grade nine learners in South African schools?

Literature Review

Research around the world is growing in terms of support regarding the idea that literacy reading skills play a crucial role in academic achievement and as stated by Stoffelsma and Spooren (2019), these domains are customarily associated with logical-deductive skills, one of them being, Mathematics. In 2010, Fang and Wei established that by integrating reading instruction in the Science or Mathematics curriculum at secondary level, there seems to be a positive impact on learners' scientific literacy. Additionally, Mol and Bus (2011) found that learners who are frequent readers tend to be more successful learners academically. Similarly, Pretorius (2000) confirmed that the more skilled learners are in making interpretations whilst they read (for example, associating different ideas in a text), the more they gravitate towards better academic performance. Furthermore, Lyengar (in Stoffelsma & Spooren, 2019) maintains that if a learner develops the habit of daily reading, there should be a positive correlation between the enhancement of literacy skills and higher academic achievement.

Henry et al (2014) reiterate the views of Hoff and Tian (2005) by stating that language acquisition is the pinnacle of mental processes that all work together to input information into a learner's mind during speech interactions. Krashen and Brown (2005) discovered that the sooner a learner is able to acquire language proficiency, the sooner they are able to improve academically. Henry et al (2014) also claim that active parental involvement tends to stimulate a higher level of development in a learner, which also leads to finer comprehension of subject matter, extensive background knowledge, and finally, a higher level of language proficiency.

Leaners who grow up in a home where reading is seen as important or where parents lead with example by reading much themselves, tend to gain various literacy skills from a young age. Hemmerechts, Agirdag and Kavadias (2017) stipulate that parents or caregivers who involve their children with literacy activities transmit the value of reading to their children. Apart from the responsibilities and involvement of the parents, teachers in South Africa also face their own unique challenges. In South Africa, there arises a very complex and unique situation of multilingualism. According to Essien, Chitera and Planas (2016) this is partly due to its political history of Apartheid, but equally due to the county's distinct nature of multilingualism. In total, ten of the official eleven languages in South Africa are indigenous African languages. The teachers are thus faced with the challenge of creating a learning environment that is conducive to the issue of language diversity and to mathematics education. Essien et al (2016) state that teachers also need to design activities that integrate the two aspects of language and mathematics in order to be successful.

Prediger, Wilhelm, Büchter, Gürsoy and Benholz (2018) remark that investigating the role of language in the mathematics classroom has been a longstanding tradition amongst research in mathematics education. Furthermore, Prediger et al (2018) discern that there is a definite connection between the family background of the learner and their language proficiency. Language proficiency can be conceptualised theoretically by the discrepancy between language use on a daily basis and academic, school language.

Kilfoil et al (2008) explain that throughout the language development process, learners will first develop conversational fluency or basic interpersonal communication skills (BICS) nurtured through social interaction with adults or at school as a second or additional language (Cummins, 2008). Thereafter, learners will, with this foundation of BICS, begin to develop cognitive academic language proficiency (CALP) where they will learn the language necessary to understand and discuss content in the classroom. Language proficiency at school level, is viewed as cognitive academic language proficiency which Kilfoil et al (2008) reiterate that learners need in order to thrive in learning tasks, especially learning tasks which have to be solved without any help from the language context. Finally, Kilfoil et al (2008) conclude that acquiring CALP takes at least five to seven years to develop effectively in the LoLT and learners often need

a great deal of support to become equivalent and proficient in comparison with their peers whose home language is English. But, Radford and Barwell (2016) emphasises that language is much more than only a window or an obstacle, "language, talk, text and the production and interpretation of symbols are integral to the creation of learning, teaching and assessment, particularly in mathematics." (Radford & Barwell, 2016). Radford and Barwell (2016) explains that when learners' academic approach seems to be incorrect it is often language that is seen as a barrier of effective communication between the learner and their desired knowledge. Setati (2001) explains that a major part of learning Mathematics is focused on acquiring control over the specific register of Mathematics, such as learning how to talk, read and write like a mathematician. The register of Mathematics includes many elements, namely, words, symbols, phrases, abbreviations and manner of speaking, writing, reading and debating that are specific to Mathematics.

Setati (2005) believes language to be significant for thinking and learning with language being a vital tool for arbitrating interaction between learners, as well as between the teacher and the learners. This means that language is not only a concern in multilingual Mathematics classrooms, but a concern in all classrooms (Setati, 2005). With this being said, it is important for teachers to always keep in mind that language as a whole and the skills of language play a role in any subject, no matter the LoLT. Furthermore, Setati (2005) admits that language is specifically vital in the Mathematics classroom filled with multilingual learners, since the LoLT in this type of classroom becomes an unquestionable, complex matter. This means that for learners who are being educated in something other than their home language, they first need to obtain the necessary language skills in the LoLT before they will be able to sufficiently study any other subject, specifically Mathematics in this case. With the learning of Mathematics, there are similar elements as to the learning of a language, since Mathematics can be very abstract and conceptual, consisting of a very specific register and set of discourses (Setati, 2005).

Mullis et al (2007) state that second language learners tend to falter behind their first language peers when it comes to reading literacy skills. Mullis et al (2007) further consider reading to be an interactive operation during which information is processed through the establishment of interaction between various components at a lower and higher level. The lower level refers to word-level identification skills, which are needed for the decoding of text, whereas the higher-level skills attribute to cognitive processes and world knowledge that are needed for comprehension (Birch, 2014). Similarly, Lems et al (2017) argue that it often happens that the lower level skills come to be a major obstacle for second language learners of English, since these skills are explicitly language-specific and need to be learned separately for each language, and it is also difficult because the word-decoding of the English language is highly complex. Grabe (2009) supports this argument by stating that first language readers develop linguistic knowledge such as syntax, morphology and phonology by the age of six, whereas, second language learners only develop this knowledge by the time that they are being schooled in English. Setati (2001) states that even though Mathematics is not a language like Xhosa or French, writing or speaking about Mathematics still requires the use of ordinary language, presumably the language in which the Mathematics is taught and learned.

Pretorius (2015) states that as a method towards measuring overall academic success, language is not necessarily used, however, internationally, literacy skills alongside numeracy are applied as barometers to measure the performance of a country's education system. Furthermore, within the twenty-first century from which technological advancement has escalated at a tremendous pace, literacy evermore contributes to a high intellectual capital. By the barometer to which Pretorius (2015) is referring, South Africa's education system is not performing well, especially given that various national and international reading literacy assessments support the fact that South African learners are performing poorly (Fleisch, 2008; Howie et al, 2012, 2017a, 2017b; NEEDU, 2012).

Lawson (2017) concurs with Pretorius (2015) claiming that all the assessments currently employed, apply language to measure learner success. Lawson (2017) argues that learners need the desired reading proficiency to accurately read tests and, in doing so, will be able to respond effectively to questions. Accordingly, learners' test scores include variances due to the various levels of literacy skills of the learners.

Lawson (2017) continues by stating that the standardised test scores in Mathematics are notably lower in non-English speaking learners than in learners who come from a background of speaking English at home.

Bohlmann and Pretorius (2008) argue that the theoretical intricacy and problem-solving nature of Mathematics make pervasive claims on the interpretive, strategic and reasoning skills of learners, specifically when these activities are expected to be completed in a language that is not their dominant language. Furthermore, Setati (2001) concludes that a large number of learners in South Africa learn Mathematics in a language that is not their main language, thus mathematical communication in the South African classroom is acquired in a multilingual manner. Learners in these multilingual classrooms are then expected to be able to manage interactions between "ordinary English and mathematical English, formal and informal Mathematics language, procedural and conceptual discourses, learners' main language and the LoLT" (Setati, 2001).

Even though the literacy skills of learners are the focus of the assessment it is interrelated with the learners' performance. The problem derived from the arguments offered above is that learners in South Africa lack the required literacy skills in order to enhance their academic performance in Mathematics. Therefore, this study sets out to determine the relationship between English literacy skills and learner academic performance in Mathematics.

Theoretical Framework

In order for a learner to have the ability to fully participate in a Mathematics lesson, the learner needs to be able to access Mathematics discourse in a broader sense, which in turn means that the learner needs to get induced into new ways of using language (Smit, 2013). Schleppegrell (2007) notes that even though Mathematics is often viewed as the involvement of understanding the use of signs and symbols, language has recently been argued to be the most prominent of these aspects. According to Smit (2013), scholars in the research field of studying multilingualism in the Mathematics classroom, all take different theoretical orientations (for example, constructivists, semiotic or sociocultural), but they all end up sharing the assumption that the learning of Mathematics involves much more than just learning the mathematical vocabulary. Hence, the theoretical framework for this study will be based on the sociocultural theory which originated from Vygotsky's work (1962; 1978).

Over the years there have been numerous views on how children learn and develop physically and intellectually. Smit (2013) observes that the sociocultural theory of Vygotsky brought with it a crucial and revolutionary change to how we view teaching and learning in the teaching profession. Smit (2013) continues by stating that Vygotsky's aim was to develop a methodology for the study of the development of a human, Vygotsky referred to it as the "higher mental functions".

Wertsch (in Smit, 2013) identified three core themes in Vygotsky's writings. Firstly, genetic analysis in various domains is necessary to understand psychological phenomena. Secondly, social processes create higher mental functions, thus, if one wants to understand humans, one needs to evaluate humans in their sociocultural context and thirdly, and most relevant to this study, all activity, including thinking, is mediated by cultural signs and cultural tools (such as language).

The last theme of Vygotsky's work as identified by Wertsch (in Smit, 2013) is relevant to this research study, as its role is attributed to language. Vygotsky believed that language had two main functions: it functions as a communicative or cultural tool, operating for the sharing of knowledge and collaborative construction and it functions as a psychological tool, operating individual thought and reflection. The combination of thought and language creates a tool for the cognitive development of a human (Smit, 2013). The sociocultural theory is thus significant to the study. Vygotsky claims that language is a communicative tool, which is exactly how language is used in the classroom, as a tool that communicates certain information from the teacher to the learners. Language also functions as a psychological tool, according to Vygotsky; in the classroom, this psychological tool is of utmost importance because if learners possess this tool in their LoLT, they are able to effectively absorb and comprehend the knowledge communicated to them. Sociocultural theory influences this study, since if the learners are in possession of the necessary

literacy skills in their LoLT, then they will be able to use the language effectively for both its functions, as a communicative and psychological tool.

Research Methodology and Design

The researcher made use of a quantitative research approach for this study. Creswell et al (2016) define quantitative research as a process that makes use of numerical data from a specifically selected population in a methodical and objective way in order to generalise the findings to the population or group of people that is being studied. For this study, the researcher wanted to achieve a significant depth of understanding around the relationship between English literacy skills and learner academic performance in Mathematics. A quantitative approach to the study aided the researcher in producing results that could be generalised for this study. The researcher believed that the quantitative approach was most appropriate for this study since the researcher wanted to be able to statistically determine the relationship between English literacy skills and academic performance in Mathematics.

Design

The researcher focused on a non-experimental quantitative research design focusing on a survey design. This design was suitable for this study in the sense that it helped the researcher to gather data at the school with the intention of describing the nature of the existing conditions and to elicit the respondents' opinions.

Population

Salkind (2010) explains that within the context of research design, the term population can be defined as the unified collection of individuals sought by the researcher in order to comprehend or, more specifically, to draw an assumption from. The target population for this study was Grade nine learners from a school in Bloemfontein, who were all being educated in their second language (English) in the Mathematics classroom.

Sampling

According to Salkind (2010) sampling transpires when the researcher examines a sample or portion of a large collection of participants and uses the results to generate statements that could then be generally applied to the even broader group or population. The researcher made use of a probability sampling method, since this allowed the researcher to generalise the population.

The sampling method relevant to the study was cluster sampling. Within Bloemfontein, there were various schools whose LoLT is English. The schools in Bloemfontein form the various clusters and the researcher identified clusters which were relevant for the study. The characteristics included schools that were based in Bloemfontein, whose LoLT was English and within these schools there had to be learners whose home language was not English. After the researcher identified relevant schools that were willing to participate in the study, one school was identified. After receiving permission from the school, the Grade nine learners participating in the study were chosen through simple random sampling. Learners participating in the study were chosen through simple random sampling resulting in 69 participants.

Data Collection Instrument

The instrument used for this study was administered online and took the form of a Google Forms survey in line with the quantitative approach. Leaners completed an online Google Forms survey which comprised multiple-choice and Likert scale questions. According to Bell (in Creswell et al, 2016), a scale is the perfect way for the researcher to discover the attitude of the participants. The researcher made use of a table to statistically analyse the learners' academic performance in both Mathematics and English First Additional Language.

Data Collection Procedures

All data were collected online through a Google Forms survey created by the researcher. The survey was distributed in the form of a link which all participants received through email or WhatsApp. Within the survey there were various questions that allowed the researcher to gather relevant data. The first set of questions were one answer questions that allowed the researcher to elicit demographic information about the participants, such as gender, age, home language, as well as questions that focused specifically on the marks that the learners received within the two subjects at hand, namely, Mathematics and English. The second set of questions were in the form of a Likert scale, asking questions in the form of statements and participants needed to answer to the extent by which they agreed or disagreed with the statements made. This information allowed the researcher to further determine the relationship between the two phenomena and the attitude of the learners. In order for all participants of the study to stay safe, the data were collected online and not face-to-face due to the current Covid-19 pandemic.

Data Analysis

After the data collection was completed, the data were analysed accordingly. Google Forms automatically works through the data entered, and displays it in the form of graphs. The researcher used these graphs for the presentation of data. The researcher evaluated each question of the survey and the various answers given by the learners. In so doing, the researcher was able to gain a general understanding of the possible relationship is between English literacy skills and academic performance in Mathematics.

Data Presentation, Analysis and Discussion

The researcher presents and analyses the data gathered and the section starts by presenting biographical information of all the participants.

Biographical Information of Participants

The learners involved in the project were all learners whom were being schooled in English, which is their second language. The population consisted of 69 participants who agreed to take part in the study. The school identified, was a parallel-medium high school in Bloemfontein, which fell under the Motheo district of the Free State. The demographics gathered from the participants were, gender, age and home language. The demographics of the participants are presented below:

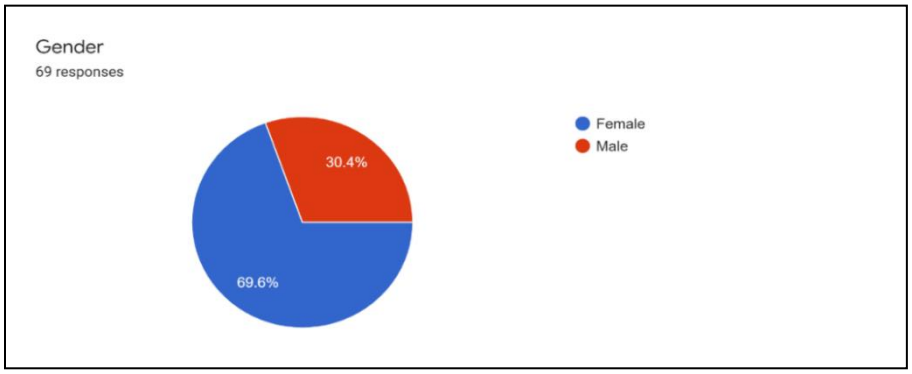

Figure 1: *Gender*

The figure above indicates the gender of the population where 30.4% were male and 69.6% female. This means that there were more female participants than male.

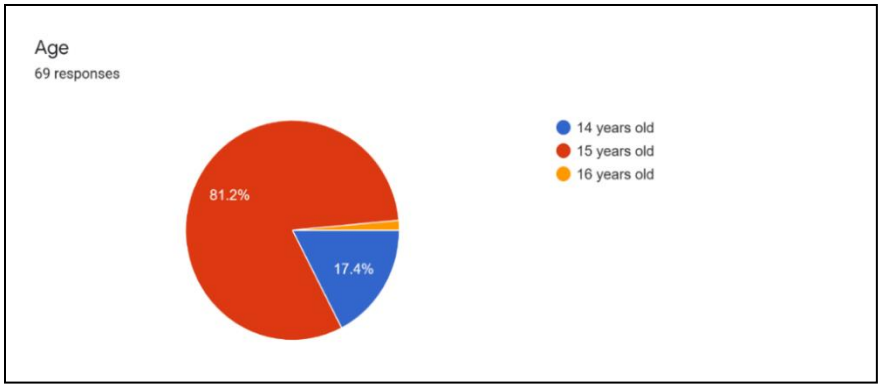

Figure 2: *Age*

The participants fell into three age groups, where the majority or 81.2% were 15 year of age. Some 17.4% of the participants fell into the 14-year age group with only 1.4% being in the 16-year age bracket.

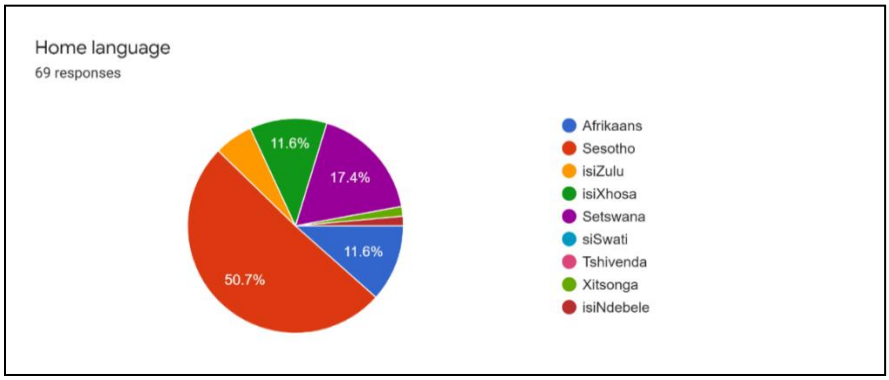

Figure 3: *Home language*

Sesotho was the home language for the majority of the population, presenting as a 50.7%. Second in the ranking came Setswana with a 17.4% of the population claiming it as their home language. The third most common home language was shared between Afrikaans and isiXhosa, which made up 11.6% of the population.

Results of the Study

The results of the study attempted to indicate that there is a a relationship between English literacy skills and the academic performance in Mathematics. Within the survey, the researcher included a number of statements in the form of a Likert scale. The statements all related specifically to one of the secondary research questions, which all work together to answer the main research question accordingly. The Likert scale consisted of four options. Learners had to read a statement and then rate their agreement or disagreement of the statement by marking number 1-4. The numbers represented the following:

1 – Strongly disagree
2 – Disagree
3 – Agree
4 – Strongly Agree

The results emerging from survey data are depicted and analysed in this section.

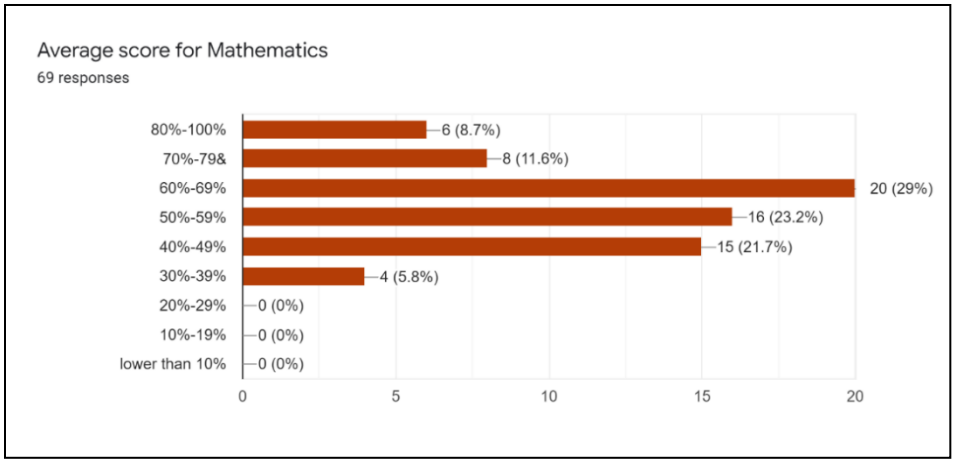

Figure 4: *Average score for Mathematics*

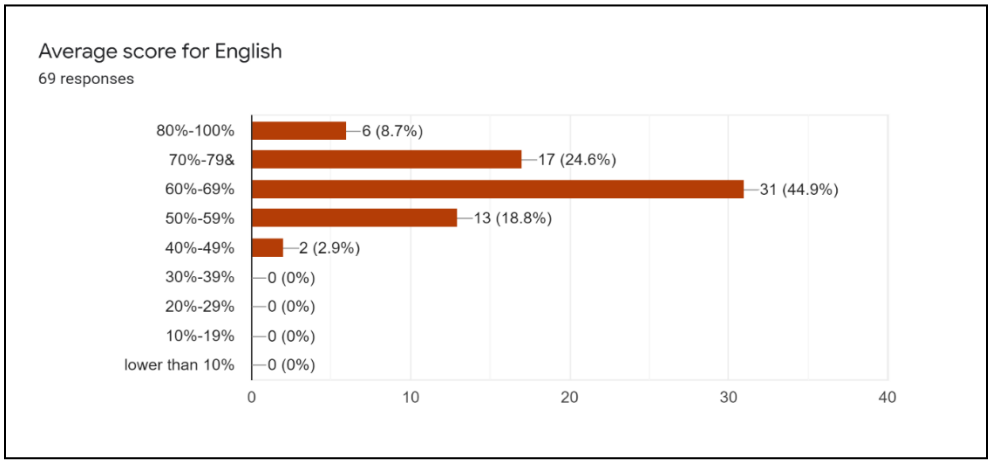

Figure 5: *Average score for English*

Figures 4 and 5 depict that the modal interval for both graphs is 60-69%. This could mean that learners' literacy skills are at the same level as their academic performance in Mathematics. A 60-69% for both subjects could be perceived as a relatively acceptable mark, but one must keep in mind that receiving a 60% means that there is still 40% of the subject that the learner did not comprehend or was not able to master.

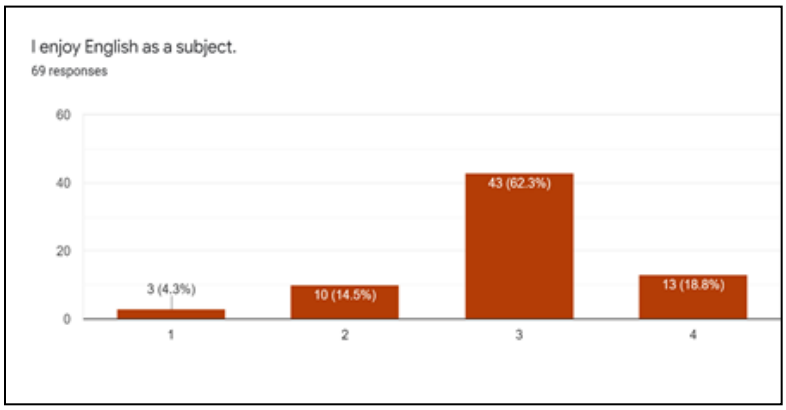

Figure 6: *Enjoyment of English as a subject*

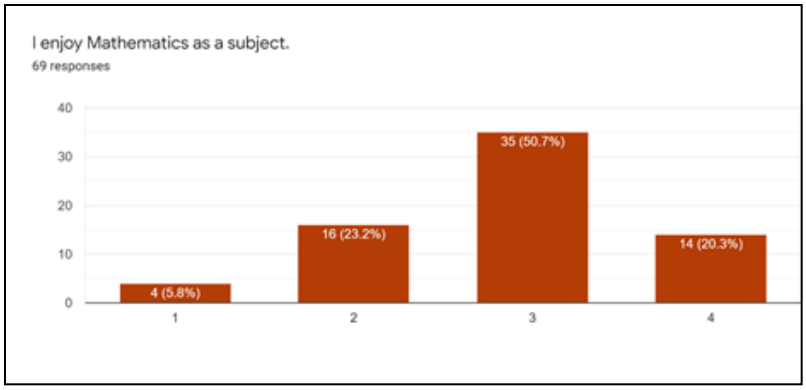

Figure 7: *Enjoyment of Mathematics as a subject*

Figure 6 indicates that 62.3% of learners agreed with the statement of enjoying English as a subject with 18.5% strongly agreeing that they enjoyed English as a subject. Figure 7 specifies that just over half the learners, 50.7%, enjoy Mathematics as a subject with 20.3% strongly agreeing that they enjoy Mathematics as a subject. This being said, it is evident that there is a matter of enjoyment within both classrooms. Learners tend to have a positive attitude to both subjects with over half the learners enjoying both subjects.

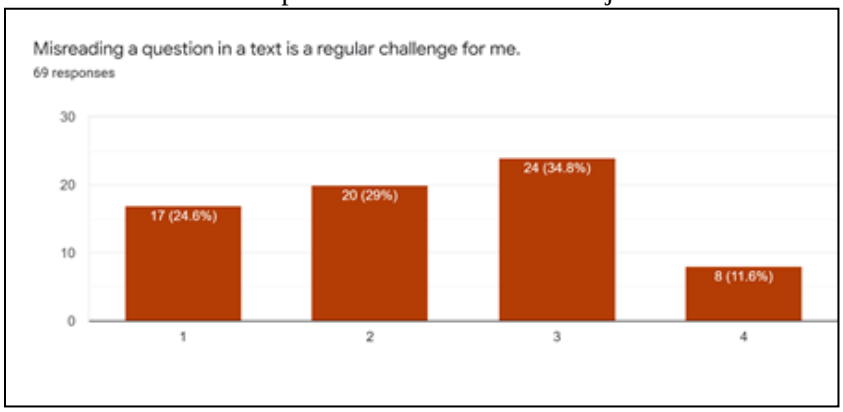

Figure 8: *Challenge of misreading a question*

Figure 8 reveals that a third of the learners (34.8%) surveyed agreed with the statement that they often find themselves misreading a question with 11.6% strongly agreeing. However, 20% and 24.6% disagreed or strongly disagreed respectively that misreading a question in a text is not a regular challenge.

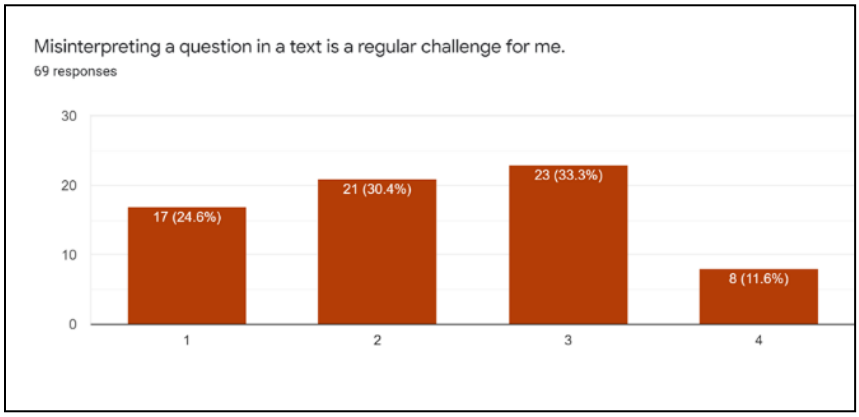

Figure 9: *Challenge of misinterpreting a question*

In addition to the results presented in Figure 8, Figure 9 indicates that 33.3% of learners agreed and 11.6% strongly agreed with the statement that they often misinterpreted a text. In contrast, 30.4% and 24.6% of learners respectively disagreed or strongly disagreed with the statement.

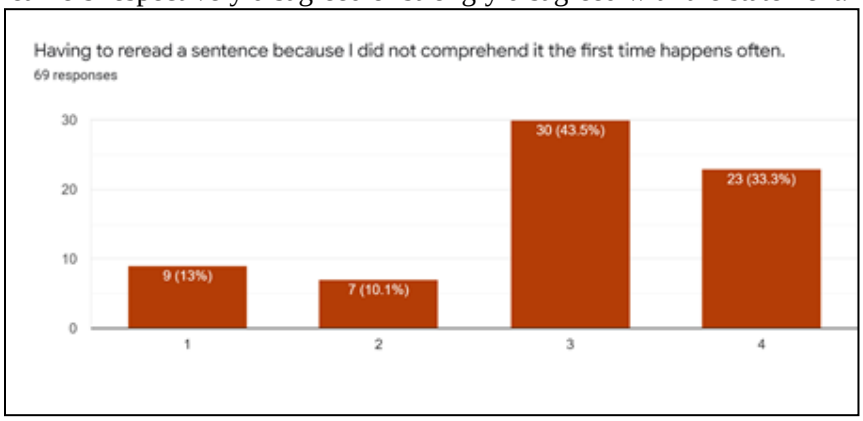

Figure 10: *Need for rereading*

The results presented in Figure 10, indicate that 43.5% of the population agree and 33.3% strongly agree that they often find themselves having to reread a sentence before being able to comprehend what is being stated. Interestingly, only 10.1% and 13% of the population disagree and strongly disagree with this statement.

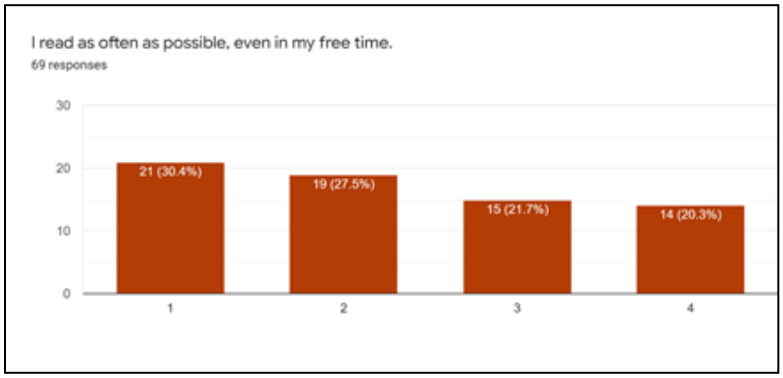

Figure 11: *Reading habits*

Results presented in Figure 11 almost seems to be spread out evenly ranging from 30.4% of learners strongly disagreeing that they read often, even in their free time, 27.5% merely disagreeing, with 21.7% agreeing and 20.3% strongly agreeing that they read as often as possible, even in their own time. Though close, the majority of the population still admitted to not reading often

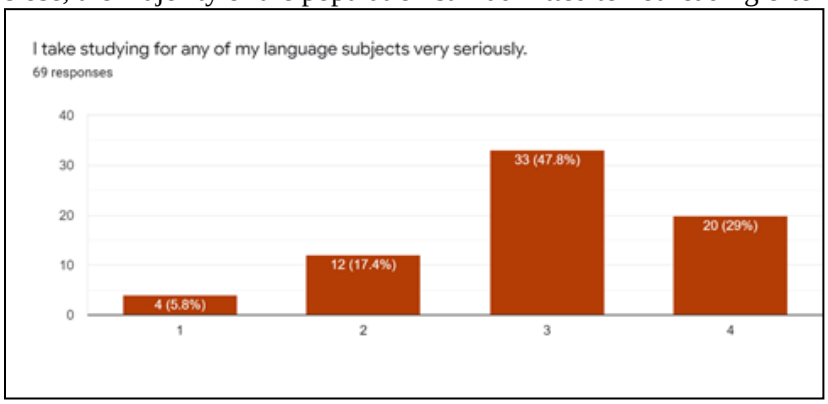

Figure 12: *Attitude to studying*

Figure 12 illustrates learners' attitude to studying with 76.8% of the learners either agreeing or strongly agreeing to taking their studies seriously when studying for a language subject.

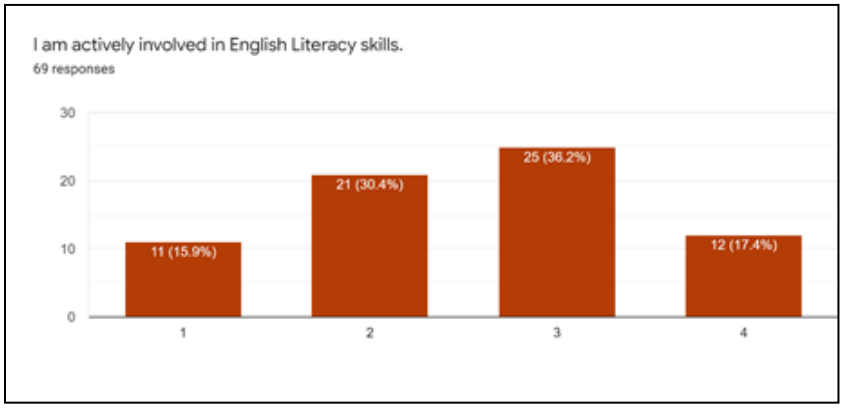

Figure 13: *Developing English literacy skills*

Figure 13 provided results which, once again, do not show a clear majority of the one over the other. The results indicate that 53.6% of learners agree or strongly agree that they are actively involved in developing and enhancing their English literacy skills, whereas 46.3% either disagree or strongly disagreed respectively.

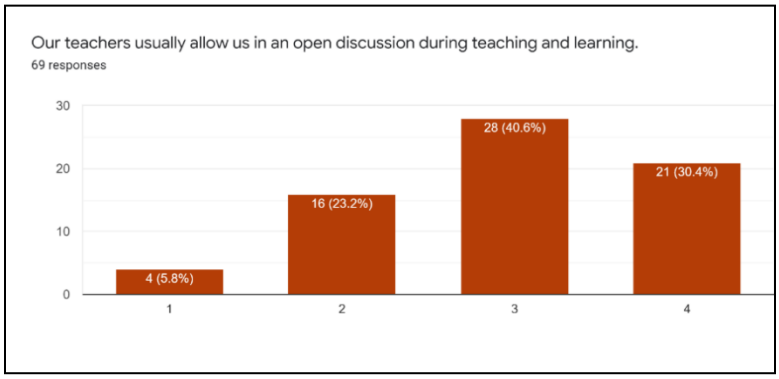

Figure 14: *Open discussions during teaching and learning*

Figure 14 show that 40.6% of learners agree that their teacher allows them to have open discussions which enhances the teaching and learning atmosphere. Some 30.4% of learners strongly agreed to the statement.

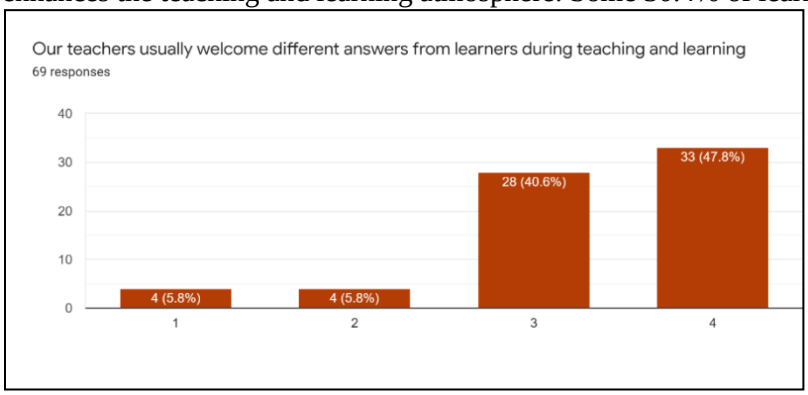

Figure 15: *Answering during teaching and learning*

In Figure 15, an overall 88.4% of learners agreed or strongly agreed that that their teachers are welcoming and open to receiving different types of answers in the classroom. The majority of learners strongly agreed with the statement (47.8%).

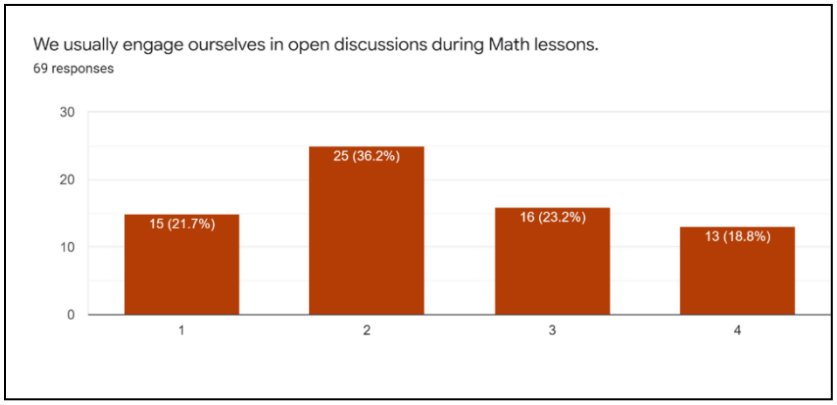

Figure 16: *Open discussion during Mathematics lessons*

Figure 16 indicates that 36.2% of learners reported that they do not truly engage in open discussion during a Mathematics lesson. Furthermore, 21.7% strongly disagree with the statement.

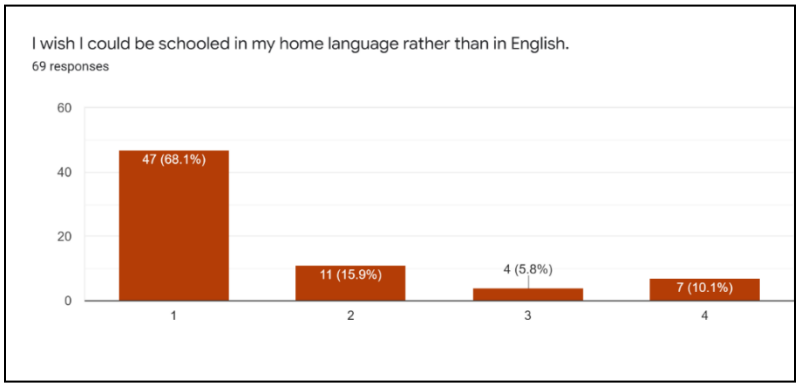

Figure 17: *Schooled in home language*

The researcher found the results depicted in Figure 17 truly interesting. The majority of the participants, 68.1% strongly disagree with the possibility of being schooled in their home language if they had the choice.

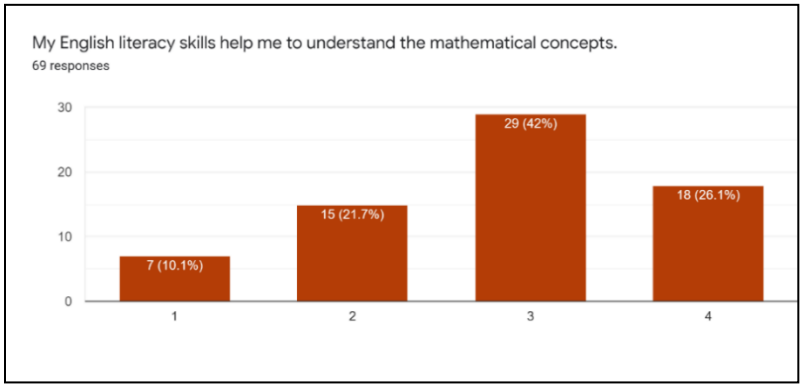

Figure 18: *English literacy skills and mathematical concepts*

In Figure 18, 42% of learners agree and 26.1% strongly agree that their English literacy skills play a vital role in helping them understand their mathematical concepts.

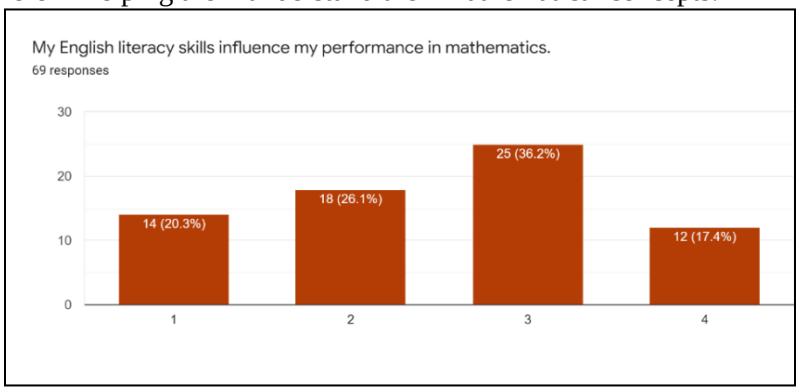

Figure 19: *The influence of English literacy skills on Mathematics*

Figure 19 indicate a spread of results amongst the learners. Some 36.2% of learners agree and 17.4% strongly agree that their English literacy skills influence their performance in Mathematics. However, there are learners (46.2%) who do not feel that their English literacy skills have an influence on their mathematics performance.

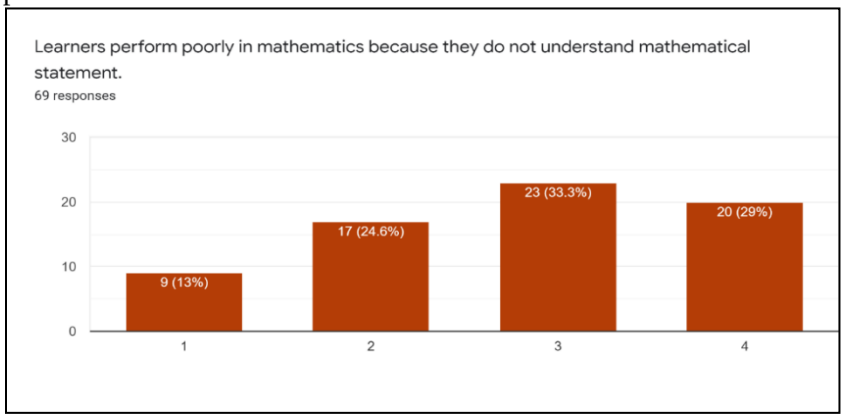

Figure 20: *Understanding mathematical concepts and performance*

When conflating the agree and strongly agree results of Figure 20, 62.3% of learners agree that they often perform poorly in Mathematics because they do not understand the mathematical statements.

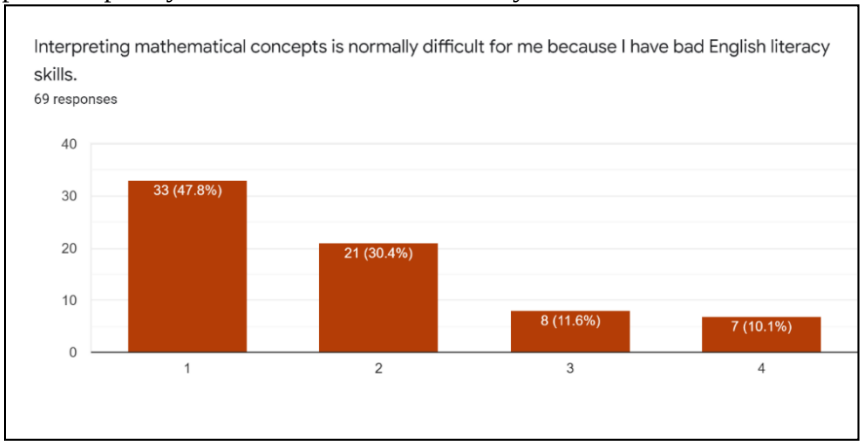

Figure 21: *Interpreting mathematical concepts*

Figure 21 illustrates that a majority of learners either strongly disagree (47.8%) or disagree (30.4%) with the statement. This leads to the conclusion that learners do not find it challenging to interpret mathematical concepts because of bad English literacy skills.

Discussion of Findings

The data were gathered and analysed with the aim of being able to answer the primary research question. In order to answer the primary research question, the researcher designed secondary research questions. Within the questions of the survey, the secondary research questions were indirectly addressed and answered.

Secondary Research Question One

What is the average level of reading literacy skills amongst Grade 9 learners?

The findings relating to this question were presented in Figures - 10. It can be intimated from Figures 6 and 7 that learners generally enjoy English and Mathematics as subjects. Figures 8 and 9 represent results on misreading and misinterpreting questions. The results are fairly even, although the majority of learners feel that they do tend to misread and misinterpret questions in Mathematics. Figure 10 is interesting in that although many learners believe that they do not misinterpret or misread question, a large majority of the population admitted that they do need to reread questions in order to comprehend the task or statement. This shows that learners' average literacy skills are not exactly at the level where they need to be in order to perform optimally in Mathematics. Misreading and misinterpreting a question leads to an answer that is not sufficient in receiving all the possible marks that can be rewarded. Having to reread questions mean that learners lack concentration and possibly waste time. This finding aligns with Henry et al (2014) who found that learners may achieve a low score on a Mathematics assessment due to the fact that they did not understand the wording of the questions. This may be due to the fact that learners might not advantage to enough assistance from their parents/caregivers or might not be borne from homes or grown up in a home where reading is seen as important or where parents lead with example by reading much themselves, tend to gain various literacy skills from a young age. This confirms the findings from Hemmerechts, Agirdag and Kavadias (2017), who stipulate that parents or caregivers who involve their children with literacy activities transmit the value of reading to their children. Furthermore, Henry et al (2014) state that low Mathematics scores are a result of a lack of "content mastery, limited English proficiency, or both." The lack of literacy skills is problematic, since it leads to an overall lower academic performance in Mathematics. Literacy skills are vital in optimally completing a test or assignment.

Secondary Research Question Two

How involved are learners in the development of their reading literacy skills?

The data gathered and presented in Figures11 – 16 provide sufficient support in order to answer secondary research question two. The learners seem to genuinely be involved in the learning of their language subjects. Over half (57.9%) of learners do, however, lack the discipline to improve their own literacy skills by reading in their free time (*cf*. Figure12). Wang and Koda (2005) note that the benefit of a repeated exposure to words in written form, is that it enhances a learner's skill of word identification. Additionally, Stoffelsma and Spooren (2019) state that the development of reading is an essential skill … "the more people read, the better they become at it" (Stoffelsma & Spooren, 2019). Within the data analysis, it can be extrapolated that the population of the study engage in their studies, enjoying both English and Mathematics and work at developing their reading literacy skills to participate fully in the quality education that is engaging and welcoming to all.

Secondary Research Question Three

What challenges do South African learners face which play a role in their English literacy skills?

Modisaotsile (2012) indicates that often the challenges learners face in a classroom are those of inadequate teacher training, lack of commitment from the teachers, poor support for learners, at both school and home,

and a shortfall in resources at the school. Though this study was not configured to identify all of the challenges, Figures17 – 21 allowed the researcher to identify possible challenges learners face due to the lack of English literacy skills. The researcher found the secondary objective interesting in that even though there will always be challenges that learners face in all aspects of education, learners do not seem to be experiencing life altering challenges when it comes to their English literacy skills. Even more intriguing, the results presented in Figure17 show that learners are not concerned about being taught in English rather than their home language. Numerous studies point to the fact that learners need to be schooled in their home language, but 68.1% of the participants strongly disagreed. The researcher acknowledges that the study was conducted with a small population comprising of a few learners at one school; however, the researcher still trusts and supports other studies where it is stated that it would be most beneficial for learners to be schooled in their home language. Probyn (2006) states that in African townships over 80% of the learners have a very limited exposure to English, apart from what they learn at school which might have a major influence on their performance in all subjects.

Primary Research Question

What is the relationship between English literacy skills and academic performance in Mathematics of Grade nine learners in South African schools?

The results of the study indicated a relationship between English literacy skills and academic performance in Mathematics. The researcher found that there was a connection between the average score that learners received in Mathematics and the average score in English, as well as, their experiences in class. The data reflected that the two depending factors of the study, a learner's English literacy skills and a learner's academic performance in Mathematics are in correlation. As shown in Figures 4 and 5, the modal intervals for both graphs were 60-69%. The researcher concludes from this that that when a learner has acquired and developed the English literacy skills necessary at their level of instruction, their academic performance in Mathematics will mirror the extent of these literacy skills. The findings in the study conducted by Stoffelsma and Spooren (2019) were very similar, in that their study confirmed that "the academic English reading proficiency of students in a non-western multilingual academic context is important for their academic achievement."

Summary of the Study

This section presents the summary of findings for the study.

- The research trusts that the data gathered and analysed revealed a relationship between English literacy skills and academic performance in Mathematics.
- Leaners' attitudes toward English and Mathematics were found to be positive and they were actively engaged in their learning.
- The relationship proves that, if a learner is actively involved in the enhancement of their English literacy skills, they will be able to achieve a good academic performance in Mathematics.
- Within the data, the researcher also found that the teachers at the school are very involved and work in creating an environment where the learners are comfortable in engaging with their peers and are actively involved in their learning. Cummins (Probyn, 2006) notes when second language learners are challenged cognitively and receive constant linguistic support, they will have the optimum conditions to thrive.

Recommendations of the Study

The study recommends that the benefits of the enhancement of literacy skills in the language of learning and teaching (LoLT) should be acknowledged by the Department of Basic Education (DBE). Ways need to be found to enhance such skills and should be implemented into the teaching programme of all schools in South Africa. Furthermore, the DBE needs to ensure that the teachers are themselves proficient in English and that professional development through training programmes for all currently employed teachers and future teachers are offered. These programmes need to develop the skills of all teachers regarding the

enhancement of literacy skills in all subjects in a creative and inclusive way. The researcher believes that more emphasis on the enhancement of English literacy skills in schools, will lead to an overall better academic performance in Mathematics. The study also recommends that schools in South Africa and the Department of Basic Education (DBE) acknowledge the importance of the enhancement of literacy skills in the language of learning and teaching (LoLT). In order to enhance such skills, programmes and mechanisms should be implemented into the teaching programme of all schools in South Africa. Furthermore, the study recommends that the DBE provides teacher training for programmes, in order to ensure that the teachers are proficiently equipped and able to participate in teaching the necessary English literacy skills to learners in an effective and creative manner.

Conclusion

The study found that there is a definite relationship between English literacy skills and learner academic performance in Mathematics. The proven relationship exhibits that learners who have acquired and developed the necessary literacy skills, obtain an academic performance in Mathematics which mirrors the extent of these literacy skills. The study concluded that there should be more emphasis on the enhancement of literacy skills in school, since this fact will lead to an overall better academic performance in Mathematics.

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