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Exploring Students' Ability to Read Mathematics Text: Case Study of Selected Secondary Schools in the Limpopo Province

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ABSTRACT This exploratory study examined the difficulties, strategies and focus areas displayed by grade 10 students when reading passages from their mathematics textbooks. A self- administered questionnaire was used to solicit data from 90 randomly selected grade 10 learners at selected high schools in Polokwane, South Africa. Data was analysed using statistical package (SPSS) version 22.0. The results were presented in the form of descriptive statistics. The results show that students had difficulties in handling mathematical text and it appears they do not benefit from reading their textbooks as much as their teachers and other stakeholders would hope. Mathematical language and vocabulary coupled by unfamiliar symbols, notations and formats in which concepts are presented were identified as the main barriers to reading mathematics text with understanding. The reading level in mathematics poses serious challenges to many students. The findings also suggest that the reading strategies used by these students were not sufficient for them to understand mathematical concepts and procedures without the teacher's guidance. Instruction or guidance in strategies that are specifically related to mathematics reading may be needed to help students deal with mathematical text.

INTRODUCTION

In South Africa there is evidence that show that there is a crisis in mathematics education (Setati 2008). With high enrolment rates each year, and increasingly poor pass rates at all grade levels, there is a clear indication that more needs to be done on the quality of teaching and learning of mathematics (Modisaotsile 2012). It has been established that a number of factors or problems hinder learners from learning mathematics with understanding. In comparison to students in other countries, South African high school students show a decrease in content-specific learning due to lack of reading skills in specific learning areas (Annual National Assessment (ANA) 2012). Takami (2009) pointed out that content area reading consists of literary reading or informational reading and is often different from the story formats the students were accustomed to seeing in primary school reading materials. The textbooks used in higher grades are designed around content, and if they are to be understood, the students must possess content area reading skills.

A number of researchers have focused on other aspects of mathematics textbooks such readability (Johansson 2003; Brändström 2005; Österholm ý2006) and very little research has been undertaken about learners' reading and comprehension of mathematical texts in learning situations (Selden ý2013). Shanahan and Shanahan (2008) noted that one of the barriers for students who do not perform well in mathematics or problem solving may be their inability to read. There is a lack of research on content area reading strategies related to mathematics textbooks. Specifically, very little is known about how reading strategies are embedded in mathematics textbooks. Outcomes from this type of research are critical to improving learners' understanding of learners' approach to reading mathematics textbooks. In this research , the reading of mathematical text is seen as an opportunity for learning, and the reading process is investigated in order to ascertain its contributions to the understanding of how and what

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one can and cannot learn through reading mathematical texts. Therefore, emphasis is not on texts that include some given task to solve, but on texts that describe and try to convey knowledge to the learner, through definitions, theorems, proofs, worked examples and sophisticated symbols and notations.

Mathematics textbooks are written in a concise manner using symbols, diagrams and graphs. The conceptual density of mathematics text is one of the major reasons for students' difficulties (Barton et al. 2002). In addition to comprehending text passages, students need to decode and comprehend scores of scientific and mathematical signs, symbols, and graphics. Students of all ages and ability levels should be taught how to use their existing knowledge to interpret and construct mathematics meaning as they read mathematics text (Duke and Pearson 2002). However, many students lack critical reading skills and the ability to interact with text in meaningful ways. McCook (2008) noted that the vocabulary and sentence structure or syntax in mathematics textbooks is above the level of understanding of the very students for whom the textbook were written. Lacking the knowledge of how to read mathematics, vocabulary is also an obstacle for many students.

Research showed that mathematics texts present special literacy problems and challenges for learners (Lee and Spratley 2010). Learners face reading comprehension challenges in understanding word problems, difficulties in understanding the texts and graphical illustrations in mathematics textbooks. Furthermore, students are required to understand numbers, abstract symbols, and the mathematical context of words. However students' command of such academic specifics lags behind. Without this fluency, the process of acquiring mathematical knowledge through reading is more difficult (Franz 2009). The ability to read mathematics is an important skill that many students are expected to possess. Clements and Sarama (2009) noted that textbooks have the potential to be powerful tools to help students develop an understanding of mathematics. However, many students are unable to use their textbooks effectively as learning tools (Weinberg 2011). Kenyon (2000) also lamented secondary school students' limited ability to read and learn from their mathematical textbooks.

For many students the mathematics textbook is perceived mainly as a collection of problems to be solved, a source of classwork and home activities (Boaler 2013). According to Aldag and Creek (2007), most mathematics students see their mathematics book as a place to go to get the questions assigned by their teacher, not as a resource full of mathematical information waiting to be read, studied and understood. Thus the reading of the text is limited to searching questions and solutions for given tasks. This contradicts Pieters et al. (2007) who viewed reading in mathematics as a means to improved understanding and acquiring problem solving skills. Ginsburg (2009) identified poor reading skills as potential obstacle to learning mathematics. The reading of a mathematical text is thereby in itself not seen as an opportunity for learning, but only as a necessary kind of ability in order to become active in situations where learning can take place (Österholm 2006).

Most mathematical classrooms utilise the textbook and the teacher as the main sources of mathematical knowledge (Shloming 2012). However, students often find textbooks too difficult to read and to understand because of the topic-specific concepts, language, symbols and structure (Draper et al. 2005). Students tend to resort to the teacher as the main resource due to their inability to utilise the textbook.

Secondary school mathematics teachers often focus on the content and may not provide reading assistance to their students. This assumption is supported by Greenleaf et al. (2001) claimed that the students in those grades are able to read textbooks. However, Takami (2009) argued that when mathematics teachers do not include reading skills into their teaching they are maintaining the stratification of content knowledge and literacy skills, where content is reserved for those few and fortunate who can deal with the reading requirements of mathematics and where literacy skills are reserved for those few and fortunate who have gained those skills prior to entering secondary school.

Adams (2003) identifies reading in any content area as an integral part of a student's school experience. He recommended that students should be taught to read mathematics text and mathematics textbook requires a different reading style from that of fiction. Mathematics teachers need to encourage students to read and utilize the textbooks as a learning resource. Reading in mathematics is both foreign and frustrating to many students, but with patience and guidance from the teacher, all students can be guided toward independence in reading mathematics. Mathematics teachers should encourage students to read and utilize the textbook as a resource and they should inculcate this behaviour for their students within the classroom.

Teachers must be aware of students' weaknesses in reading mathematics and be prepared to help students translate mathematical ideas into statements and mathematical sentences. Cheung and Slavin (2013) stressed the importance of students being able to correctly translate written statements into mathematical sentences. She noted that students take long to acquire these abilities. Thus, mathematics teachers must take ownership for instruction of not only mathematical concepts, but also the understanding of the mathematical language. Teachers need to incorporate reading and learning strategies that help activate prior content knowledge, master vocabulary, and make sense of unfamiliar text styles" (Barton and Heidema 2002: 24).

Problem Statement

The underlying problem here is that students struggle to read mathematics text. Students struggle to read or do not read traditional mathematics books with understanding. Most textbooks contain explanations of concepts and "big ideas" to help students achieve this goal. When mathematics instructors read textbooks, these explanations seem meaningful. However, students often confess that they have difficulty reading their textbook effectively (Grabe and Stoller 2013). Lacking the knowledge of how to read mathematics is an obstacle for many students. In the long run, they do not learn to become independent learners capable of acquiring mathematics outside of school when the need arises. Students often struggle to understand the logic of stipulated definitions, examine carefully how theorems, proofs and concepts are worked through in the examples to be sure they understand the underlying logic. Students' lack of ability to read mathematic text may be one of the reasons for low achievements rates in South African secondary schools. Instructional strategies that reflect concern for reading as meaning making are rarely incorporated into the mathematics classroom. Therefore the present seeks to investigate whether the above mentioned challenges are experienced by the students under study.

Purpose of the Study

The purpose of this research was to get insights on how students actually read, and use, their mathematics textbooks, in particular, which parts of the mathematics textbooks they read, and why. Such insights on students' reading would greatly inform both research and practice**.**

Research Objectives

The objectives of this study were to:

- Identify the challenges faced by students when reading mathematics text with comprehension.
- Examine the strategies that students use to understand mathematics content.
- Explore students' ability to utilize the textbook more fully to become independent learners whether in classroom or at home or in the absence of the mathematics expert.
- To give recommendations to the relevant authorities regarding strategies that can be used in high schools to improve the understanding of mathematics text based on research findings.

Research Questions

The research investigates students' ability to read mathematics text, their strategies to enhance understanding and retention of mathematical concepts the challenge and obstacles encountered and the ability to recall what they have read in problem-solving situations. The study is specifically guided by and attempts to answer the following research questions:

1. What reading strategies are students using in reading mathematical text?
   - i. And are these strategies effective?
   - ii. What they do when reading mathematical text?
2. What difficulties or obstacles do students encounter when reading mathematics text?
   - i. Do they benefit mathematically from their reading?
3. Are students able to successfully carry out straight-forward tasks (sometimes called

examples, exercises, or problems) after reading examples explaining how the tasks should be carried out?

Conceptual Framework

Theoretical models of reading portrayed reading as a transaction involving reader, text and content. The theoretical framework that guides this research is Rosenblatt's transactional theory of reading. Rosenblatt (1985) portrayed reading as a process involving a relationship between a reader and a text, situated in the reader's context.

Rosenblatt (1985) viewed the reading act as an event involving a particular individual and a particular text, happening at a particular time, under particular circumstances, in a particular social and cultural setting, and as part of the ongoing life of the individual and the group. Therefore reading is treated as an event, and thus providing an approach consistent with the need to consider the process of knowledge transfer. The transactional approach is linked to broader theories of behaviour and scientific method that emphasises the inter-connectedness of human activity as illustrated in Figure 1.

Fig. 1. The Transactional Model of Reading

Rosenblatt (1985) pointed out two aspects to the reader's activity, that is, what they 'bring to' the event in becoming a reader and the choices or "stance" of the reader. He argued further that the reader's "linguistic reservoir" of past experiences to a reading (1994:12) would be more consistent with the transactional approach to think of the reader's past and current purposes, entering the reading process in so far as they are activated by the reader- text transaction. The reader's attention to the text activates certain elements in his/her past reading experiences that have become linked with the verbal symbols.

Literature Review

Most secondary school mathematics textbooks currently used in South Africa contain exposition, definitions, theorems and less formal mathematical assertions, graphs, figures, tables, examples and end of section exercises (Osei 2006). Often the definitions, theorems, and examples are set apart from the expository text by boxes, colours, or spacing. Figures containing graphs and explanatory captions are often highlighted. Typically there is a repeated pattern in all topics consisting of first presenting a bit of content, such as a definition or theorem and perhaps some less formal mathematical assertions, then a few closely related worked examples, and finally students are invited to work very similar tasks in an exercise. At the end authors include a glossary where mathematical vocabulary words are defined in a mathematical sense and reference pages identifying various symbols used throughout the textbook.

Despite all these friendly features of the text, students prefer using other resources other than the textbook as learning resource. Barton and Heidema (2002) identified conceptual density as a special feature of mathematical text that leads to student difficulties. Parr and Woloshyn (2013) further noted that mathematics textbooks contain many complexes of symbols that function as ideographs rather than letters. The meaning of such complexes cannot be "spelled or sounded out" while students read, as is often the case with unfamiliar words. Kendeou et al. (2011) indicated that some difficulties in comprehension can be traced to an inability to integrate what is read with prior knowledge. The spectrum of the causes could range from insufficient prior knowledge to an inability to integrate what is read with the existing knowledge.

According to Sadoski and Paivio (2012) the process of reading focuses on how the reader creates meaning as a result of the interaction, or transaction, between the text and the reader. Reading researchers have found that competent readers actively construct meaning through a process in which they interact with the words and symbols on the page, integrating new information with pre-existing knowledge structures (Kim 2011). Boelkins and Ratliff (2000) pointed out that reading encourages greater independence, and more lively interactions among students, however, the challenge is getting students to read the text.

When reading mathematical text, there is no room for an acceptable interpretation of the text other than the one intended by the author. However, Shepherd et al. (2011) indicated that formal definitions are not used by students as much as their concept images when reasoning about the abstract ideas encountered in a typical upper-level mathematics class such as abstract algebra. This suggests that reading strategies for mathematics should advocate that students actively engage in working from their concept images to the actual definitions, and vice versa, in order that they come to a reasonable semblance of the meaning intended by textbook authors (Pinto and Tall 2002). However Kudo and Bazzan (2009) noted most students struggle to make concept images during reading due to inadequate prior knowledge.

Researchers concurred that strategies that engage students in activities that can help create hooks to prior knowledge, ground concepts in concrete objects or actions, or encourage readers to use the stated definitions as opposed to their individual concept images may be more important when reading a mathematics textbook. Since mathematics textbooks often do not have many clues, beyond the definitions themselves, to the meanings of less familiar terms and symbols, students need to be especially active in attempting to understand definitions and in monitoring their comprehension.

Literature indicates that ability to read mathematical text is an integral part of understanding mathematics. Fisher and Ivey (2005) also observed that mathematics teachers need to integrate reading skills and strategies into the content and assist students with reading the subject-related textbooks. Hence, reading and reading with comprehension could be more explicitly included in the teaching and learning of mathematics. In mathematics reading appears mainly in two different forms, that is, when comprehending word problems and when reading texts without direct focus on problem solving. Reading should focus on the transfer of encoded information from written text to the reader and the comprehension of the information by the reader (Lee 2010). Reading should not be limited to 'extracting a message encoded by the author', but will be seen as a more interactive process, and will be treated as an opportunity for learning, and not merely as a potential obstacle (Österholm 2003). This view is consistent with the transactional perspective which propounds that the written text is perceived as a spring board for generating new meanings rather than as a template against which a reader's understanding is measured (Dreeszen 2009).

Researchers singled out low reading competence as a primary factor for the failure of school students in mathematics (Imam 2012). Being able to read and interpret mathematical text is a basic step in aiding memory and conceptual understanding (Metsisto 2012). Reading cannot be taken for granted if mathematics performance needs to be enhanced. Snow et al. (2005) pointed out that reading particularly at primary school level paves way to achievement as the learner progresses to higher levels in mathematics. Learning to love and value mathematics language requires a good foundation in reading. Studies by Ward (2000) revealed the existence of close association between mathematics performance and reading ability. Barton (2010) stressed that reading mathematics alone does not only involve comprehension of texts but also entails "special reading skills" which are not adopted in other subject areas. Thus, students are expected to possess an ability to decode and understand "scientific and mathematical signs, symbols and graphics", read mathematics texts arranged differently, and "interpret information" given in an unusual manner (p. 25). Wood (2010) adds that mathematics deals with natural thought and language processes as well.

A literature survey by Österholm (2004) showed the existence of special properties of mathematical texts which affect the reading in particular ways and claims that one needs to read mathematical texts in special ways for comprehension. Most students learn to read books from left to right. In mathematics, it is necessary to read from left to right, right to left, top to bottom, bottom to top, and diagonally.

There have been a number of calls for teachers to guide students on how to read mathematics (DeLong and Winter 2002; Bratina and Lipkin 2003). Researchers suggested a five-step approach that learners should follow when reading mathematics text which include reading the mathematical development, working through the illustrative examples, working the matched problem, reviewing the main ideas in the section and working the assigned exercises at the end of the section. Furthermore, no mathematics text should be read without pencil and paper in hand; mathematics is not a spectator sport (Hatfield 2011).

RESEARCH METHODOLOGY

To explore students' ability to read mathematics text and comprehension, an empirical study was undertaken. The quantitative research method was used in this study. The researchers used a quantitative approach because, as noted by Terera and Ngirande (2014), quantitative research design allows the researcher to answer questions concerning the variables identified with the purpose of explaining the phenomena. Quantitative designs, on the other hand, deal with a large number of respondents, use numbers to generalise comparisons and conclusions about populations (Rubin and Babbie 2013). It was for this reason that a quantitative approach was chosen.

The Sample

The population for the study comprised of 120 grade 10 students from a selected high school in South Africa. A probability sampling procedure was used and a simple random sample consisting of 60 males and 30 female learners was drawn.

Data Collection

A self-administered questionnaire was used to solicit data in this study. A 5-point Likert–scale type questionnaire was constructed to meet the criteria recommended by de Vos et al. (2006). The questionnaire was divided into three sections. Section A dealt with the classification of respondents' biographical details and utilized a nominal scale of measurement, using three categorical variables. Aspects covered included: age, gender and home language.

Section B contained items developed to measure respondents' ability to read mathematics text as well as the difficulties that students encounter in trying to understand mathematical text. The section also solicits information pertaining to the strategies used by students as they go through a mathematics text. Section C deals with issues related to students' area of focus when reading a mathematics text. Five areas were identified: definitions of terms, theorems and proofs, worked examples and tasks, prior knowledge about a new topic and mathematical symbols and notation.

In order to pre-test the questionnaire, it was given to four mathematics experts and two high school teachers to check the validity of the questionnaire. It was also given to a statistician to ascertain the practicality of the instrument in terms of response categories and items for statistical analysis.

Data Processing and Analysis

The returned questionnaires were inspected to determine their level of acceptability. They were edited where necessary and coded. A statistical computer package, SPSS version 22.0, was used to process the results from the respondents. The techniques used during data analysis included descriptive statistics (measures of central tendency and graphical displays).

RESULTS

Response Rate

A follow up of the questionnaires showed a good response rate from the research participants. At the end of the data collection phase, the total number of the completed questionnaires was 90. Given that the sample size of the study was 120, this represented a response rate of 75%. This was considered sufficient enough to continue with the analysis of the data as eluded by Bryman and Bell (2011) who posit that a response rate above 60% is acceptable.

Table 1 presents the demographics statistics of the sample. The majority of the respondents, 60 (67%) were females while 30 (33%) were male. In terms of the age, 57(63%) of the respondents were in the age group 11-15 years, followed by the age group 16-20 years with 33(37%) respondents.

Table 1: Demographic variables

Variable	*Frequency*	*Percentages (%)*
Gender		
Male	30	33
Female	60	67
Total	90	100
Age		
11-15 years	57	63
16-20 years	33	37
21 years and above	0	0
Total	90	100
Home Language		
Sepedi	66	73.3
Sotho	3	3.3
Venda	5	5.6
Shangane	16	17.8
Total	90	100

Sample Descriptive Summary

Results from the reading strategies in Table 2 indicate that students learn mathematics mostly

Table 2: Mathematics text reading strategies and difficulties

Item	*Question*	*Mean*	*Standard deviation*
Strategies			
7	The mathematics textbook helps me to complete my tasks.	2.22	1.1877
8	Reading over the lesson before we discuss helps me to understand the mathematics concept	2.87	1.0621
9	I set purposes for reading by asking questions about what I want to learn (know) during the reading episode.	2.11	1.1940
10	Class and peer discussions help me to understand the mathematics material.	1.80	.8767
11	I build enough background by activating appropriate prior knowledge about what I already know about the topic	2.04	.8464
12	Reading helps me to ask knowledgeable questions in class.	2.71	1.0520
14	The types of questions that I ask have changed because of reading the mathematics text.	2.84	1.1209
19	My teacher(s) reword or interpret mathematics problems for the students	1.83	0.8513
20	It helps me to learn mathematics by taking notes or using my reading textbook.	1.69	.8695
21	It helps me to learn mathematics text by discussing after reading.	1.81	.8058
22	It helps me to learn mathematics by having my teacher explain the examples me.	2.08	1.7041
24	I learn math mainly from the textbook	3.07	2.4255
25	I learn mathematics mainly from form my teacher.	1.32	1.1301
Difficulties			
4	I can read and understand the majority of content found in my mathematics textbook.	2.289	.9025
5	I can understand the vocabulary in mathematics textbook.	2.444	.9008
6	I can reword/ rephrase the majority math content in my textbook into my own words.	2.600	1.0145
13	I can't find answers to my questions in my mathematics textbook.	3.489	3.2576
15	Unfamiliar words sometimes put me off when I am reading mathematical text	2.244	1.1048
16	Some of the unfamiliar symbols, words, notations, and formats in which numbers and concepts appear can be confusing.	2.356	1.2207
17	I often get confused when reading math concepts	1.978	1.2980
18	I am able to go through an exercise that follows immediately after textbook explanations and worked examples	3.011	1.0111
23	The reading level is too hard for me.	3.389	1.0461
Specific Difficulties			
26	When reading through sections in your text book, what do you look most?	2.611	.9909
27	When reading through sections in your text book, what do you least look at?	3.022	1.3981
28	As you read through a mathematics section, do you ever get confused? What confuses you most? How have you been able to become unconfused?	3.656	1.4852

from their teacher either by taking notes or through explanations from the teacher (*M*=1.32, *SD*=1.1301). The textbook is only useful if the teacher is available to interpret it for the students, otherwise it is a source of homework, tasks and activities. Students indicated that they prefer class or peer discussion to understand concepts rather than extracting them from the textbook (M=1.80; SD=0.8767). The least preferred strategy involves learning mathematics from the textbook (*M*=3.07; *SD*=2.4255). Results also show that students do not read mathematics text in advance (M=2.87; SD=1.0621) but use the text to relate tasks to worked examples.

In trying to answer the research question 2 which investigated the difficulties or obstacles that students encounter when reading mathematics text, the results in Figure 2 show that many students struggle to use their textbooks to solve problems which immediately follow af-

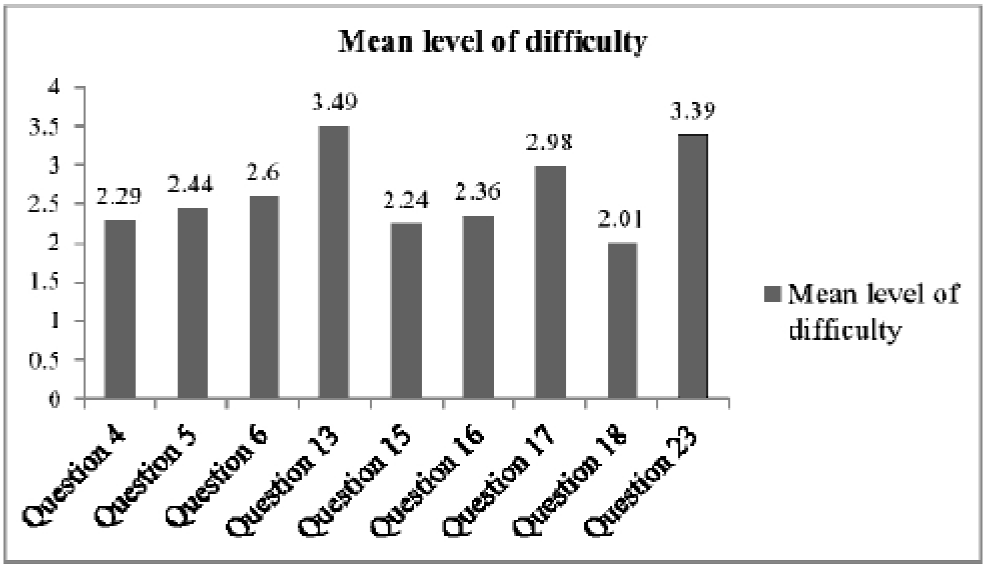

Fig. 2. Mean Level of difficulty

ter textbook explanations and illustrations as depicted by a *Mean* of 3.49. This is consistent with Wiest (2003)'s findings regarding the challenges faced by students in reading mathematics text. Another closely related difficulty reported by students was their inability to read mathematics text with understanding (*M*=3.39). They reported that the reading level in mathematics was too hard for them. This might be due to the dense structure of mathematics text as pointed out by Österholm (2006). Other constructs which also indicated mild to moderate difficulties includes symbols and notation (*M*=2.36) and unfamiliar vocabulary (*M*=2.44). As a follow up to research question number three, the above summary of results indicate that students were unable to go through problems that follow immediately after textbook explanations and illustrations.

The results from Figure 3 pertain to what students' look at most when reading a mathematics text. Results indicate that most students pay special attention to the symbols and notation 41(46%) used to develop the mathematical concept rather than the concepts itself. Definitions of terms and illustrative worked examples received little attention 9(10%). This is in sharp contrast with Edwards and Wards (2009) who coined that definitions play a significant role in the students' understanding of mathematics concepts. Edwards (2008) also emphasized that definitions are often used as a vehicle toward a more robust understanding of a given concept. The words of a formal mathematics definition incorporate the essence of and completely specify the concept under discussion. However the respondents in this study seem to pay little attention to the meanings of the concepts which they are trying to understand.

With regard to the nature of mathematic text, the majority 41(45%) of the respondents revealed that mathematical symbols and unfamiliar notation were the most confusing features of a mathematical text (Figure 4). Students reported that unfamiliar notations and symbols sometimes put them off and they resort to memorization of procedures without understanding the concepts. Theorems and proofs were also identified as another major cause of great confusion when going through a mathematical text 20 (22%). Mathematics involves understanding the laws behind numbers, algebra and geometry (Marcus 2010). Being able to navigate through proof may indicate that a student has thoroughly understood the problem.

DISCUSSION

The findings from this study indicate that the majority of the students experience difficul-

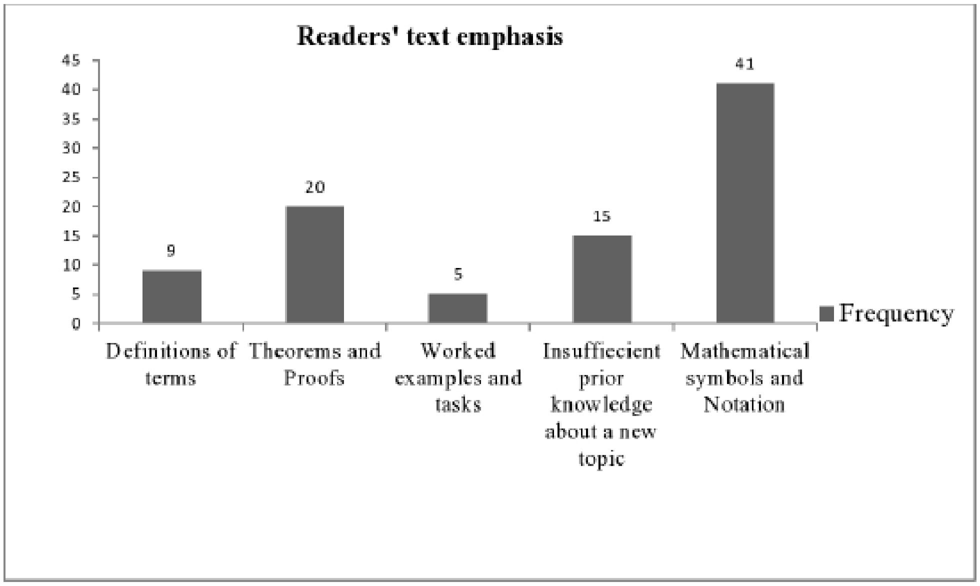

Fig. 3. Readers' emphasis when reading mathematics text

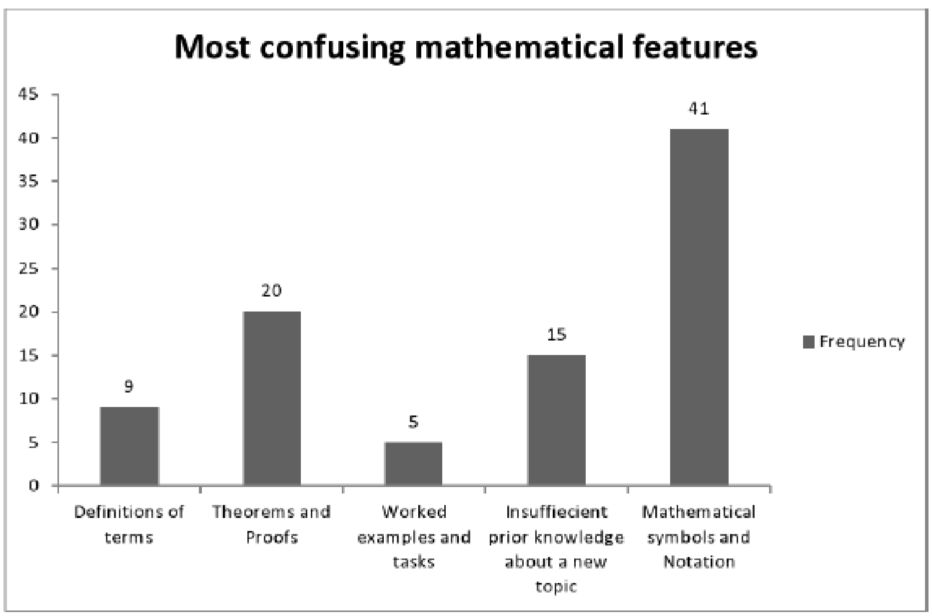

Fig. 4. The most confusing aspects of mathematical texts

ties with unfamiliar symbols, notations, words and formats in which numbers and concepts appear in mathematics textbooks. Independent learning using textbooks as resources seems to be a tall order for many students. Respondents confirmed that very little learning takes place outside the mathematics classroom due to their inability to handle mathematical text.

Findings from this research indicate that students perceive their teacher, not the textbook, as the main source of knowledge. Students find their teacher easier to understand than the textbook. Students put the responsibility for acquiring the information contained in the text squarely on their teachers' shoulders. They expect the teacher to reword or interpret mathematics phrases, symbols, concepts problems for them. However other researchers (Bennett 2013; Alvermann et al. 2013) have reported that in some content area classrooms, it is the custom for teachers to use the textbook as a "safety net" something to fall back on rather than as a vital link and a basis for class discussions.

CONCLUSION

This study has explored the difficulties and strategies that secondary school student's encounter in their attempt to use textbooks as resource. Many secondary school students could benefit from some instruction in how to read a mathematics textbook. Secondary school mathematics educators may need to encourage their students to become more active in reading. This might include getting students to activate their prior knowledge, teaching students strategies to help them integrate what they are reading and learning with prior knowledge, getting students to approach definitions as stipulative rather than descriptive, and teaching students how to construct their own examples and non-examples by carefully consulting the formal mathematical definitions of concepts, understanding mathematical concepts by working from the definition and applying theorems during problem-solving.

Teachers need to encourage students to start the learning process in mathematics by pre-reading the material before class discussions in order to have a foundation upon which to build new knowledge. This experience gives students a base upon which to build, help them derive questions to interject during class discussions. Teachers must be aware of students' weaknesses in reading mathematics and be prepared to help students translate mathematical ideas into statements and mathematical sentences that are equivalent to the original problem. Thus, mathematics teachers must take ownership for instruction of not only mathematical concepts, but also the understanding of the mathematical language. Classroom reading experiences should contribute to students' increased mathematical confidence where students will evolve from dependent learners requiring one-on-one teacher attention to independent deep-thinking mathematicians.

RECOMMENDATIONS

To learn mathematical concepts, students need to practice reading in order to understand concepts. Mathematics ideas are best expressed in written symbols, therefore it is imperative that students should be well versed with it symbolic language. By learning to read they learn how mathematics works. If students find reading the text difficult, they should recognize that they are dangerously weak at an important skill. The harder they find reading mathematics text, the more they need to work at it. Students should be encouraged to read the text and work through illustrative examples with the intention of figuring what is going on. Students should be encouraged to read mathematics with pencil and paper at hand, and to work out each line of worked examples, step by step, with the author. Results from this study indicate that mathematics teachers have a tendency of cueing up procedures, reading and interpreting statements for students, who then perform the calculations. This hinders students from developing mental faculties capable of soliciting knowledge from other sources during independent studies. Mathematics teachers must be trained in reading instruction and employ literacy as part of their skills set. They should appreciate that reading a mathematics text or problem is difficult and requires specific strategies unique to mathematics. If the intention of mathematics education is to enable students to understand mathematical concepts rather than to develop specific procedures, then teachers must train students to engage meaningfully with mathematics texts.

Based on the findings, the poor reading comprehension skills of students is also consistent with their performance in mathematics. Students need help to read and understand mathematics textbooks on their own, with the ultimate goal being that they become independent learners. Mathematics teachers do not need to become reading specialists in order to help students read mathematics texts, but they do need to recognize that students need their help reading in mathematical contexts. Teachers should make the strategic processes necessary for understanding mathematics explicit to students. Teachers must help students use strategies for acquiring vocabulary and reading word problems for meaning. Students are helped not by having their reading and interpreting done for them, but rather by being asked questions when they do not understand the text.

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