GSJ: Volume 7, Issue 11, November 2019
ISSN 2320-9186

Global Scientific JOURNALS

GSJ: Volume 7, Issue 11, November 2019, Online: ISSN 2320-9186

www.globalscientificjournal.com

THE COPPERBELT UNIVERSITY

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF MATHEMATICS AND NATURAL SCIENCES

MSc. in Mathematics Education

RESEARCH PROJECT

SUBMITTED

BY

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RESEARCH QUESTION:

INVESTIGATING THE EFFECT OF REALISTIC MATHEMATICS EDUCATION STRATEGY ON LEARNERS' ACHIEVEMENT IN MENSURATION AND ATTITUDES TOWARDS MATHEMATICS.

MAY, 2019

ABSTARCT

This study was done in order to investigating the effect of realistic mathematics education strategy on learners' achievement in mensuration and attitudes towards mathematics. This study also sought to determine the relationship between learner's achievement and attitudes towards mathematics. The design used in this study was a quasi-experimental design with a sample size of 64 grade 11 leaners of Namwala secondary school of southern province Zambia.

The sampling of participants was done in two (2) stages, i.e. the selecting of two classes out of 8 and the assigning of the two classes one as a control and the other as experimental groups. The control group had 29 participants while the experimental group had 35 participants as classes where taken as intact as they were. This study was conducted for 8 weeks. The research instruments used were the mathematics achievements test and the attitudes towards mathematics questionnaire. Data collected was analyzed using SPSS. To test the hypotheses, a one way ANOVA test was used with alpha level 5% ($\propto = 0.05$). The results showed that there was a significant difference between the Realistic Mathematics Education strategy and the traditional strategy in terms of achievements. The study further reviewed that there was no significant difference in attitudes of participants between two groups.

It can be concluded that the theory of Realistic Mathematics Education Strategy on the teaching of mensuration enhanced the achievement of learners. The Realistic Mathematic Education Strategy encourages learners to be in the center seat of the learning process as they seek to understand and link their social life experiences to classroom concepts. Therefore, the Realistic mathematics education Strategy is an effective method to improve the teaching and learning process of mensuration as pupils not only learn but see the value of the concepts in the lesson, enjoy the lesson and ultimately develop confidence in solving mathematical related problems.

DECLARATION

This thesis is a presentation of my original research work. Wherever contributions of others are involved, every effort is made to indicate this clearly, with due reference to this literature, and acknowledgement of collaborative research and discussions.

The work was done under the guidance of Dr. Chaamwe, N. at The Copperbelt University of Zambia

Name: ______________________________________

Student Identity: ______________________________

Signature: __________________________________

In my capacity as a supervisor of the candidate's thesis, I certify that the statement are true to the best of my knowledge.

Name: ____

Signature: _______________________________________

Date: ____

ACKNOWLEDGEMENT

First and foremost, I would like to thank God almighty for giving me strength, knowledge ability and opportunity to undertake this research study and to persevere and complete it satisfactorily. Without His blessings, this achievement would have not been possible.

I further take pride in thanking my thesis advisor Dr Chaamwe the Dean of the school of computer science at The Copperbelt University of Zambia. Your door was always open whenever I ran into trouble spot or had question about my research or writing. He consistently allowed this paper to be my own work, but steered me in the right direction whenever he thought I needed it.

I would also like to thank the experts who were involved in the validation of the research instruments for the research project. Assistant Head of department-mathematics Mr Hankombo, M., mathematics Marker of grade 12 final examinations, Ms Muntanga, M. Without their passionate participation and input, the validation survey could not have been successfully conducted.

I would like to acknowledge Mr Chibala, C. M. of the Kaleni Hill Secondary school as the second reader of this thesis, and I am gratefully indebted to him for his very valuable comments on this thesis.

It would be inappropriate if I omit Dr. Banda the Coordinator (Postgraduate School of Mathematics and Science Education) for his countless efforts in his updates and coordination during my thesis writing.

Finally, I must express my very profound gratitude to my parents and to my spouse Brenda for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without them. Thank you.

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CHAPTER 1: INTRODUCTION

1.1 Background of the Study

1.1.1 General background of mathematics in Zambia

In Zambia, Mathematics is a compulsory subject taught in all grades of education from primary to secondary level of education. Mathematics has become a basic capital for life, particularly for solving everyday problems. Mathematics has unique values such as; systematic logic, following regular and specific orders. Learning mathematics develops learners' brains a habit of solving problems systematically. Due to these values it instils in learners in the real world, they can easily provide solutions to almost every problem hence mathematics is fundamental to national prosperity in providing tools for understanding science, engineering, technology, economics, social and natural science problems. It is also essential in public decision making and for participation in the knowledge of economy (Curriculum Development Centre (CDC), 2013).

Mathematics at the same time tends to equip learners with uniquely powerful ways to describe, analyse and change the world. It is because of such values that Zambia as a country has reformed its educational curriculum to suit her developmental agenda. In the change of curriculum mathematics was not an exception. The cry of Zambia is to have the education system that produce secondary school graduates who impact society positively in an effectively manner.

The CDC (2013) adds that; "The syllabus has been reviewed in line with the Outcome Based Education principles which seek to link education to real life experiences that give learners skills to access, criticize analyse and practically apply knowledge that help them gain life skills. Its competences and general outcomes are the expected outcomes to be attained by the learners through the acquisition of knowledge, skills, techniques and values which are very important for the total development of the individual and the nation as a whole"

From this quote it is clear that the learners after leaving school should be well equipped with knowledge which enables them impact society unlike the kind of learners who have just memorised theories but can't apply them in life.

Since mathematics develops learners' higher order of thinking, it is justifiable for Zambia to have made it compulsory both at primary and secondary level. But the unfortunate reality is that learners are afraid of learning mathematics and most of the times they avoid it. This suggests that teachers need to do some reflection on mathematics learning to make it more interesting and fun for learners.

1.1.2 Background of the problem

Mensuration is one of the topics in mathematics which links the learners' classroom experiences to everyday life activities. Mensuration refers to the part of geometry concerned with ascertaining lengths, areas, and volumes. So if it deals with measurements and human activities which are inseparable with measurements, it is very important therefore that, learners as they leave school should comprehensively understand mensuration and be able to apply the concepts in the day-to- day living.

Many professions and tasks today require and use geometrical concepts and its associated techniques. Besides architects, surveyors and navigators, all of us use it in our daily lives — for example, to describe shapes of objects, directions on a car trip and space or position of a house. For engineers to come up with a bill of quantity let's say for a road or building, they have first of all to look at the length, area and volume of the structure. In other words its geometric knowledge required to come up with proper materials and right quantities needed. The most common volumes considered in the real world are the volumes of prisms, pyramids, spheres and objects which are a combination of these. For example, country people who rely on tank water need to know the capacity (volume) of water that the tank is holding

(Morris, 1994). Also geometry is applied in cartography. The concept of similarity helps cartographers to refer to maps for specifying locations or for establishing distances between two locations. Maps are a reduction of lengths in real life; that is, they have the same shape as the original but are much smaller in size. A measure of the amount of reduction is the map scale.

There are many practical applications of similar triangles in the real world. It is particularly useful for determining the lengths of inaccessible features such as the height of tall trees or the widths of rivers (Charles, 2014).

Further, check gives an idea that as much as learners come to school to learn mensuration, the concepts they come to learn in class are already what they do and what just lucks is scientific knowledge and application. For instance, when preparing Nshima; the quantity of water put in the pot should much with the number of people being prepared for. All these examples just shows us the importance of mensuration in our lives; hence much care is needed when teaching learners in order for them to appreciate and be able to be logical and responsible in their action and behaviours.

1.2 Statement of the Problem

Problems related to learning Mathematics are a common phenomenon among learners around the world (Fennema and Shermann, 1976). This holds true in the Zambian context too. A number of factors do influence learner's Mathematics achievement positively or negatively. One among these factors is learner's attitude towards Mathematics. Many scholars have argued that, there is a direct relationship between Mathematics achievements and attitudes (Aiken, 1970; Johnson, 1984; Sherman, 1980; Tsai and Walberg, 1983).

This attitude is promoted by the method of teaching used in classrooms by teachers as mathematical concepts are repeatedly taught in an abstract manner. Hence when it is time for mathematics, learners would rather abscond from the lesson or stay in classrooms to avoid the consequences of absenteeism hence start dozing during the lesson or decide to take an inactive role in the learning process as a sign of not being interested. The reason learners exhibit this attitude towards Mathematics is that, they are not able to see its relevance in daily life or in relation to other sciences, and hence the feeling that why learn it if it has no use. This kind of thinking prevails among most learners (Fennema and Sherman, 1976).

This thought and feeling has negatively affected the performance of learners in mathematics and Namwala secondary school is non exceptional. According to ECZ (2014) examination report which shows that the mean performance in the 2014 Mathematics examinations at Grade 12 was 17.4% as compared to 26.5% in 2013, showing a decline in performance.

And also the mean performance for the subject in 2015 was 17.4 % and in 2016 was 24.39 %. This shows that there was an improvement in mean performance in the 2016 examination of 6.99 % points. In 2017 there was equally an improvement with mean performance of 28.29% compared to 24.39% of 2016 giving the difference of 3.9%. Even though performance at Grade 12 improved, generally this performance is still poor because it is below 30 percent (ECZ, 2016, 2017).

This national picture above holds true for Namwala secondary school too as there has been a decline in mathematics results at grade 12 final examination from 67% in 2015 to 57% in 2016 and 48% in 2017. In 2018 the performance further dropped to 47.4%. Mensuration on average contributes to the grade 12 final examination about 12 marks from both paper one and paper two which is about 6.7%. Hence as a teacher one needs to use effective method in teaching which meets the needs of every child. With regards to the above problem, this study will seek to use the theory of realistic mathematics education in addressing the challenge. CDC (2013) adds that, "The teaching of Ordinary Level Mathematics should expose learners to practical applications of mathematics in everyday life. Learners should be exposed to do more of practical work as much as necessary through contextual reference to the local environment."

1.3 Purpose of the Study

This study sought to explore the effectiveness of realistic mathematics education strategy on the teaching of Mensuration and the attitude that learners have towards learning of mathematics. The study was meant to identify the attitudes held by selected learners towards mathematics. It further investigated the impact of learners' attitudes on the learning of mathematics.

1.4 Research Objectives

1. To determine whether there is a statistically significant difference in learner's achievement in Mensuration using the RME strategy compared to traditional strategy.
2. To determine whether there is a statistically significant difference in learners' attitudes towards Mensuration using the RME strategy compared to traditional strategy.
3. To determine whether RME strategy has an effect on learners' attitudes towards the learning of Mathematics compared to traditional strategy.

1.5 Research questions

1. Is there a statistical significant difference in learner's achievement in mensuration using the RME strategy compared to traditional strategy?
2. What are learners' attitudes towards Mensuration using the RME strategy compared to traditional strategy?
3. Do learners' attitudes towards Mathematics have any impact on learning of mensuration?

1.6 Hypotheses of the study

The following are the research hypotheses which were tested.

H_o: There is no statistical significant difference in learners' achievement in mensuration using the RME strategy compared to traditional strategy.

H_1: There is significance difference in learners' achievement in mensuration using the RME strategy compared to traditional strategy.

H_o: There is no statistical significant difference in learners' attitudes towards mathematics using the RME strategy compared to traditional strategy.

H_1: There is a difference in attitude towards mathematics between learners learning mathematics using RME and traditional strategy.

1.7 Significance of the study

The researcher hopes that, the findings of this study will be helpful in understanding the difficulties that learners face as they learn mathematics at Namwala secondary school and ultimately reduce the low performance of learners in mathematics by suggesting better ways of imparting knowledge to learners. Further, the researcher hopes that the findings will shade more light on the use of RME strategy in teaching mensuration and other abstract concepts which are practiced in society where learners come from. Findings will also in one way or the other help those who are in administration at school level to change the mind set on how they perceive mathematics through resource allocation in buying learning and teaching materials which promote RME strategy. This equally applies to learners on how they should perceive and comprehend mathematics beyond the book and classroom scenarios both in application and understanding. Also the findings will add to the field of literature for future studies and reference on the RME strategy.

1.8 Delimitation of the study

This study was delimited to only one secondary school located in the rural town of Namwala. The population of the study was restricted to grade 11 learners of Namwala secondary school only due to the topic chosen which is taught in grade 11 at the school. The study was planned to be finalized in six months.

1.9 Limitation of the study

The duration of the study planed was for 6 months in which the research would administer the questionnaires, achievement tests as tools for data collection and do the analysis. The resources and time frame for the study to be conducted limited the researcher to cover a large sample which would have required more resources and longer period.

1.10 Theoretical framework

This study was derived from Jerome Bruner's theory of discovery learning. The principles of this theory are that learning is an active process and the learner should be actively involved in the learning process. Discovery learning takes place in problem solving situations where the learner draws on his/her own experience and prior knowledge and is a method of instruction through which learners interact with their environment by exploring and manipulating objects, wrestling with questions and controversies, or performing experiments (Balim, 2009).

1.11 Operational Definition

Realistic Mathematics (RME) Strategy – will mean a domain-specific instruction theory for mathematics which promotes teaching and learning of mathematics using learners' daily activities experience.

Traditional Strategy- kind of teaching based on chalk and board

Attitude- the interest and feeling in learning mathematics

Mathematics achievement - Learner's performance in Mathematical tasks.

Learning - Relatively permanent change in behaviour as a result of such experiences like; exploration, observation and practice.

Contextualisation- The education process which relate the lesson to a particular setting, area or environment of application to make the competencies relevant, useful and meaningful to the learner.

CHAPTER 2: ANALYSIS OF RELATED LITERATURE

Meaningful learning is a process through which new knowledge is absorbed by connecting it to some existing relevant aspect of the individual's knowledge structure (Orton, 1992). One of the reasons why learners attitude towards Mathematics is negative is that learners are not able to see its relevance in daily life or in relation to other sciences, and hence the feeling that why learn if it has no use prevails among most learners (Fennema & Sherman, 1976:14). This attitude is developed due to lack of localising the learning process by teachers to the environment familiar by the learner. For instance, the examples given during learning mostly are rarely linked to daily activities learners do when out of school time.

In most African schools the approach that is used to teach mathematics is very theoretical, and many abstract concepts and formulas are introduced without paying much attention on aspects such as logic, reasoning, and understanding (Karnasih & Soeparno, 1999; Soedjadi, 2000). This makes it difficult for learners in grasping concepts easily as they just tend to memorise them hence encountering difficulties in recalling and applying them to similar problems. Besides, the teaching learning-process is always organized in a traditional (teacher centered) way. This approach always regards a teacher as the fountain of knowledge and pupils know nothing (Somerset, 1997). The only teaching aids used in the above mentioned method are chalk and board. There is lack of mathematizing concepts by teachers so that learners find it easy to understand. As a result many learners lose interest in the subject and tend to prove the hypothesis correct told to them by their friends, guardians, brothers and relatives that mathematics is difficult.

The conditions above make mathematics more difficult to learn and understand and learners become afraid of mathematics. Moreover, the conditions also create unfavourable climate for mathematics instruction in the classrooms. In general, the climate in Zambian classrooms is similar to those in several African countries. Ottevanger (2001) adds to say that in most African schools learners are passive throughout the lesson; 'chalk and talk' is preferred teaching style; emphasis on factual knowledge; questions require only single words, often provided in chorus; lack of learning questioning; only correct answers are accepted and acted upon; whole-class activities of writing/there is no hands work is carried out. This kind of learning is mostly effective in lower grades at primary and not at upper grades where learners are able to reason.

In almost all Zambian schools Mathematics is considered as a challenging subject which cannot be understood easily and is a common phenomenon among learners, teachers and parents. This ugly picture has for some time prevailed probably because of the way it is taught in classes. But, this is true in many countries too as it can be seen in colleges the number of learners who decides to study mathematics few compared to those who chose to do other courses. Mathematics is considered by many individuals as a difficult subject to learn (Fennema & Sherman, 1976). This kind of outlook has a direct relation with achievement. Children with negative attitudes towards Mathematics have performance problems because they develop anxiety (Hembree, 1990).

A number of factors do influence learner's Mathematics achievement positively or negatively. One among these factors that contribute to variations in Mathematics achievement is attitude towards Mathematics. The direct relationship between Mathematics achievements and attitudes, as well as their reciprocal influence are well documented (Aiken 1970; Johnson 1984; Sherman, 1980; Tsai and Walberg 1983). If learners have positive attitude towards Mathematics, it is likely that they will allot a considerable portion of their study time to the subject and strive to master the knowledge and skills necessary hence be able to apply in their day to day life. Equally they tend to enjoy learning the subject and always treating as a game where they derive their pressure. This attitude encourages learners to indulge themselves into solving different mathematical problems whenever there is no teacher to attend to them while in class in stated of noise making.

Many children develop fear towards Mathematics due to their misunderstanding, non-understanding and failure during previous lessons; effort must be exerted to resolve this fear before proceeding to the next section as learners learn new Mathematical concepts and procedures by building on what they already know. Teaching is like constructing a building by putting one block over the other. If the lower block is not put properly as to carry the next block to be put on it, the whole idea of building goes

GSJ: Volume 7, Issue 11, November 2019
ISSN 2320-9186

wrong. The same is true in the education of a child; if he/she didn't understand the previous lesson then he/she can't follow and understand the coming ones. In other words, learning with understanding can be viewed as making connections or establishing relationships either within existing knowledge or between existing knowledge and new information (Hiebert & Carpenter, 1992).

Negative attitude towards Mathematics is also common among most Parents. Parents believe that Mathematics is hard to understand and they try to avoid it for their children as far as possible. Simple example which exhibits this negative attitude of Zambian Parent is their reluctance to send their children to college or university faculties which offer Mathematics as a course. They advise their children to enrol in the social science faculty where they think there are "no" Mathematics courses.

This pattern of learners' enrolment of being many in social science compared to natural science with mathematics is uniform in almost all Zambian colleges/university. Equally even in schools you will find that mathematics department is understaffed and gender biased. One of the purposes of teaching Mathematics is to equip the learner with knowledge and skills to live effectively in this modern age of Science and Technology and to enable the learner to contribute to the social and economic development of the nation. This is why Mathematics is examined at Grade 7, 9 and 12 levels of education in Zambia. It is a requirement by higher institutions of learning that a candidate obtains a credit or better in Mathematics for them to be considered for training and the world of work. However, performance in Mathematics at all levels, over the years, has been poor. One major challenge faced by some candidates is lack of mastery of the content (ECZ, 2014). This problem can be attributed to the mode of lesson delivery in classrooms by teachers.

The following are the tables showing the performance of Learners country wide as shown in the 2015 and 2016 ECZ Examinations Performance Review Report respectively.

Table 2. 1 Candidature performance at grade 12 in mathematics Paper 1 and Paper 2 in 2015

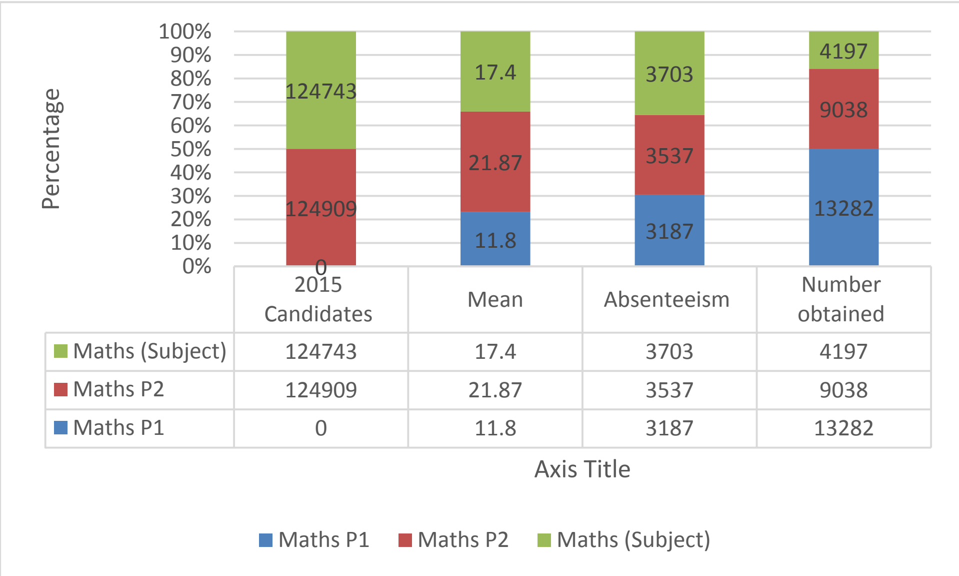


Table 2. 2 :2015 Candidature and Performance at Grade 12 in Mathematics Paper 1 and 2

Subject	Candidature in 2015	Mean % in 2015	Mean % in 2014	Maximum Mark	Highes t Mark Attain	Lowest Mark Attain	Number Absent	Number obtainin g zero
MathsP1	125273	11.8	12.7	80	80	0	3187	13282
MathsP2	124909	21.87	21.0	100	100	0	3 537	9 038
Maths (Subject)	124743	17.4	17.4	180	176	0	3 703	4 197

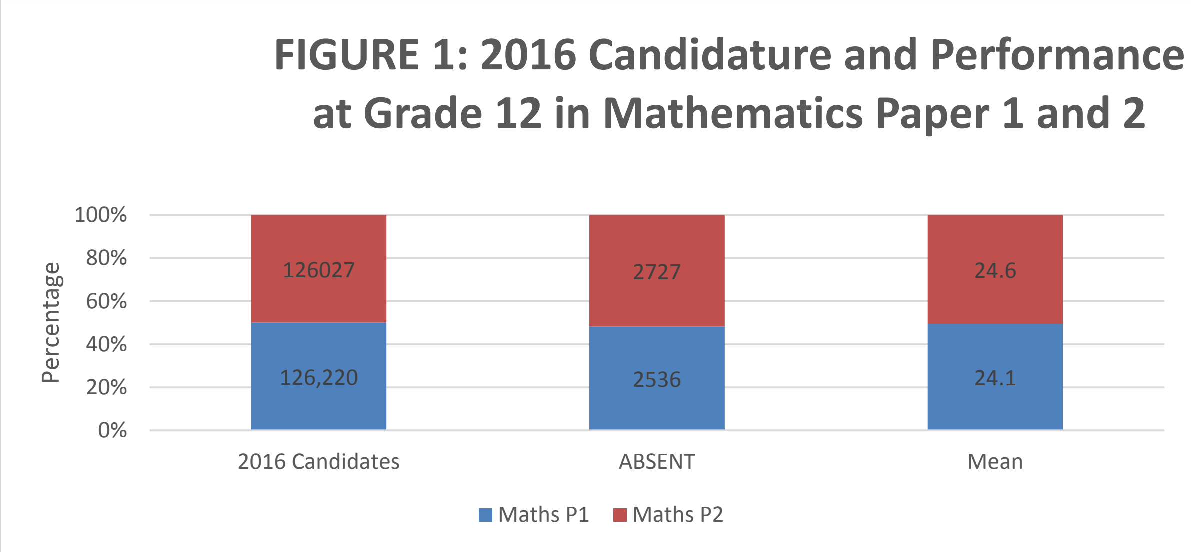


Table 2. 3: 2016 Candidature and Performance at Grade 12in Mathematics Paper 1and2

Subject	Candidature in 2016	Mean % in 2016	Mean % in 2015	Maximum Mark	Highest Mark	Lowest Mark Attain	Number Absent
MathsP	126220	24.1	11.8	80	80	0	2 536
MathsP	126027	24.6	21.86	100	100	0	2 727
Maths (Subjec	125914	24.39	17.4	180	177	0	2 839

The existing traditional way of teaching in our schools is teacher centred; the teacher is expected to do every activity while the learners are mere listeners. It doesn't give the learners a chance to learn by doing hence learning from their mistakes. The outlook of learners, that is the role of learners, is to receive Mathematical knowledge and to be able to demonstrate it; the role of the teacher is to transmit this knowledge and to ascertain that the learners have acquired it is a common phenomenon in our schools (Frank, 1988). Such views prevent learners from making their own efforts towards alternate strategies and approaches to Mathematical problems. The teacher may also develop a mistaken view of what a learner's Mathematical strengths and weaknesses are. Motivation can break down just as easily if a learner is repeatedly 'under challenged' as it can if the learner is 'over challenged' by their teachers.

The existing method of teaching in schools is old fashioned which is highly dependent on the performance of the teacher only. It is teacher centred, that is teachers are expected to explain, demonstrate, illustrate give detailed note and the learners have a minimal participation in the teaching learning process (Dean, 1982). Engagement and motivation are critical elements in learner success and learning. Engaged learners learn more and retain more, and enjoy learning activities more than learners who are not engaged (Akey, 2006). In subjects like Mathematics learners benefit more from active participation and they can learn more things by doing than listening only to the teacher, they can learn more from their peers and advantaged from group dynamism.

Ausebel in his theory of meaningful learning explains that meaningful learning takes place when a learner's new knowledge relates to the already existing knowledge in his/her cognitive structure. The pre-existing knowledge structure in an individual is the building block for new knowledge and if learners lack this knowledge, then learning becomes a struggle to most of them. Ausebel believed in the idea of meaningful learning as opposed to rote memorisation.

Memorisation of concepts doesn't last long as learners tend to forget easily and worse fail to apply the concepts learnt in their day- to –day life experiences. Before teaching new mathematical concepts, a teacher should motivate the learners and relate the new concepts with pre-knowledge of the learners so that the learners will be positive in the concepts and ready to learn. Teaching should be done according to the need and interest of learners in meaningful way (Rosenshine, 2012). Teaching materials should be meaningful to the learner. To ensure meaningful learning, the teacher must help learners to build linkage between their own cognitive structures and structure of the discipline being taught. For example; to teach fundamental concepts of geometry the expository method is better than discovery method.

GSJ: Volume 7, Issue 11, November 2019
ISSN 2320-9186

Meaningful learning: According to Ausebel, "the most important single factor influencing learning is what the learner already knows". Therefore meaningful learning, which implies longer retention than memorizing, occurs when humans relate new concepts to pre-existing familiar concepts. Then changes are produced in our cognitive structure, concepts are modified and new links are created. It is a useful tool because it enables real learning, it generates greater retention and it facilitates transferences to other real situations. www.meaningfullearning.eu (Ballester, 2011)

Vygotsky (1978) theorised about the Zone of Proximal Development that it bridges the gap between what is known and what can be known. Vygotsky claimed that optimal learning occurred in this zone. Traditionally, schools have not promoted environments in which learners play an active role in their own education as well as their peers'. Also Vygotsky's theory requires the teacher and learners to play untraditional roles as they collaborate with each other. Instead of a teacher dictating meaning to learners for future recitation, a teacher should collaborate with learners to make their own meaning (Hausfath and Samuel, 1996). Learning becomes a reciprocal experience for the learners and teacher.

The classroom learning activities based on Vygotsky's theory, would provide clustered desk sort able sand works pace for peer instruction, collaboration, and small-group instruction. Like the environment, the instructional design of learning material would promote learner interaction and collaboration. Thus the class room becomes a community of learning. Because Vygotsky asserts that cognitive change occurs with inthe zone of proximal development, instruction would be designed to reach a developmental level just above the learner's current developmental level.

Individualsparticipatinginpeercollaborationorguidedteacherinstruction must share the same focus to access the zone of proximal development. "Joint attention and shared problem solving is needed to create a process of cognitive, social, and emotional interchange"(Driscoll, 1994)."If one partner dominates, the interaction is less successful" (Hausfather and Samuel, 1996). In science education we find a common call for the need for deeper, more conceptually rooted knowledge that learners can relate to and apply to real world problems (Giamellaro, 2012). Recent studies have demonstrated that context learning is important in the sense that the experiences learners have duringfield trips to out-of-school settings such as Jua Kali are very much under-realized in termsof their potential to develop rich and detailed cognitive understandings (Nashon & Anderson). Contextualizing instruction has been theorized to help students make sense of complex scientific ideas, because the use of meaningful problems or situations provides students with a cognitive framework for which to connect or ‘‘anchor’’ knowledge (Rivet & Krajcik, 2008).

The cognitive framework acts like a structure upon which abstract ideas can be linked with prior understanding and fixed in long-term memory. In this way, the use of meaningful problems over extended periods of time makes the learning situation ‘‘bushier’’ (Kozma, 1991) with more available links onto which students can connect ideas. Learning occurs when new information is ‘hooked’’ and embellished by previous knowledge held in memory (McGilly, 1994).

Since the composition of learners in a class varies in different aspects such as level of mastery, economic background, cultural background etc. each child should be treated according to his/her individual need. Different strategies and teaching methods should be used and individual plan should be adapted to meet the learner’s requirements.
Realistic mathematics education is an approach in which mathematics education is conceived as human activity (Freudenthal, 1973). Learning mathematics means doing mathematics, of which solving everyday life problems (contextual problems) is an essential part. Other key principles of RME are that students should be given an opportunity to reinvent mathematical concepts and that teaching and learning process should be highly interactive.

RME approach hinges on five main areas, namely, students’ daily life experience, changing reality to a model and changing model through a mathematical vertical process before turning it into a formal system. Also it involves the use of students’ active style; use of discussions and question and answer methods to cultivate the mathematics skills of students and formation of a connection between concepts and topics until learning becomes holistic and complete (Yuanita, Zulnaidi & Zakaria, 2018).

The underlying principle of RME is to transform learning of mathematics into fun and meaningful experience for students by introducing problems within context. This RME approach starts with choosing problems relevant to student experiences and knowledge. The role of a teacher is to moderate the learning process as students try to find solutions to contextual problems.

Therefore, realistic mathematics education is an innovative learning approach that emphasises mathematics as a human activity that must be associated with real life using real world context as the starting point of learning (Yuanita &Zakaria,2016).

Mathematics learning would be more effective if learners are able to work to process and change information actively. RME has emphasized the use of learning aids in learning which is related to learners' ability. Realistic refers to asking learners questions that they can think of (Wijdeveld, 1980). It was then followed by learners solving mathematics problems (Treffer1987).

Instructions in RME are mainly focused on learners and the development of their ability in learning mathematics. Learners' activities are mostly interactive and they are designed to build learners 'interesting studying mathematics (Fauzan, Slettenhaar and Plomp,2002) as quoted in Laurens et.al (2017).RME can increase learners' logical, critical, and creative thinking (Ruseffendi,1990;Usdiyana, Purniati, Yulianti and Harningsih, 2013; Saefudin, 2012; Sembiring, Hadi, & Dolk, 2008).

It helps construct learners' cognition at every stage of creative thinking. Based on some literature and research, creative thinking process is actually more oriented and concentrated on individuals' cognitive and intellectual functions, particularly in creative problem solving (Almeida, Prieto, Ferrando, Oliveira, and Ferrandiz, 2008;Isaksen and Treffinger, 2004). The structure of the intellectual ability is systematically perceived as a boost for learners' creative thinking and achievement. RME is oriented on empowering mathematization as a key process to mathematics learning.

Mathematics is not only for mathematician, but it is involved in someone's daily life. Mathematization helps learners connect ideas to rediscover, which means that it constitutes a process in which learners formalize there in formal understanding and intuition. Freudenthal uses the mathematization concept in developing RME. This process includes two aspects that are horizontal and vertical mathematization. Horizontal mathematization is related to transforming problems found every day to symbols mean while vertical mathematization is a process that occurs within the scope of the symbols (Heuvel & Panhuizen, 2003).

RME draws these two approaches closer so that they can be related to each other and sustainable. In other words, learning starts from an informal step which later directs learners to do mathematization of real world problems represented by symbols. After that, the learners can continue with vertical mathematization by using models to draw more general conclusion (Laurens et.al, 2017)

CHAPTER 3: RESEARCH METHODOLOGY AND PROCEDURE

Under research methodology, areas considered are research design, research population and sampling procedure, data collection methods and data analysis.

3.1 Research design

Since the classes existed as in tact group, quasi-experimental non-equivalent control group design study was used in this study. After one week of teaching the two classes together, a Pre-test was used by the researcher to determine whether the two groups were similar (homogeneous).Thereafter, a simple random method was used to assign two classes; one as the control group and the other one as the experimental group which differed in their teaching strategy. After the learning process was carried out, both groups were given a post-test. The data obtained from the pre-test and post-test were used as data in the study which was analysed. The table below shows the study design used in this study.

Table 3. 1 Design of the study

	Pre-test	Treatment	Post-test
Experimental Group	O_1	X_1	O_3
Control Group	O_2	X_2	O_4

In table 3.1 above,O_1 and O_2 are the pre-test for both groups where O_1 is the pre-test for the experimental group and O_2 is for the control group, while $O_3$and O_4 is the post-test for both groups where O_3 is the post-test for the experimental group and O_4 is for the control group.X_1 and X_2 represent the teaching strategies used. X_1 represents Realistic Mathematics Education (RME) strategy used as a treatment on the experimental group and X_2 represent the Traditional strategy used as treatment on the control group. The results obtained from both the pre-test and post-test were analysed to see the difference between two groups. At the end of the study, both groups where given attitude questionnaires to answer which were also analysed.

3.2 The Research Site

Namwala secondary school is located right in the developing town centre of Namwala district which is 170km western side of Choma town, the provincial capital town of southern province. Namwala secondary school is a co-education boarding school with approximately total number of learners enrolled of about 1,300 per year. It draws her pupils from all corners of the southern province and partly from Lusaka province and central. The number of girls is more than the number of boys.

3.3 Research Population and Sampling

The sample size of this study consisted of 64 learners of Namwala secondary school drawn from two classes of the same grade 11 studying mathematics. Langdridge (2004) adds to say that the larger the sample size, the greater the precision of the sample in representing the population from which it was drawn.

The sampling of participants was done in two (2) stages, i.e. the selecting of two classes and the assigning of the control and experimental group. The selection of two classes was done using simple random sampling with replacement.

A simple random sample is a random sample selected by a method which ensures that all possible samples, of a given size, are equally likely to be chosen. We employ some randomization process for sample selection so that there is no preferential treatment in selection which may introduce selectivity bias (Freedman, 2017). All the eight grade 11 classes, each one was written on a piece of paper and folded then placed in the box which was reshuffled to pick two classes. The simple random method was then used in assigning of classes to experimental and control groups.

3.4 Instrumentation

The instruments used in this study were the mathematics achievement tests (pre-test and post-test) for each group and the questionnaire about learners attitudes toward mathematics. These research instruments were administered by the researcher.

3.4.1Validity of the instruments

The validity of the questionnaire survey instrument and the achievement test instruments were checked for validity to ensure that there were effective. Validity is often defined as the extent to which an instrument measures what it asserts to measure (Blumberg et al., 2005). Validity of a research instrument assesses the extent to which the instrument measures what it is designed to measure (Robson, 2011). The achievement tests were validated by experts and a number of experienced teachers specialising in teaching, setting and marking of final examinations of mathematics at secondary level. Furthermore, the questions were revised by the supervisor to provide additional input for improvement of the instrument.

3.4.2 Pilot Study

The instruments were piloted to establish their suitability. Thirty (30) Mathematics learners were randomly selected among the grade 11 learners of Niko girls school. The school was selected purposively for the pilot study. The purpose of the pilot study is to determine the reliability co-efficient of the instrument of the study through a trial run (Creswel, 2008).

Tichapondwa (2013) adds that piloting the research instrument helps the researcher to check the clarity of the wording of questionnaire item, instructions and the layout; eliminating the ambiguity or difficulties in the instructions. It also helps in checking the time taken to complete the responses.

3.4.3 Reliability of the Instrument

Reliability of the Likert-scale sections of the questionnaire was determined by computing Cronbach's alpha values. Cronbach's alpha values was computed for the benefits of inquiry section of the questionnaire, and for the challenges of inquiry section of the questionnaire (Cohen, 1988).

3.4.4 Data Collection procedure

For this study, mathematics achievement tests and attitude questionnaires were used to collect data. The pre-test was administered to both experimental and control groups and later the post test. The researcher also administered the questionnaire to the participants. The researcher then scored the achievement test and the questionnaire and generated quantitative data.

3.4.5 Methods of Data Analysis

Data analysis is the process used for making sense out of data; it involves consolidating, reducing and interpreting what participants have said and done and what the researcher has seen and read (Merriam, 2009). In order to compare the differences between control and experiment groups for learner's achievement using the RME strategy compared to traditional method in Mensuration and Attitudes towards Mathematics, a Single factor ANOVA test and mean averages were used. The data obtained using the achievement tests were coded and then used in the Excel to analyse it with alpha level of 5% ($\propto = 0.05$)while the data collected using the attitude questionnaire test, was also coded and analysed using SPSS to run a one way ANOVA.

3.5 Mathematics Achievement Test

The researcher used pre-test and post-test measures to assess the learning of mensuration as well as to collect data for this study. Before administering a pre-test, the researcher introduced the topic of mensuration using the knowledge learners acquired in primary and basic levels which had to do with identification, lengths, areas and volumes of shapes of figure. According to Zambian syllabus, learners are introduced to concepts of areas and volumes of various figures at basic level (i.e. grade 8 and 9). From this background the researcher introduced the topic. After 3 contact period of 40 minutes each in a week, the pre-test was administered to learners.

The pre-test measure consisted of 8 non multiple choice items which demanded short response, with a maximum possible score of 22 marks. Items were created to measure both content and process understanding across three levels; low, medium and high cognitive levels. Lower cognitive level items focused on recalling appropriate shapes and usage of right formula to solve the problem. Medium items required participants to draw the shape of figures in the questions and then find the solutions. The higher cognitive level items demanded that learners use more than one formula to arrive at the answer as it was a combination of different shapes.

During the intervention period the researcher planned his lesson carefully for both the control and experimental groups. The concepts which were in focus of the study where the area of figures in two and three dimensions. Also the volume of the cube and cuboid, cylinder and that of the cone. The concepts where taught differently to both groups based on the strategy assigned to each one. For the control group the concepts where explained using board and chalk. Examples where carefully drawn from the recommended text books by the ministry of general education. As the researcher taught and explained concepts to learners, learners mastered and memorised the concepts.

The researcher during the treatment to the experimental group, he carefully organised his lesson plans by choosing examples with situations which were familiar to the learners. Some examples were structured in such a way that they allowed learners to go out of class and get measurements of different figures given in the examples for them to find the solutions. The researcher would divide the learners into groups and give instructions to them to follow and provide all necessary materials needed to use such as a tape measure and a metre rule. Learners would argue amongst themselves within groups over which measurement is needed to be taken for the problem to be solved. The researcher would observe the groups and intervene were necessary to provide guidance. From there learners would understand easily the concepts being taught in the real world. Other examples were situation based depicting real life experiences familiar to learners.

The use of problems and situations as the focus of instructions that are meaningful to learners, promotes meaningful learning to learners in that they have implications to learners outside school. When learning is structured in the way mentioned above, learners sustains their attention more continuously and process information at deeper levels when they have personal interest in the domain (Ann, Rivet, Joseph & Krajcik, 2007). The other importance of meaningful problem provides a need- to- know situation to learn mathematical ideas and concepts. The problem situations motivates a reason to understand the content and engage in the task of mathematics learning and provides a purpose of knowing mathematical ideas and concepts (Krajcik et al., 2002).

The post-test was designed in such a way that it had 5 major questions with some questions having other sub questions. The structuring of these question items was not different from the pre-test. Three questions where drawn from the Examination council of Zambia past papers which had both medium and high level cognitive. The other were crafted by the researcher in order to cover the concepts taught. The attributes of the said two questions were of both lower and high cognitive levels of thinking. Learners needed to apply the concepts in the real world.

3.6 Attitude Questionnaire

The attitude questionnaire used in this study was developed by selecting some question items from both Fennema-Sherman mathematics attitude scale and from the questionnaire developed by the University of Cambridge, faculty of education. Both instruments for Fennema-Sherman and University of Cambridge are used to measure the attitude toward mathematics. This questionnaire consisted of 30 items in the form of Likert 5 points scale. The questionnaire consisted of questions designed to measure four areas; self-confidence, value of mathematics, enjoyment of mathematics and motivation of learning mathematics. The questionnaire further had items which can be grouped into two categories, namely positive and negative item categories. The positive questionnaire items were 24 while the negative questionnaire items were 6. A summary of the questionnaire items is given below in table 3.2.

Table 3. 2 Questionnaire Composition

No.	**Attitude Scale/Items**	**Positive statements**	**Negative statement**
1.	Confidence	4, 10, 13, 16, 18, 23, 24, 29	11, 27,
2.	Enjoyment	7, 12, 14, 17, 19, 20, 21, 30	3, 22
3.	Motivation	5, 8, 15	25, 28
4.	Value Of Mathematics	1, 2, 6, 9, 26	

The attitude questionnaire was scored by using 5 point Likert scale ranging from strongly agree = 5, Agree = 4, Neutral = 3, Disagree and Strongly disagree = 1. The score was reversed for negative items. As a way of checking for validity and reliability, the questionnaire was piloted and checked by experts.

CHAPTER 4: FINDINGS AND ANALYSIS

4.1 Profile of the respondents

The sample size of the respondents was 64 in total, 29 belonged to the control group with 16 females and 13 males while 18 females and 17 males making a total of 35 belonged to the experimental group as shown in table 4.1 below.

Table 4. 1: Composition of Respondents

Gender	Class	
	Control	Experimental
Male	13	17
Female	16	18
Total	29	35

.

To test the hypotheses regarding the effectiveness of the RME teaching strategy compared to traditional strategy and that there is no statistically significant difference in learners' attitudes towards mathematics using the RME strategy compared to traditional strategy, descriptive statistics for both achievement tests and attitude questionnaires were calculated using excel and SPSS.

4.2 Homogeneity

To check for the homogeneity of variance between the two groups that is the control and the experimental group, both were subjected to a pre-test. The results obtained from the two groups were compared using a levesnes' test of Homogeneity of variance. The table below is Levenes' test.

Table 4. 2 Test of Homogeneity of Variances

Levene Statistic	df1	df2	Sig.
1.384	1	62	.244

From the table above, we have Since F –value 0.244is greater than $\propto = 0.05$, the equal variance assumption is assumed. Hence the conclusion that the there is no significance difference between two groups.

4.3 Results Analysis

The following tables below gives us the results analysis of both the pre-test and post-test of the participants.

From table 5 below, it can be seen that there was no improvement in the control group because the number -107 in the summary table under the sum column is a negative number. However, there was much larger improvement in the experimental group as evidenced from the summary sum of 314.

Table 4. 3 Summary of ANOVA : single factor

Groups	Count	Sum	Average	Variance
CONTROL	29	-107	-3.68966	388.5788
EXPERIMENTAL	35	314	8.971429	206.2639

Table 4. 4 ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2542.306	1	2542.306	8.80911	0.004255	3.995887
Within Groups	17893.18	62	288.5997			
Total	20435.48	63				

In table 4.4 above, the results of one way ANOVA test of the learners' performance in the mensuration achievement test indicated that F = 8.80911 and P = 0.004 <∝=0.05. This means that there is a significance difference in the RME strategy compared to Traditional Strategy. There is only approximately 4% chances that this difference could have happened due to random error.

The table 4.5 below shows the descriptive statistics of learners' performance in a post-test.

Table 4. 5 Descriptive Statistics of the Post test

	N	Mean	Std. Deviation	Std. Error
Control	29	46.90	13.552	2.517
Experiment	35	57.71	12.817	2.166
Total	64	52.81	14.133	1.767

The total number of learners who participated was 64 of which 29 belonged to the control group and 35 where from the experimental group. The experimental group had an average mean of 57.71 higher than 46.9 of the control group. This gives an indication that the experimental group hard better results compared to the control group. Equally the standard deviation of the control group 13.552 was higher than that of the experimental which was 12.817 implying that the scores of the control group deviated more from the mean compared to the scores of the experimental group.

The following table shows the results of one-way ANOVA of the general attitudes of learners towards mathematics.

Table 4. 6 Mean attitude towards mathematics (One way ANOVA)

	SS	df	MS	F	Sig.
Between Groups	1.395	1	1.395	3.447	.068
Within Groups	25.090	62	.405		
Total	26.484	63			

Table 4.6 above was generated from SPSS and shows the results of the learners' attitudes toward mathematic. The results of one-way ANOVA test carried out indicated that F =3.447 and P = 0.068 >0.05. This means there is no statistical difference in attitude towards mathematics between learners learning mathematics using realistic mathematics education strategy and traditional strategy.

Table 4. 7 Mean of attitude Scale/Items

	Minimum	Maximum	Mean	Std. Deviation
Confidence	1	5	3.89	1.127
Enjoyment	1	5	4.08	1.039
Motivation	1	5	3.97	1.140
Value	1	5	4.39	.864

The four items measured from the questionnaire gives the mean as shown in table 8 above. The minimum score a learner would get on the questionnaire was 1 and 5 as the maximum. The mean averages of all the items shows that learners have confidence and enjoy learning and solving mathematics. Equally all learners that participated they know the value of mathematics and are motivated.

CHAPTER 5: DISCUSIONS OF FINDINGS

5.1 Mathematics Achievement test

From own set as checked from the pre-test using levenes' test of homogeneity as shown in table 4.2, it indicated that two groups were equal. After the intervention for 3 weeks, a post test was administered and the results were analysed using SPSS to check whether the claim made before the study that; there is no statistically significant difference in learners' achievement in mensuration using the RME strategy compared to traditional strategy was true. According to table 4.3 on page 25, shows that performance of leaners in the mensuration achievement test indicated was $F = 8.80911$ and $P = 0.004 < \propto = 0.05$. This means that there is a significance difference in the RME strategy compared to Traditional Strategy. The mean difference noticed in the post-test results shown in the analysis table 4.6 above on page 26 suggest that it was due to the use of realistic mathematics strategy. This difference indicate that learners understand well, as they see and relate concepts to the real world. RME strategy of teaching has shown that it is a useful tool because it enhances real learning, it generates greater retention and it facilitates transferences to other real situations. These findings support the study done by Zakaria and Symaun (2017) in Malaysia as they looked at the effectiveness of Realistic mathematics education approach in the teaching and learning of mathematics. Further, the findings highlights that RME strategy is an effective strategy to use when teaching mensuration.

The fact that RME strategy can improve learners' mathematics achievement was also confirmed by Laurens et.al. (2017) who proved that learners who were taught using RME strategy achieved better than other learners who were taught using a conventional strategy. Similarly Gezahegn (2007) agreed in his study that RME strategy was effective to help learners in overcoming barriers that hinder them from not being successful in their education of Mathematics. Yuanita et. al. (2018) also approved that the RME principles could be beneficial in mathematical representation as a mediator between mathematical belief and problem solving. Since the RME strategy promotes the contextualising of lessons by using real life situations familiar to the learner, teachers should strive to build on the existing knowledge of learners they acquired from their daily life experiences. This is more useful especially when dealing with abstract concepts which may be hard to grasp and apply. By using RME strategy, learners become active in the process of learning and try to draw conclusion on their own and come up with mathematical concepts with guidance of the teacher.

This strategy promotes the kind of learning which is pupil centred and a teacher acts as a moderator. The use of RME strategy require learners to have an Initiative to solve contextual problems given by the teacher with their own way. Furthermore, RME allows learners to learn individually or in groups. Learners' activities include actively following the teacher whom they can work together within solving realistic contextual problems. RME is a way out to change learners' perception on working in a group, associating what they learn and what they know, and constructing knowledge.

Giamellaro (2014) adds that helping learners contextualize their science learning is critical if they are to move beyond inert knowledge to an integrated, applicable understanding that will serve them beyond the immediate classroom walls. The experiences of the learners in this study suggest that learning mathematics within an authentic context can increase conceptual understanding and increase the retention levels of concepts. Contextualizing of examples during the presentation of concepts contributes to that learning. Further, the level of RME that learners utilized directly impacted the degree of learning achieved.

The findings further supports Vygotsky's sociocultural theory of human learning which describes learning as a social process and the origination of human intelligence in society or culture. The theory of Vygotsky encourages Scaffolding and reciprocal teaching as effective strategies to access the zone of proximal development. This scaffolding requires the teacher to provide learners the opportunity to extend their current skills and knowledge acquired from environments they come from. The teacher must engage learners' interest, simplify tasks so that they are manage able, and motivate learners to pursue the instructional goal. During the process of doing the task, the teacher must look out for discrepancies between learners' efforts and the solution and then guide their learning.

RME strategy to teaching mensuration is good method which promotes meaningful learning though it needs careful planning. This is because learners have different backgrounds and environment they come from. The researcher in this study hard faced a challenge to contextualise some concepts as learners have different backgrounds and environment they live in back home.

Nevertheless, learning concepts in their natural environment is one of the exciting thing to learners and they get motivated as they interact with nature and express their understanding of concept and solving problems in unscientific way. An important stage in RME is when learners move from their own intuitive mathematical strategies to more sophisticated and formal ways which is more scientific of problem solving. Dutch mathematics educators inverted a variety of ways to secure this transition by using 'models' as a scaffolding device. A thorough analysis of the use of such models has been provided by van den Heuvel Panhuizen. Because their learners' understanding is rooted in contexts and mental images, it is secure. (Dickinson & Hough, 2012). Therefore, as teachers when planning to use RME strategy, adequate planning is needed as the process is time consuming especially for problems solving which would require at times learners to move out of there classroom environment and go outside and learn concepts in their natural environment. This is because there are so many detractors which may divide the attention of learners in the process and ultimately lose focus.

RME strategy promotes high participation from learners in the learning process as mainly examples used are situations familiar to them. This means that each and every learner may have an idea on how to solve the problem which just needs to be moulded to scientific method. Furthermore, reviewed studies showered that learner taught using RME do not only demonstrate high retention of knowledge but also enjoyment as they interact and appreciate one another's experience. RME strategy increase learners' logical, critical, and creative thinking. It helps construct learners' cognition at every stage of creative thinking. Based on some literature and research, creative thinking process is actually more oriented and concentrated on individuals' cognitive and intellectual functions, particularly in creative problem solving (Laurens et.al, 2017).

5.2 Attitude of learners towards mathematics

At the end of the study, the researcher gave out questionnaires to learners to measure the attitudes of learners towards mathematics. The researcher wanted to ascertain whether the claim that, there was no statistically significant difference in learners' attitudes towards mathematics using the RME strategy compared to traditional strategy. The questionnaires where coded and scored in SPSS and analysed by running the one-way ANOVA. From the analysis done in table 4.6 on page 26 with F =3.447 and P = 0.068 >0.05, it showed that there was no significance difference between learners who were taught using the RME strategy and those who were taught using tradition strategy. Both groups the control and the experimental exhibited positive attitudes towards mathematics. This is also evident in the means of individual 4 items which composed the questionnaire as summarised in table 4.7 on page 26. All the 4 means are above half which is 2.5. In other words, the means were extremely well giving an indication that all learners from both groups have positive attitude.

Since the philosophy underpinning Realistic Mathematics Education (RME) is that learners should develop their own mathematical understanding by working from contexts that make sense to them, it is without doubt that pupils get confident and motivated, enjoy solving problems and get to see the value of mathematics in their daily lives. This usually is enough driving force to great achievement in mathematics performance because learning is intrinsically motivated. Initially they devise their own intuitive methods for working on problems but, using a carefully chosen sequence of examples and appropriate teacher interventions, they then generalise and develop a more formal understanding.

GSJ: Volume 7, Issue 11, November 2019
ISSN 2320-9186

CHAPTER 6: CONCLUSION

6.1 Summary

This study was conducted using quasi experimental design and two instruments were used to collect data from the targeted group of grade 11 mathematics Learners. A mathematics achievement tests and questionnaire were used to collect data. Based on the data obtained and gave us the findings, the following general conclusion of the study is given.

One of the research questions poised in this study was that there was no statistically significant difference in learners' achievement using the RME strategy compared to traditional method. The findings showed that there was a significant different in the achievement of pupils in mensuration due to the effectiveness of the RME strategy compared to the traditional strategy of teaching of mensuration in classrooms. However, the improvement shown in learners in the subject was not hundred percent as still some learners scored below 50 percent. This gives an encouragement and assurance that once appropriate and effective method of teaching are used on learners, they all have a chance of performing better than their previous performance.

The second focus point of study was that there was no statistically significant difference in learners' attitudes towards mathematics using the RME strategy compared to traditional strategy. The study showed that indeed there was no significant difference in the learners' attitude towards mathematics after the other group was subjected to RME strategy. The attitude was measured by different items such as confidence, enjoyment, motivation and the value learners attach to mathematics, generally all the learners from both groups showed positive attitudes.

RME strategy alone without the creativity and through lesson planning by the teacher is nothing. This is because learners needs guidance as they attempt to solve problem using their various methods. Therefore, the teachers need to be more creative and innovative in designing lesson plans by using appropriate teaching strategies. It is necessary for teachers to develop more appropriate learning media, strategies, or model which are suitable with learning materials or with contexts that students are dealing with. Several scholars recommends that, teachers are supposed to create contextual learning environment which is rich of information for about how to solve real life situation problems. By doing so it helps learners to understand difficult and abstract concepts hence increasing the retention levels and application of concepts in real life.

Finally as teachers introduce concepts to learners, they need to constantly show the importance of that topic at hand by clearly stating the value of concepts in real life. This can be done through the use of well selected examples which are situation based and familiar to the learners. The research is of the view that if teacher at Namwala secondary use RME strategy in their teaching of mathematics, the results will improve to the desired level.

6.2 Recommendations

Based on the findings and my experience of work as mathematics teacher, I would like to recommend the following points which I believe require attention.

- The school should invest in teaching and learning materials in the area of mathematics. The mathematics department should be well furnished with teaching aids which enhances simplifying of concepts.
- The use of technology should be highly embrace in the department. Such as teaching using a computer and projector for easy mathematization of concepts. This can be done through use of computer assimilations depicting the application of abstract concepts.
- In order to update the skills and knowledge of teachers, in service short and long term capacity building training should be encouraged among teachers for them to be braced with new teaching approaches and strategies which matches with societal needs and demands. This will enable teachers to choose and use appropriate methods of teaching for any given topic to impart necessary skills and knowledge

- The teaching materials especially examples given in books should always be localised. In other words examples should be situations familiar to learners which depict the problems faced in their daily life.

- Teachers must be accustomed with preparation of individual lesson plans to meet the needs and interests and abilities of the learner. The planning of lessons should not only be classroom based but also outside classroom environment in order for learners to be able to appreciate the use of mathematics in real life.

- Besides providing learners with modern books, internet facilities should be provided to both teachers and learners for effective teaching and learning.

REFFERENCE

Aiken, L. R. Jr. (1970). Attitudes towards Mathematics. Review of Educational research, no. 40: 551 – 596.

Akey, T. M. (2006). School context, learner attitudes and Behaviour and academic achievement: An exploratory analysis.

Balim, A., G. (2009). The Effects of Discovery Learning on Learners' Success and Inquiry Learning Skills. Egitim Arastirmalari-Eurasian Journal of Educational Research, 35, 1-20.

Blumberg, B., Cooper, D. R., & Schindler, P. S. (2005). Business Research Methods. Berkshire: McGrawHill Education.

Cohen, J. (1988). Statistical Power Analysis for the Behavioural Sciences (2nd Ed.), Hillsdale. NJ: Lawrence Earbaum association

Charles, L. G. (2014). Mathematics Laboratory and Learners' Conception of Mensuration Using Demonstration and Collaborative Approaches in Rivers State. Journal of International Academic Research For Multidisciplinary Impact Factor 1.393, ISSN: 2320-5083, Volume 2, Issue 7.

Creswell, J. W. (2008). Educational Research Planning, Conducting and evaluating Quantitative and Qualitative research (3rdEd.). Upper Saddle, NJ Pearson Education.

Curriculum Development Centre (2013).“O” Level Mathematics Syllabus; Grades 10 to 12

Dean, P.G. (1982). Teaching and Learning Mathematics. London: Woburn press.

Dickinson, P. and Hough, S. (2012). Using Realistic Mathematics Education in UK classrooms

Driscoll Marcy (1994), Psychology of Learning for Instruction, Needham, Ma: Allyn & Bacon.

Examinations council of Zambia, 2014 Examinations Performance report, Natural science.

Examinations council of Zambia, 2015 Examinations Performance report, Natural science.

Examinations council of Zambia, 2016 Examinations Performance report, Natural science.

Examinations council of Zambia, 2017 Examinations Performance report, Natural science.

Fauzan, A., Slettenhaar, D. and Plomp, T. (2002).Traditional mathematics education vs. realistic mathematics education: Hoping for changes. In Valero, P. and Skovsmose, O. *Proceedings of the 3rd. International Mathematics Education and Society Conference* (pp.1-4).Copenhagen Denmark, Centre for Research in Learning Mathematics.

Fennema, E. and Sherman, J. (1976). Sex related differences in Mathematics learning Myths, realities and related factors. A paper presented at the annual meeting of the American association for the advancement of science, February, Boston.

Frank, M.L. (1988). Problem solving and Mathematical beliefs. Arithmetic teacher. V35, no 5: 32-34.

Freedman, D. A., Pisani, R. and Purves, R. (2007). Statistics, 4th edition, W. W. Norton.

Hembree, R. (1990). The Nature, Effects, and Relief of Mathematics Anxiety. Journal for Research in Mathematics Education, 21(1), 33-46.

Giamellaro, M. (2014). Primary Contextualization of Science Learning through Immersion in Content-Rich Settings. International Journal of Science Education, 36(17), 2848-2871. doi:10.1080/09500693.2014.937787

Heuvel, A. V. D. and Panhuizen (2003). The didactical use of models in realistic mathematics education: an example from a longitudinal trajectory on percentage. *Educational Studies in Mathematics*,*54*,9-35.

Hiebert, J. & Carpenter, T.P. (1992). Learning and Teaching with understanding. In D, Grouws (Ed.), Handbook for research on Mathematics teaching and learning. New York: Macmillan. 65-97.

Karnasih, I and Soeparno, (1999).Teaching mathematics has to focus on logic, Indonesia: Kompas.

Kozma, R.B. (1991). Learning with media. Review of Educational Research, 61, 179–212.

Laurens, T., Batlolona, F. A., Batlolona, J. R. and Leasa, M. (2017). How Does Realistic Mathematics Education (RME) Improve Students' Mathematics Cognitive Achievement? EURASIA Journal of Mathematics, science and Technology Education, 2018 14(2):569-578

Morris, N. M. (1994). Mastering Mathematics for Electrical and Electronic Engineering, Macmillan Master Series. Plagrave, London.

McGilly, K. (1994). Cognitive science and educational practice: An introduction. In: K. McGilly (Ed.), Classroom lessons: Integrating cognitive theory and classroom practice (p 317).

Nashon, M. S. and Anderson, D. (2013), Interpreting Student Views of Learning Experiences in a Contextualized Science Discourse in Kenya, Journal Of Research In Science Teaching, Vol. 50, NO. 4, PP. 381–407

Ottevanger, W., (2001).Teacher support materials as a catalyst for science curriculum implementation in Namibia, Enschede: Print Partners Ipskamp.

Rosenshine, B., (2012). Principles of instruction; Research – Based Strategies That all Teachers Should Know. Retrieved from; https://buildingiti.utexas.org>rosensine.

Sherman, J. (1980). Mathematics, Spacial Visualization, and Related Factors: Changes in girls and boys, grades 8 – 11. Journal of Educational psychology. V72, no 4:476-482.

Somerset, A., (1997).Strengthening quality in Indonesian junior secondary school: An overview of issues and initiatives, Jakarta: MOEC

Tichapondwa, S., M. (2013). Preparing your Dissertation at a Distance; A research Guide. Virtual University for Small states of Collonwealth-Vancouver.

Tsai, S. & Walberg, H.J. (1983). Mathematics achievement and attitude productivity in junior high school. The journal of Educational research, no 47: 267 – 272.

Treffers, A. (1987). Three dimension. A model of goal and theory description in mathematics education-the wiskobas project. Netherland: Springer-Netherland

Rivet, A. E. and Krajcik J. S. (2008), Experiences to Foster Understanding of Middle School Science, Journal Of Research In Science Teaching Vol. 45, No. 1, PP. 79–100.

Robson, C. (2011).Real World Research: A Resource for Users of Social Research Methods in Applied Settings,(2nd Ed.). Sussex, A. John Wiley and Sons Ltd.

HausfatherSamuel, J. (1996). "Vygotsky and Schooling: Creating a Social Contest for Learning," Action in Teacher Education, (18)1-10.

Wijdeveld, E. (1980). Zichrealiseren, in IOWO, deachterkant van de Mobius, IOWO. Utrecht, The Netherland, 23-26.

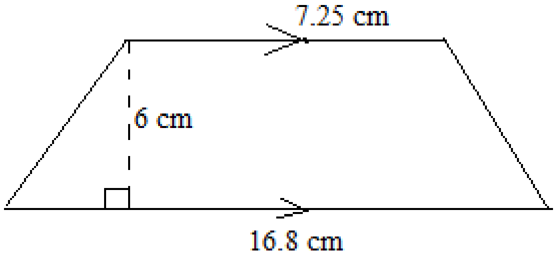
Yuanita P, Zulnaidi H, Zakaria E (2018). The effectiveness of Realistic Mathematics Education approach: The role of mathematical representation as mediator between mathematical belief and problem solving. PLoS ONE 13(9):e0204847. https://doi.org/10.1371/journal.pone.0204847.

Yuanita, P. and Zakaria E (2016). The Effect of Realistic Mathematics Education (RME) Implementation to Mathematics Belief, Mathematics Representative and Mathematics Problem Solving. Advanced Science Letters, 2016; 22(8):1989–1992.

APPENDICES

Appendix: I- Pre-test

1. If the sides of a triangle are 26m, 24cm and 10cm, what is the area? [2]
2. Calculate the area of the figure bellow.



[2]

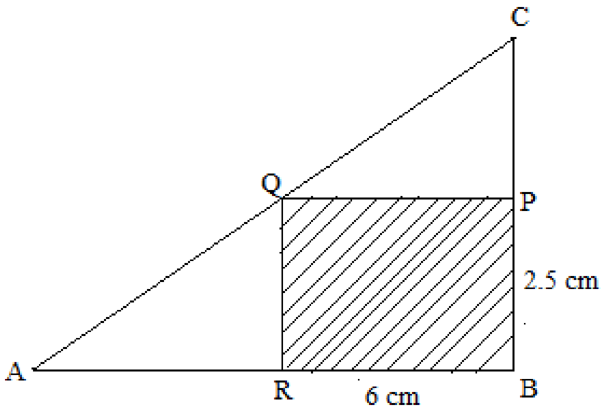
3. The area of a rectangular figure is $40.25cm^3$ and its breadth is$7.5cm$. Find the length of the rectangle, correct to 2 decimal places. [2]

4. Calculate the area of the circle whose radius is $3.5cm$, [take π to be $\frac{22}{7}$.] [2]

5. A pipe is 2.5m long and has a diameter of 30cm. calculate its curved surface area taking π to be 3.142. [3]

6. A closed cylinder has a total surface area of $527cm^2$ and a radius of 5cm. calculate height of the cylinder correct to 3 significant figure [3]

7. In the diagram ABC is the right triangle and BPQR is a rectangle.



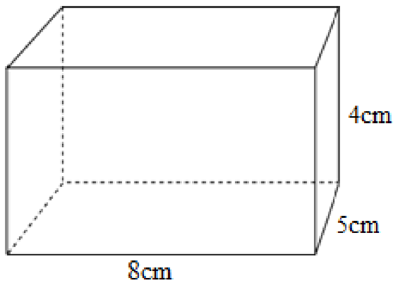
AR = BR= 6cm and BP = PC = 2.5cm. Calculate:

(a) The perimeter and area of BPQR. [2]

(b) The perimeter and area of triangle ABC. [2]

Appendix:II- Post test

1. The following is the trunk with measurements shown.

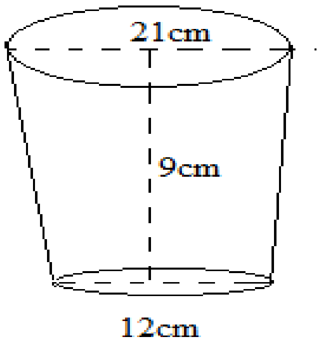


Calculate

(i) the surface area of the of the iron sheet used to make the trunk. [2]

(ii) its volume. [2]

2. The figure below represent a bucket for storing water. The top and base diameter is 21cm and 12cm respectively with a height of 9cm as shown.



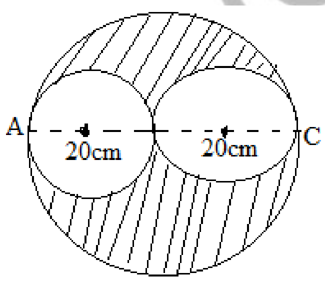
Calculate the volume of the bucket. [4]

3. Mr Mwiinga wants to cover his sitting room floor of 4 metres wide and 5.5 metres long by squared tiles. If each square tile is of side 50 mm, then find

   (i) The number of tiles required to cover the floor. [4]

   (ii) The amount of money required to buy the tiles required if one tile costs k 65. [2]

4. A pattern on a Chitenge material consists of three circles as shown in the diagram blow , AC is the diameter of the bigger circle



Given that the diameter of each of the small circler is 20cm and taking $\pi = 3.142$,

Calculate the

(i) total perimeter of the two small circles, [2]
(ii) area of the shaded part [2]

5. The diagram below represents a metallic window frame of a sports hall. It consists of a rectangular frame ABCE and a semi-circular arc CDE. The two parts are welded together at point C and E.

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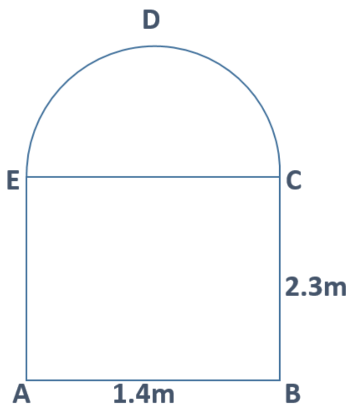
ISSN 2320-9186



a) Calculate
   (i) The length of the metal CDE [2]
   (ii) The total length of the metal required to make the frame ABCDE [3]

b) Grass panes would be required to cover this window frame, find the area of the total sheet of grass pane required.

c) Given that glass costs K42.5 pay square metre, calculate how much was spent on glass panes for the window. [2]

Appendix: III-ATTITUDE QUESTIONNAIRE MATHS

i. Background information

1. Sex : ☐

2. Class: ☐

ii. Main questions

How much do you agree or disagree with the following statements? Please tick a box in each row.

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	The maths we learn at school is useful in other subjects.	☐	☐	☐	☐	☐
2	Understanding the maths we are doing is important to me.	☐	☐	☐	☐	☐
3	Maths is boring.	☐	☐	☐	☐	☐

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4	I can usually manage the maths we do at school.	☐	☐	☐	☐	☐
5	I would like a job that involves using maths.	☐	☐	☐	☐	☐
6	Many of the things we learn in maths are useful elsewhere.	☐	☐	☐	☐	☐
7	I like learning maths.	☐	☐	☐	☐	☐
8	I might go on to do something related to maths after I leave school.	☐	☐	☐	☐	☐
9	School maths is relevant to life in the today's world.	☐	☐	☐	☐	☐
10	I am good at maths.	☐	☐	☐	☐	☐
11	I will avoid maths once I leave school.	☐	☐	☐	☐	☐
12	I find maths interesting.	☐	☐	☐	☐	☐
13	Even when maths gets hard, I can do our maths.	☐	☐	☐	☐	☐
14	I enjoy studying maths.	☐	☐	☐	☐	☐
15	I plan to carry on studying maths when the time comes to choose.	☐	☐	☐	☐	☐
16	I want to make sense of what I am learning in maths.	☐	☐	☐	☐	☐
17	Mathematics is a very interesting subject.	☐	☐	☐	☐	☐
18	I think I can cope with a harder maths course.	☐	☐	☐	☐	☐
19	I am happier in a maths class than in any other class.	☐	☐	☐	☐	☐
20	I like to solve new problems in maths.	☐	☐	☐	☐	☐
21	I learn maths easily.	☐	☐	☐	☐	☐
22	I am always confused in my maths class.	☐	☐	☐	☐	☐
23	Maths does not scare me at all.	☐	☐	☐	☐	☐
24	I expect to do fairly well in any maths class I take	☐	☐	☐	☐	☐
25	When I hear the word maths, I have feeling of dislike.	☐	☐	☐	☐	☐
26	Maths helps develop the mind and teaches a person	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐

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	to think.					
27	Studying maths makes me feel nervous.					
28	My mind goes blank and I am unable to think clearly when working with maths	☐	☐	☐	☐	☐
29	I want to develop my maths skills.	☐	☐	☐	☐	☐
30	I get a great deal of satisfaction out of solving maths problems	☐	☐	☐	☐	☐