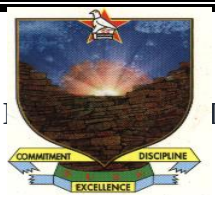


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**ABSTRACT**

This study focuses on the effects of different grouping strategies (homogeneous and heterogeneous) on learning of secondary school students in cooperative learning contexts. The study sought to find out the comparative effectiveness of homogeneous and heterogeneous groupings in the teaching of mathematics at secondary level. Both quantitative and qualitative data will be collected. Test scores will be used to compare the effectiveness of homogeneous and heterogeneous groups in the teaching of mathematics. Some questionnaires will be also issued to pupils to seek their opinions on the use of those two types of groupings when learning mathematics. However, research findings will show that each one of the types of groupings had its own merits and demerits when employing the group work technique. The main findings are: heterogeneous grouping based on student ability is more beneficial for student achievement and student satisfaction, high and medium level ability students benefit more in homogeneous groups but low level ability students benefit more in heterogeneous groups, heterogeneous grouping based on learning styles is more beneficial for student satisfaction with their learning and their attitudes toward other students rather than student achievement and studies in which groups were based on personal characteristics support heterogeneous grouping, but the results of experiments differed. Overall, heterogeneous grouping is more beneficial for student achievement as well as student satisfaction than homogeneous grouping.

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# CHAPTER ONE

# THE RESEARCH PROBLEM

## 1.0 Introduction

The potential learning benefits of group work are significant but simply assigning group work has no guarantee that these goals will be achieved. This research will investigate the effectiveness of homogeneous and heterogeneous groups in the teaching of mathematics at secondary level. This chapter will presents the background to the study, statement of the problem, research questions and the significance of the study. Delimitations and limitations of the study as well as definition of the key terms will be outlined.

## 1.1 Background to the study

At the school where the researcher is carrying out the study, pupils are grouped according to their learning abilities. However, the researcher noted that pupils who are labelled as high achievers compete against their records and the teachers move at their pace. On the other hand those labelled as under achievers continue failing and lose interest in learning. Thus, the two groups, the above average and below average discriminate one another on the basis of ability which is detrimental to their social development. This is supported by Fink (2004) who laments that grouping under achievers and high achievers on their own has an indirect effect of minimising conduct between students who differ in social class therefore denying pupils a chance of social interaction. According to Mkandla (2004), pupils are able to cover a large proportion of content when working in groups since they will be sharing different viewpoints. Fink (2004) asserts that student centred teaching strategies are being encouraged to be used in the classroom as these promote teamwork vital in promoting their understanding of concepts. Thus group work is one of the widely used methods of teaching mathematics in secondary schools but most teachers seem to pay little or no attention on group composition. According to Kutnick and Rogers (1994), placing pupils into various groups is a feature of all classrooms. Group work is no exception as it promotes students' corporation and collaboration necessary for learning to take place. From the researcher's experience as a teacher, the type of grouping used during group work has an impact on pupils' attitudes towards school work. Thus it is against this background that propelled the researcher to investigate the effective type of grouping between homogeneous and heterogeneous groupings in teaching mathematics.

## 1.2 STATEMENT OF THE PROBLEM

From the workshops previously attended in Chirumhanzu district, Mathematics teachers concurred that they employ cooperative learning technique quite often as it was proved that it promotes pupil-pupil interaction which is an important feature in learning. However, despite the frequent use of the group work technique in the classroom the pass rate in the subject is still low. The research was carried out to find out the extent to which the group work method can lead to improved student performance in the teaching of Mathematics. It is in the light of the above revelations that the research was conducted to ascertain the most effective method of grouping between homogeneous and heterogeneous groups in improving pupils' performance in Mathematics.

## 1.3 OBJECTIVES OF THE STUDY

**By the end of the research process, the researcher should be able:**

- to investigate the effectiveness of group work in the teaching and learning of mathematics.
- to compare the effects of homogeneous and heterogeneous grouping in learning mathematics.
- to analyze homogeneous and heterogeneous grouping in learning.

## 1.4 RESEARCH QUESTIONS

The study was guided by the following questions

1.4.1 Do pupils prefer working in homogeneous or heterogeneous groups when solving mathematical problems?

1.4.2 Why do pupils prefer working in homogeneous or heterogeneous groups?

1.4.3 Which of the two types of groupings, homogeneous and heterogeneous, better improves pupils' performance in mathematics?

1.4.4 What are the effects of different grouping strategies (homogenous and heterogeneous) on the learning of secondary school students in cooperative learning contexts?

## 1.5 SIGNIFICANCE OF THE STUDY

The study will equip the researcher with adequate knowledge on the use of homogeneous and heterogeneous groups when employing the group work technique. Apart from that, the researcher will also understand how pupils behave when they learn in those different types of groupings. Knowing how pupils behave when working in homogeneous and heterogeneous groups enables the teacher to better monitor and supervise them. The research will help other established mathematics teachers both at cluster and district level during seminars on how to improve their class management skills. Pupils will also benefit as this research will ensure that quality of education is improved through the use of effective methods of grouping. The Ministry of Education will also benefit as it will see the need to implement preventive measures against the effects of heterogeneous and homogeneous groupings.

## 1.6 DELIMITATIONS

The research was carried at a rural secondary school in Chirumanzu district in Midlands province. The study mainly focuses on form three mathematics learners.

## 1.7 LIMITATIONS

According to Leedy & Omrod (2012), limitations are characteristics of research design or methodology that set parameters on the application or interpretation of the results of the study. That is, the constraints or generalizability and utility of findings that are the result of the device of design or method that establish internal or external validity.

### 1.7.1 Physical constrains

The researcher faced some challenges when he conducted his research and these challenges include high internet challenges at researcher's home area and no library facilities nearby. However, the researcher managed to tackle the challenge by constantly travelling to the University to access the library facilities. On the other hand, the researcher bought internet bundles to get some of the latest information on the subject. The researcher achieved this through the use of smart phones with PDF readers.

### 1.7.2 Confidentiality issues

It takes more than expected time to get some data since organizational protocols, policies and procedures has to be followed in order to access the relevant data. Due to confidentiality clauses management may not disclose some of the information which they consider confidential to their organization. However to overcome this constraint the researcher got a reference letter from the university.

### 1.7.3 Time constraints

The researcher faced time constraints because he was preparing the assignments and examinations on his final year. In addition, the study was carried over a short period of time. A long period of time was required to allow the researcher to have enough time to carry out the study. In light of this, the researcher would work during the night.

## 1.8 ASSUMPTIONS

It is assumed that,
learners can grasp mathematical concepts the same way whether they are put in groups or not
learners can work on their own without the supervision of teachers
learner can understand better when they are working together in groups.

## 1.9 DEFINITION OF TERMS.

A **homogeneous group** is an aggregate of individuals or other elements that are similar to one another in a number of significant respects. In a social context, for example, a homogeneous group might include members who are the same age or have the same socioeconomic background, values, work experience, education.Homogeneous grouping is when students are grouped based on shared characteristics, such as ability level, age, or gender.

**Heterogeneous grouping** is when students are mixed in a group, regardless of any shared characteristics. The advantage of this approach is that it can promote cooperation and collaboration since students must work together to achieve the group's goals. This can also lead to students feeling more invested in the material since they are more likely to see the relevance of the content to their own lives.

**Learning** is "a process that leads to change, which occurs as a result of experience and increases the potential for improved performance and future learning" (Ambrose et al, 2010, p. 3).

A **questionnaire** is a research instrument that consists of a set of questions for the purpose of gathering information from respondents through survey or statistical study. A research questionnaire is typically a mix of close-ended questions and open-ended questions.

**Qualitative research** relies on data obtained by the researcher from first-hand observation, interviews, questionnaires, focus groups, participant-observation, recordings made in natural settings, documents, case studies, and artifacts. The data will be generally non numerical.

**Quantitative research** means collecting and analyzing numerical data to describe characteristics, find correlations, or test hypotheses. It is a research strategy that focuses on quantifying the collection and analysis of data. It is formed from a deductive approach where emphasis is placed on the testing of theory, shaped by empiricist and positivist philosophies.

**Group work** is a form of co-operative learning or method of instruction that gets students work together in groups (Mannix and Neal, 2005),

**Cooperative learning** is an educational approach which aims to organize classroom activities into academic and social learning experiences. There is much more to cooperative learning than merely arranging students into groups, and it has been described as "structuring positive interdependence."

## CHAPTER 2

## REVIEW OF RELATED LITERATURE

## 2.0 Introduction

This chapter looked at the review of related literature on group work and cooperative learning as a teaching technique. The advantages of the methods will be discussed as well as the different forms of group composition. Review of some literary work by some authors will be looked at as to how the group work technique can be employed in teaching to achieve maximum benefits. After that, four theoretical perspectives of cooperative learning are described. In addition, a review research which focuses on heterogeneous and homogeneous grouping under cooperative learning will be given. The disadvantages of heterogeneous and homogeneous grouping are summarized, and the theoretical foundations of grouping are introduced.

## 2.1 Theoretical framework

Many theorists try to use theories to explain the relations between cooperative learning and student learning, especially under what kind of conditions cooperative learning can positively affect student learning. According to Slavin (2010), motivational, social cohesion, cognitive-developmental and cognitive-elaboration theoretical perspectives are the four major perspectives on the achievement effects of cooperative learning. According to Slavin (1995), the motivational perspective states that cooperative learning encourages learners to not only work on their own but also help and inspire other group members to learn because the success of the group is equivalent to success of each group member.

The motivational theorists hold the opinion that individual and competitive rewards in traditional classrooms reduce the acceptance of high achievers; therefore cooperative rewards should be emphasized and applied. When cooperative rewards are applied, group members are rewarded on the basis of their group performance rather than their separate individual performance, thus the only way for them to get both awards and acceptance is to try their best to help other members, including answering questions and offering appropriate feedback (Slavin, 2010).

The social cohesion perspective holds that members in a group will study hard and support other group members to achieve more. The difference between the social cohesion perspective and the motivational perspective is the explanation of the reason why group members work for others: the motivational theorists believe that the reason for members helping others is mainly for their own interests while the social cohesion theorists believe that the reason for members

helping others is mainly for other members' interests as a result of emotional connections among the members (Slavin, 2010).

According to Slavin (2010), the cognitive perspective does not focus on the purpose and motivation of the learners in the group. The cognitive theorists believe that the cooperative activities will increase the achievement of the learners no matter whether they tend to study hard or not. Two main sub-perspectives under cognitive perspective are the cognitive elaboration perspective and the cognitive developmental perspective, both of which explain the reason why cooperative learning activities have better effects.

In addition, the cognitive elaboration perspective states that the learning procedure in cooperative learning has a particular part in expressing what students have learned to other students. This procedure recalls students' previous knowledge and forces them to organize the information they have, which benefits their comprehension of the knowledge and increases their achievement. Larson (1984) states that, in cooperative learning, when students express their own thoughts, discuss or even argue about thoughts of other students, the interactions among group members lead them to reorganize information based on their own comprehension and then share it to other members. Such activities expand the knowledge base, help them to better understand their own thoughts and adjust their thoughts according to the discussions (Miller, 1993).

The cognitive developmental perspective holds a slightly different opinion, which is that cooperative activities naturally accelerate the development of learning and some knowledge can be only absorbed from cooperative activities. Therefore, cooperative learning instinctively increases the achievement of learners. Vygotsky (1978) defined the zone of proximal development as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers". Vygotsky believed that interactions with more skillful peers can assist less knowledgeable students to develop skills and achieve tasks. However, the assistance should be based on a student's actual and potential levels of development, not too high or too low from the actual level of development of the less knowledgeable student (Miller, 1993).

## 2.2 Cooperative learning

According to Slavin (2010), cooperative learning is defined as "instructional methods in which teachers organize students into small groups, which then work together to help one another learn academic content". Research has shown that cooperative learning is very useful to improve student learning as well as social skills because through discussions in cooperative learning, students not only strengthen the understanding of their own thoughts, but also have more opportunities to communicate with others (Miller & Polito, 1999).

According to Watson and Marshall (1995), task structures, cooperative incentive structures, individual accountability, and heterogeneous grouping are the four elements of cooperative learning. Task structure is the activities used in classrooms such as lectures, pair work and discussions (Slavin, 1980). Task specialization and group study are two different kinds of task structures. Each member in task specialization is required to do one part of the task, and then the group combines them. According to Watson & Marshall (1995), all group members in group study work together on the same task, they solve each small part of the task together, but they do not need to finish each part of the task individually. There are three different reward structures during the general learning process. Slavin & Tanner (1979) note that a cooperative reward structure in cooperative learning means rewards for an individual are based on the good performance of other individuals in the same team. In other words, the success of one individual requires the success of all individuals in the same group.

In addition, a competitive reward structure means that the failure of one person leads to the success of another individual. An individual reward structure means that rewards for an individual totally depend on his or her own performance, and have nothing to do with the performance of other individuals. Different reward structures have been proved to increase individual performance in different learning environments (Michaels, 1977). Miller & Hamblin (1963) concur with the view that without cooperative rewards, cooperative learning may not help students enhance academic achievement. Individual accountability means that good individual performance of all members in the group, rather than the group outcome as a whole, is the basis of group rewards. Tutty & Klein (2008) stipulates that, each member in cooperative learning has to help others to understand new knowledge well, and ensure everyone in the group truly learns the knowledge, so that when students are individually tested, they can

independently give right answers. Heterogeneous grouping is another element of cooperative learning (Watson & Marshall, 1995).

Students in heterogeneous groups are different from other members on a certain factor which is the base of forming groups. A section is created after explaining the theoretical basis of cooperative learning to introduce two main group strategies which are heterogeneous grouping and homogeneous grouping. Cooperative learning has been proven to improve the attitude of students towards learning as well as towards their classmates (Camara et al., 2007). When students discuss the information with other members, they can learn better because discussions benefit their understanding of knowledge (Jonassen & Kwon, 2001). The interactions among group members develop their social skills (Miller, 1993).

### 2.3 Groups and group work as a teaching technique

Groups play a pivotal role in people's lives. Ezewu (1990:74) defines a group as a "set of people who cooperate for a purpose." Smith (1995) views a group as a unity consisting of a plural number of either animals or people who have collective perceptions or identification of their unity and have collective power to act in unity towards their environment. Since a group is a collection of people or animals then in the context of this study it can be referred to as the arrangement of pupils in a certain way for them to work together to accomplish a given task and help to improve their academic performance.

Munetsi (1994) says group work is a flexible arrangement for adjusting the curriculum to the children's needs. Pupils can be grouped in pairs or more to solve a particular problem. Brown (1982) view group work as a discussion method which involves the interaction of two or more people with each other verbally and record the material being discussed. Therefore in general group work means two or more people sharing ideas to achieve a specific purpose.

Group work is simply viewed as a form of co-operative learning. The method is widely used in teaching various subjects as it facilitates the cross pollination of ideas amongst the learners. Detya (2000) also supports group work as he views it being applied even in contemporary workplaces where people work in teams which are cross-disciplinary.

The ability of a person to work in a group is highly valued than the ability to work independently. Fink (2004) also noted that there has been a rapid growth in the use of small

groups for the purpose of learning even in higher education. Basically, group work is all about team work and collaborative learning in order to achieve a certain objective.

The researcher noticed that most teachers are not very much worried about how pupils are arranged or grouped when employing the group work technique in the teaching mathematics. This has also partly contributed to the decline in pupils' academic performance in the subject both in the internal and external or public examinations. Students would actually have failed to comprehend, retain and recall concepts learnt in groups.

According to Kutnick and Rogers (1994), placing pupils into various groups is a feature of all classrooms. In other words, pupils are grouped in every classroom in one way or the other for the purpose of learning. Zimbabwe Journal of Educational Research (1994) says that the success of group work is very much dependent on the teacher's organisational and managerial skills. This means that grouping should be done by the teacher and it is his or her knowledge which greatly contributes to the success of the group work technique. The researcher focused on ability grouping in the teaching of mathematics.

According to Cohen and Manion (2007), group work frees the children from their teacher for it is important for them to work with each other rather than the teacher. Group work helps pupils to discover and acquire skills by themselves. This teaching method generates enthusiasm and encourages creativity in pupils. Kasambira (1993) asserts that group work breaks cliques and prevents isolation of individuals. Therefore the approach may boost pupils' self-esteem and promotes the sharing of ideas. Sharing of ideas is very important in the learning mathematics as pupils can easily grasp concepts being learnt through discussions.

Vigotsky (1962) also values group work as an approach to social interaction which is centred in facilitating learning. He further argued that learning awakens a variety of internal levels of mental processing that are able to create only when a child is interacting with people in his environment and cooperating with other peers. This means that pupils are shaped their personality; acquire knowledge and skills through social interaction which in this case lies on group discussions.

Cohen (2007) asserts that it is possible that many different ways of working out a problem calls for many different talents. Most of the time pupils do have different abilities in the classroom.

Therefore each can contribute according to his or her ability and this effort amongst pupils creates unity of purpose so that their educational goals and ambitions can be achieved.

Group work is open to a variety of answers, Mnkandla (2004). Pupils will be able to cover a large proportion of content since they will be sharing different viewpoints. Mnkandla (2004) points out that, pupils become exposed to a wide coverage of information and can participate knowledgeably.

Kasambira (1993) asserts that group activities promote competition between and amongst the pupils. Pupils will actually strive to become their best in the given tasks. According to Kasambira (1993), positive competition is generally healthy as it keeps the pupils intellectually trying to outwit each other and further creates interest and participation.

The group work technique is employed because of its several advantages. Mannix and Neale (2005) view that group work help students to develop a host of skills that are very vital in the world of work. They further explain that if group work is well structured it can reinforce skills that are relevant to both the group and individual. It enables complex tasks to be broken down into manageable units. Students can improve their ability in planning their work and time management as well. At the same time, students' communication skills are enhanced.

Mannix and Neal (2005) further noted that there are some of the pupils who are shy to talk during the lesson and their communication skills can be improved as they interact with their classmates tackling problems in different subject areas. Generally, more students in class are given a chance to participate in class activities which may lead to improved performance.

According to Gwarinda (1993), group work improves pupils' ability to delegate tasks. When assigned work by the teacher, pupils in a group can divide the tasks amongst themselves in order for them to manage time and meet deadlines. At the same time, pupils tend to have a sense of shared responsibility. Previous studies show that sharing with others provides pupils with emotional comfort, Barash and Webel (2005).

Some pupils are motivated by working in groups. Group work gives pupils a chance to compete with each other positively as they provide solution to problems. As a result pupils tend to

improve their academic performance significantly unlike when they are operating independently.

This teaching method however, has its own demerits. Group work method is time consuming and requires a lot of planning. The problem to be solved has to be clearly stated and the necessary resources put in place. Gwarinda (1993) views that decision making takes time due to the need to consult others unlike when one is working independently.

The group work technique calls for the teacher to be well organised by ensuring that all the resources are in the right place and in their right quantities. There is also a need for the teacher as a classroom manager to maintain close supervision of group work activities if they are at all to be fruitful, Cohen and Manion (2007).

More so, conflicts are common as individuals usually share different perspectives before they can finally reach a consensus. According to Farrant (1980), such conflicts can be a big setback when the problem needs to be solved urgently. Pupils also have different attitudes towards group work in the classroom. Some students may find it difficult to adjust appropriately to group activities and consequently get frustrated by other pupils who take the role of controlling others.

### 2.4 Heterogeneous grouping and homogeneous grouping in cooperative learning

According to Bossert et al (1984) in Kutnick and Rogers (1994), there are basically two common methods of grouping pupils which are used in the classroom. These are homogeneous groupings and heterogeneous groupings. Bossert et al (1984) in Kutnick and Rogers (1994) described a heterogeneous group as consisting of pupils of different levels of academic performance ranging from underachievers, average performers and high achievers mixed together. In other words, a heterogeneous group comprises pupils of mixed ability. Low, average and high ability students are grouped so that they work as a team to solve some problems.

According to Schullery & Schullery (2006), the communications among group members in heterogeneous groups lead them to understand their own thoughts as well as thoughts of other

members which can help them to successfully finish group tasks. However, the learning atmosphere of heterogeneous groups may not be as good as that of homogeneous groups because in heterogeneous groups, conflict can be more serious due to different perspectives and backgrounds.

In most research related with cooperative learning, heterogeneous grouping is used to form groups (Watson & Marshall, 1995). However, it does not mean heterogeneous grouping is a better strategy to form groups than homogeneous grouping considering the limited amount of empirical research supporting the effects of heterogeneous grouping on student learning. In fact, both heterogeneous and homogeneous grouping has been supported as group composition in cooperative learning research. Studies carried by Lawrenz & Munch, (1984) have shown that students in homogeneous groups have better performance than students in heterogeneous groups, while other studies carried by O'Donnell & Dansereau have found that low-ability students in heterogeneous groups have better performance than in homogeneous groups. Thus, the question remains: which grouping is better when cooperative learning is used with secondary school students, heterogeneous grouping or homogeneous grouping?

Bossert et al (1984) in Kutnick and Rogers (1994) view that in a homogeneous group, there are under achievers only, average performers only or high achievers only. In homogeneous groupings, pupils are almost of the same ability or academic performance and they work together to accomplish a given task. However, the aim of the study is to find out the type of grouping, heterogeneous or homogeneous, is more effective than the other in the teaching of mathematics at secondary level.

According to previous studies, both types of groupings can have positive and negative impact on students' academic performance and social development. Students can actually be affected in different ways in these types of groupings. Gwarinda (1995), views that one advantage of homogeneous grouping is that pupils learn at the same pace. This means that the teacher will not push one ability group at the pace of another group. The teacher can give the groups some tasks that suit their cognitive level of ability. By so doing, this has the potential of improving the academic performance of pupils working in homogeneous groups.

Moving at the same pace that suits each ability group in homogeneous groupings, can promote individualised learning. Individualised learning enables pupils' weaknesses to be attended to

individually. To support this notion, Kelly (1978:12) says ".....teachers will inevitably treat them accordingly, developing those curricula and level of work that has to be appropriate to them."

Teachers' Forum May (1998) supports the idea that pupils of similar ability can discuss their knowledge and ignorance and thus develop a sense of social identity as they learn. In other words, a homogeneous group gives the group members an equal chance to participate in group activities. Each member can contribute something and slow learners or underachievers can improve their academic performance as a result.

Charzan (1974) described slow learners as underachievers as their academic performance is below average. He further goes on to refer children with severe learning adjustments problems as 'handicapped children' and are in need of special educational treatment. In other words, underachievers experience some difficulties in comprehending mathematics concepts in class and need special assistance. Whitehead (1982) views that many slow learners are socially oriented but their written work is usually incomplete and sloppy, even though their oral work may be satisfactory.

As Kasambira (1993) puts it, in homogeneous groups high performers learn at their own fast pace whereas slow learners learn at their slow pace. So the teacher teaches each group accordingly, giving each group a different task. Therefore, this allows the teacher to give more attention to the slow learners in an effort to improve their academic performance. More challenging tasks can as well be given to fast learners to keep them occupied and engaged in the learning process.

Gatawa (1990) aptly say that heterogeneous or mixed ability groups allow the stronger students in an activity to help the weaker ones in a cooperative manner. Fast learners can greatly assist the slow learners to grasp mathematics concepts. So, one of the disadvantages of homogeneous groupings is that the group members may fail to assist each other if they encounter a problem in solving a given task in groups. As a result, the homogeneous groups can end up becoming less effective in the learning of mathematics and at the end produce poor results.

According to Kurt (2001), heterogeneous groupings create an intrinsic state of tension within group members which motivates movement towards the accomplishment of the desired goals.

Therefore, all the students in heterogeneous groups become motivated to achieve the set objective as a team and the students will have a positive impact on each other. Kurt (2001) further explains that a change in the state of one member causes a change in the state of other group members. In short, group members benefit from each other and they are all likely to increase their achievement in mathematics.

Barrows et al (2004) are of the idea that heterogeneous groups encourage constructive competition and interdependence between the group members. They further go on to say that students learn to give and take, to appreciate that in the group as well as in life, each of us can do something but cannot do everything. With this in mind, pupils can therefore work together as a group, engaging in team building and also promote social skills that are necessary for effective learning to take place.

Bailey and Bridges (1983) say that heterogeneous groupings prevent rejection of the less able implied in streaming, setting or banding. Mixed ability grouping therefore eradicate labelling created by homogeneous groupings. According to Mead (1967), in his theory of symbolic interactionism people can attach labels to each other through interaction. Some slow learners in homogeneous groups can end up being labelled as dull. Mead (1967) viewed that these labels can either be accepted or rejected. So if the slow learners accept that label they are likely to perform even poorer. But if they reject it they can work extra hard to prove that they are not dull thereby improving their academic achievement.

Heterogeneous groups eliminate labelling created by homogeneous groupings and promote cooperative learning. Bailey and Bridges (1983:20) say that "..... all getting on well together respecting each other's differences and this suggestion leads to an increase in tolerance of individual fables within the group." This may result in slow learners performing better and having a raised self-esteem.

Mixed ability groupings can also have a negative impact on pupils' achievement. According to Gwarinda (1993), mixed ability groupings tend to eliminate the spirit of competition among pupils. Elimination of competition leads to a drop in pass rate as pupils begin to relax knowing in mind that society accepts them as they are.

Barker-Lunn (1970) asserts that mixed ability grouping creates over-reliance of slow learners on fast learners thereby distorting their academic achievement. Slow learners end up not contributing anything meaningful to the group activities and become passive learners. Only the fast learners provide the solution to given group tasks. As a result underachievers learn nothing meaningful thus resulting in the decline in their academic performance.

Heterogeneous groupings according to Gwarinda (1993), presents the teacher with a problem in varying the manner, pace and content of instruction to the diverse levels of ability among the pupils. So giving pupils of mixed ability a task tailor made for all different levels of abilities poses a problem to the teacher.

Conflicts are usually common in heterogeneous groups unlike in homogeneous groupings. Barash and Webel (2005), view that students can work in similar ability groupings together with peace of mind. They explained peace as harmony in human or personal relations, mutual concord and esteem. Cunning (1978) says that pupils in mixed ability groups might fail to relate to each other. Hence the group discussion is negatively affected leading to poor academic performance.

Mnkandla (1996) also noticed that heterogeneous groups have disadvantages of truancy, noise and disorder, indiscipline and domination by one individual. So, for the discussions or group activities to be fruitful, the teacher needs to closely monitor or supervise pupils in heterogeneous groups to improve their academic achievement.

Though the group work technique is highly recommended, there appears to be no single best way of grouping students into learning. Lou et al (1996) view that low ability students learn more in heterogeneous groups and high ability students learn just as much in either group. This shows that fast learners are always active in group activities regardless of the type of grouping. Those students who are actively involved in the learning process tend to benefit more than other group members.

Webb and Palinsca (1996) also observed that as fast learners explain concepts to their peers they benefit from the cognitive restructuring involved and that might trigger the detection and repair of misconceptions and knowledge gaps. Basically, giving explanations encourages students to clarify and reorganise the material to make it understandable to others. That is the

reason why slow and average learners have been said to benefit more when they learn in heterogeneous groups as they are coached by the fast learners.

Gwarinda (1993) points out that teachers can use either of the groupings depending on their preferences and tasks to be completed. Each type of grouping has its own merits and demerits when applied in the classroom. Heterogeneous groups tend to benefit slow learners as they are coached by fast learners. Kasambira (1993) adds that complex concepts to be learnt can easily be understood by slow learners when they are explained by their classmates. Pupils do not hesitate to seek further clarification from their peers unlike from their teacher. Effective learning can therefore take place which is the primary concern of education as struggling students can get assistance from their peers.

Sometimes heterogeneous groups limit other students' participation to group work due to controls by other pupils who may want to lead the discussions, Kasambira (1993). However, some educationists believe that a teacher should mix the groups so that students of all levels are represented in each group that is, coming up with heterogeneous groups.

**2.5 Teachers' and Pupils' perspectives on homogeneous and heterogeneous groupings**

Gwarinda (1993) noted that most teachers prefer using the heterogeneous groupings where they combine mixed ability students. The whole aim is to enable slow learners to be coached by fast learners for them to quickly understand the concepts being learnt. However, there are some researchers who feel that mixed ability grouping can do the opposite as slow learners pull down the fast learners. Lesson delivery pace tend to slow down and the teacher is forced to device two lesson plans for the fast learners and the other for the slow learners.

Previous research has shown that there are both positive and negative impacts of using homogeneous and heterogeneous groups. Sharp (2001) views that homogeneous groups tend to benefit fast learners. He further goes on to say that when the homogeneous group is composed of gifted students this allowed the instructors to cover the necessary content at a faster pace. The homogenous grouping allowed these high achieving students the setting to excel and raised their academic achievement. Teaching a group of students with similar abilities allowed instructors to adjust the pace of instruction to best reach students' needs Sharpe (2000).

So there are some teachers, according to previous research, who prefer using homogeneous groupings when employing the group work technique. They believe that they can apply the same methodology in explaining some concepts since pupils move almost at the same pace. Constantly changing approaches in one lesson can be tiresome. However, according to Kasambira (1993), it is not advisable to use one type of grouping throughout in all academic areas.

Slavin (1990) believe that ability grouping considered a sensible response to academic diversity. Issues such as students' attitudes towards grouping, the role of the gifted students as role models for other students, impact of grouping on student behaviour and teacher expectations are all crucial when employing the group work technique.

Harsher critics of homogeneous groupings say that it is just another form of racial segregation. However, the proponents view that the practice increases students' achievement by allowing the teacher to better tailor or suit the pace and content of instruction according to students' needs.

Emily et al (2003) studies reveal that if students are grouped homogeneously, there is a fear that low ability students will be deprived of opportunities and be unmotivated to learn because of peer, personal and teacher's expectations of poor performance. On the other hand Lou et al (1996) believe that it is unethical to retard the achievement of high ability students by assigning them to heterogeneous group settings where they might spend their time instructing other group members instead of them learning what they do not know. Emily et al (2003) argues that neither homogeneous nor heterogeneous grouping is superior for promoting academic achievement of students.

Other studies suggest that gifted students working in heterogeneous groups increase in self-esteem, the gifted who work homogeneously and cooperatively had a decrease in self-esteem. Shield (1995) found that students of all ability exhibited greater academic self confidence in heterogeneous groups. Learning outcome can be affected by the student's attitude and lack of interest in the subject. Groulund (1976) describes attitude as all aspects of personality development such as interest, motives, values and so on derived from our daily lives.

Schafer and Olexa (1971), counter that homogeneous groupings are unfair to slow learners citing problems of poor peer models, low teacher expectations and slow instructional pace. They further point out that generally life experiences do not occur in homogeneous groupings and therefore interaction in that social context may be impeded. Cotton and Savars (1981) say that homogeneous groupings can cause teachers to be less sensitive to individual differences. As a result, this can reduce pupils learning experiences leading to low achievement.

According to Gwarinda (1993), homogeneous groupings can result in the teacher concentrating on one group of his/her interest at the expense of other groups. Therefore, it means that other group members end up lacking the much needed assistance which may end up in poor academic performance.

### 2.6 SUMMARY

This chapter was on literature of group work as a teaching technique. The common types of groupings, homogeneous and heterogeneous, have been discussed in detail borrowing some works from other researchers. The next chapter is on research design and methodology which was employed to a class of form two pupils in an effort to find out the comparative effectiveness of homogeneous and heterogeneous groupings in the teaching of mathematics at secondary level.

## CHAPTER 3

## RESEARCH METHODOLOGY

### 3.0 Introduction

The purpose of this study is to review effects of heterogeneous and homogeneous groupings on learning of students when cooperative learning is used at secondary school level and to clarify the role of grouping in cooperative learning contexts. This review addresses the research

question: what are the effects of different grouping strategies (homogenous and heterogeneous) on the learning of secondary school students in cooperative learning contexts? In order to conduct the review, a narrative synthesis is used. This thesis focuses on the effects of heterogeneous and homogeneous grouping on student learning when cooperative learning is used at schools. The results of empirical studies found are diverse due to the diversity of participants, grouping factors and outcome variables in those studies. In order to find the differences among those studies and draw conclusions, comparing and contrasting the results are necessary steps of this review. Narrative synthesis is reliable because by using this method, differences can be easily found when the processes and results of experiments are compared and contrasted (Popay, et al., 2006).This chapter presents the research methodology. Aspects covered include the research design, research paradigm, population and sampling technique, data collection procedures and instruments.

### 3.1 Research paradigm

Kuvuyu (2017) defines a research paradigm as "a pattern, world view, perspective, thinking, school of thought or set of shared beliefs that informs the meaning and interpretation of research data'. In other words the research paradigm indicates the philosophical orientation of the researcher (Lincoln: 2000). According to Lincoln (2000) the major research paradigms are positivism which is scientific in nature, the interpretive paradigm which is subjective and finally the pragmatic paradigm where the choice of the research methods depends on the choice of the research. Pragmatism looks more at the reality on the ground.

Lincoln (2000) also says that a research approach shows the plans for the research. There are four main research approaches which are derived from the research paradigms stated above. These are quantitative, qualitative, pragmatic (mixed methods) and participatory research approach also known as advocacy or action research. For this study a pragmatic research approach will be used.

### 3.2 Research design

Burns and Grove (2003) in Langeni (2009) view a research design as a blueprint for carrying out a study with maximum control over factors that may interfere with the validity of the findings. The research design is simply a plan that describes how and where the data was collected and analysed and basically hinges the conducting of a research.

The researcher applied a case study in carrying out the research. According to Barkley et al (2005), a case study bridges the gap between theory and They further point out that case studies give students practice in identifying the parameters of a problem, articulating positions and arguing different points of view. The researcher had a case study with the form three class. Both quantitative and qualitative data was collected using tests and questionnaires respectively. Pupils were organised in homogeneous groups to solve some mathematical problems on solving triangles. The pupils were given a test at the end of the topic. Heterogeneous groups were also formed in the same class to learn a topic on solving right angled triangles using Pythagoras theorem and trigonometrical ratios. Pupils were given a test at the end of the topic. Questionnaires were also administered to the pupils to seek their opinion on the use of homogeneous and heterogeneous groupings. Both quantitative and qualitative data was collected. Better results are guaranteed than relying on a single data collection method which is inferior, (Tashskkori and Teddlie 2009). Clark (2011) supported the idea that the combination of quantitative and qualitative data provides a more understanding of the research problem than using either approach by itself. The data collected was then used to answer the research questions.

### 3.3 Population and Sampling

Wallen (2016) says that it is upon the population that the results of the study are generalized. Kahn (2013) defines population as any group of individuals or an item that has one or more characteristics in common that are of interest to the researcher. According to McGrown (2011), population is the totality of persons, events, organizational units, case records or other sampling units from which the sample is selected and with which the research problem is concerned. Burns and Grove (2003) in Langeni (2009) describe population as all the elements that meet the criteria for inclusion in a study. In other words population refers to the group that has been targeted for the research study. Mitchell (2012) believes that population is a particular universe or persons, objects or events in which the researcher is interested in. However, from the above statement one can define it as the total number of targeted people in certain area. In this research the population comprised 40 mathematics students from form three class.

According to Chiromo (2006) a sample is a smaller subset of the population selected from the population. This is supported by Cohen and Manion (2007) who described a sample as consisting of individuals selected from a large group called population. Thus a sample is a fraction of the whole population. The sample of this study is made up of 12 pupils. The

researcher applied the purposive sampling procedure. According to Kumir (2005), purposive sampling is the use of the researcher's judgement as to who can provide the best information to achieve the objective of the study. Using purposive sampling the twenty students were selected on the basis of the researcher's judgement of their typicality. The twenty students were in one class being taught mathematics by the researcher. The class had a reasonable number of students thus forming a sample which was representative of the population under study.

### 3.4.0 Data collection Instruments

### 3.4.1 Tests

A test is a measurement tool. It is a short examination of knowledge and ability consisting of questions that must be answered or carried out. Basically, a test is given to check pupils' level of knowledge or understanding of particular concepts.

Pupils were given two tests which were structured. Pupils were asked to answer all questions set and marks were clearly indicated at the end of each part question. Firstly, pupils in the class were organised into homogeneous groups by the researcher to learn a topic on solving triangles using trigonometrical ratios. The class was then tested at the end of the topic. Marks were captured in the record book.

Heterogeneous type of grouping was formed for the purpose of learning a topic on solving triangles using sine and cosine rule. This enabled the researcher to compare the effectiveness of homogeneous and heterogeneous groups in the teaching of mathematics.

### 3.4.2 Questionnaires

The researcher also gathered more data from pupils by means of questionnaires. Questionnaires were prepared for pupils to gather their perceptions on the use of the two group compositions. A questionnaire has guaranteed anonymity and provides a permanent data record.

Cohen and Manion (2007) define a questionnaire as a collection of carefully constructed questions designed to provide systematic information in a particular subject. Chikopo and Mhloyi (1995) view a questionnaire as a document containing questions designed to solicit information appropriate for analysis. The data gathered from the respondents is processed into information useful in answering a topic being studied. It can also be described as a set of questions with aims and objectives of a concept.

Questionnaires were used because they allow data to be collected from a large number of respondents over a short period of time. Both closed and open-ended questions were used in

the questionnaires. The use of open-ended questions provided the opportunity for the respondents to say what they mean confidently in their own words. Therefore, the researcher got detailed information from the respondents.

### 3.4.3 Document analysis

Document analysis may include records. The specific document used is the record of marks from previous tests written. Document analysis is a systematic procedure for reviewing or evaluating documents both printed and electronic material (Bowen, G.A 2012). According to Elli Scambor (2012) document analysis is an investigation method, that focuses on data material and document, which already exist. Bowen (2009) says "Document analysis is a form of qualitative research in which documents are interpreted to give voice and meaning around an assessment topic". In fact documents provide physical evidence to a research (O'Leary: 2014). It yields data excerpts, quotations, or entire passages that are then organised into major themes, categories and case examples specifically through content analysis (Labuschargne: 2003).

## 3.5 Validity and reliability

Bollen (2019) defines reliability as consistency of measurement. On the other hand, Nunnally (2018) notes that reliability is the stability of measurement over a variety of conditions in which basically the same results should be obtained. Nunnally (2018) further says that reliability is that part of a measure that is free of purely random error and that nothing in the description of reliability requires that the measure be valid, therefore, it is possible to have a very reliable measure that is not valid. However, reliability is necessary but not a sufficient condition for validity.

Fraenkel and Wallen (2016) state that the validity of an instrument must always be considered within the context inferences the researcher makes regarding particular areas or topics. In addressing key issues about research instruments: validity, reliability and objectivity, the questionnaires were pre-tested before administering them to the sample. This was done to bring out any vague or poorly phrased questions and also to indicate whether the instructions to the respondents were clear.

## 3.6 Trustworthiness

Trustworthiness involves credibility, transferability and conformability. Credibility is the how confident the qualitative researcher is in the truth of the research study's findings. Qualitative researchers can use triangulation to show the research study's findings are credible. Transferability is how the qualitative researcher demonstrates that the research study's findings are applicable to other contexts. In this case, meaning similar situations, similar populations and similar phenomena. Researchers can use thick description to show that the study can be applicable to other situations. Finally, confirmability is the degree of neutrality in the research study's findings. Researchers can provide an audit trail, which highlights every step of data analysis that was made in order to provide a rationale for the decisions made.

### 3.7 Data collection procedure

Pupils in the class were organized by the researcher into homogeneous groups. The researcher used document analysis of the previous results in trying to group pupils into fast, average and slow learners. Four groups were formed consisting of five pupils in each group. One group had fast learners, average and slow learners had two groups each. The class was taught in those groups a topic on solving triangles using Pythagoras theorem and trigonometrical ratios. The class was tested (Test 1) at the end of the topic and the marks were recorded.

Heterogeneous groups were also formed in the class for learning purposes. The researcher came up with five groups each consisting of pupils of mixed ability. The class was taught in those heterogeneous groups a topic on solving triangles using sine and cosine rule. A test (Test 2) was given to the class at the end of the topic and the marks were recorded. The test scores were then used to compare the effectiveness of homogeneous and heterogeneous groups in the teaching of mathematics.

Pupils were also given some questionnaires by hand post to seek their opinions on the use of homogeneous and heterogeneous groups in the learning of mathematics. The data collected from the tests and questionnaires was analyzed to assist in answering the research questions.

### 3.8 Data analysis

According to Hitchcock and Hughes (2010), data analysis is what the researcher does with data collected so that theories and generalizations can be developed. The data shall be presented and analyzed according to how research questions were addressed. This research study will be both quantitative and qualitative and also diagnostic in nature. Therefore, the researcher shall use tables, graphs and descriptions to clearly and vividly present the data for easy interpretation,

analysis and inference. The information will be presented using tables, graphs and written explanations to enable easy comparison and clear projection of the situation in line with the research questions. The researcher shall also use the independent samples t-tests in analyzing the data collected.

### 3.9 Ethical considerations

According to Makore & Rukuni (2011) ethical considerations are relationships between the individual and the social world. Thus they are the relationship between the social world and the consent of the respondents. These include:

#### 3.9.1 Privacy and confidentiality

Parveenh & Showkat (2017) say that it is the researcher's responsibility to take care of the safety, dignity, rights and wellbeing of participants in the research. In other words the researcher should guarantee the privacy and confidentiality of the research participants (Walker: 2005). Whelen (2007) information provided by participants must be protected and kept strictly confidential. Therefore a consent form must be given to the participants. The aim of ethical considerations is to protect the participants from harm politically, physically and psychologically.

#### 3.9.2 Informed consent

Leedy (2004) says informed consent is any participation in research studies by individuals which are strictly voluntary. Therefore, in this intended study all the participants will participate on their own free will and have the right to withdraw from the study at any time. The respondent shall be asked permission to be a volunteer in the study.
The researcher will also observe other ethical issues as suggested by Resnik (2020) such as;

#### 3.9.3 Honesty

The researcher should honestly report data, results and the research procedures.

#### 3.9.4 Objectivity

The researcher should avoid bias in data presentation, analysis and interpretation.

#### 3.9.5 Integrity

The researcher should keep promises and agreements and act with sincerity.

### 3.9.6 Carefulness

The researcher should try to avoid careless errors and negligence by keeping all research records.

### 3.10 SUMMARY

This chapter outlined the research design, population, sample and sampling procedure and the research instruments. Data collection procedures have also been explained in detail. Reference had also been made to the pilot testing of the instruments and data presentation and analysis plan. The next chapter focuses on data presentation, analysis and discussion.

## CHAPTER 4

## DATA PRESENTATION, ANALYSIS AND DISCUSSION

### 4.0 Introduction

This chapter deals with the presentation of data that was collected through tests and questionnaires. The data was presented by way of a graph, tables and a pie chart. The graph shows the comparison of pupils' performance in the two tests. Number of pupils who got marks in the given mark ranges are clearly given.

### 4.1 Data presentation

**Table 4.1.0 Research question 1.3.1: Type of grouping and pupil performance**

| **Marks %** | **0-20** | **21-40** | **41-60** | **61-80** | **81-100** |
|---|---|---|---|---|---|
| TEST 1 | 9 | 14 | 14 | 3 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| (homogeneous) | | | | | |
| TEST 2 (heterogeneous) | 8 | 16 | 11 | 2 | 3 |

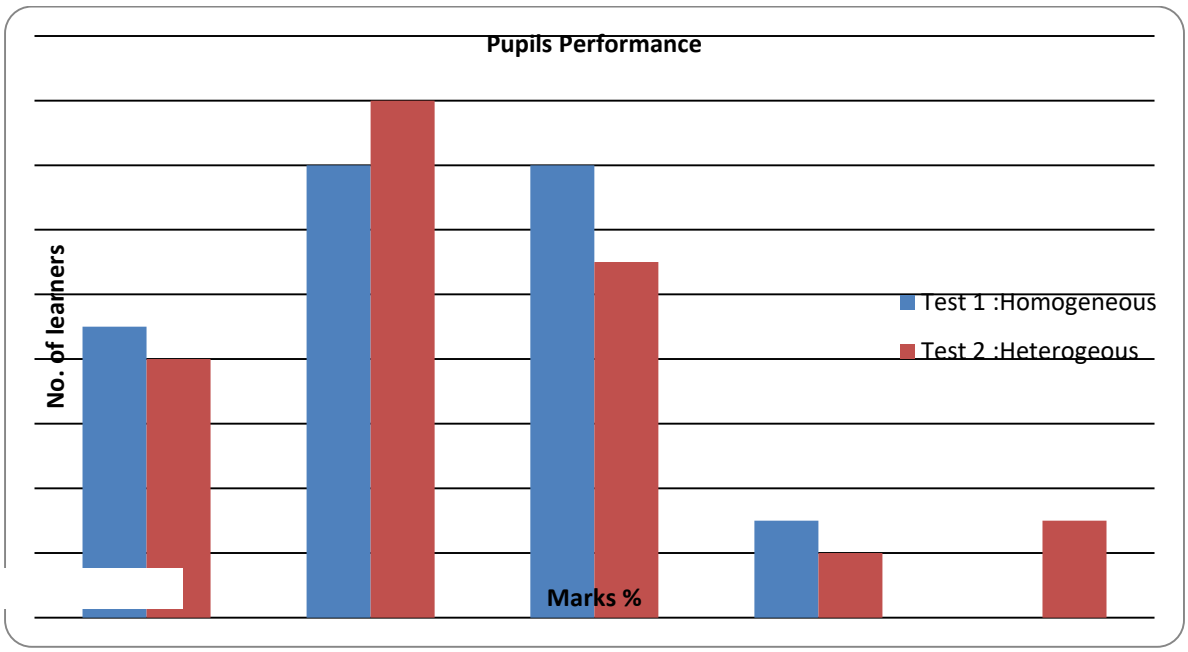



**Fig 1: Bar chart showing pupils' performance on the two tests**

The highest number of pupils (14) scored marks between 21-40% and 41-60% respectively in homogeneous groups. Sixteen and eleven pupils scored marks within the same mark ranges respectively in heterogeneous groups. In test 1, nine pupils scored marks within 0-20% as compared to eight pupils in test 2. The number of pupils who scored marks above 60% declined in both tests though the numbers were different. No one got a mark above 80% in test 1 as compared to 3 pupils who passed in test 2 in the same category. Above three quarters of the students got low to average marks in both tests but there are some who performed exceptionally well in test 2.

The mean mark for test 1 and test 2 was 36.7% and 45.25% respectively**.** When pupils exposed to heterogeneous groups, the mean mark rose by 8.55% to 45.25%. The increase in the mean mark shows that pupils' performance improved when they worked in heterogeneous groups. From the research findings, it shows that if pupils of mixed ability work together in solving mathematics questions, the students can improve their academic performance. The mean mark increased by 8.55% in heterogeneous groups (test 2) which is generally satisfactory. Therefore,

heterogeneous groupings were found to be more effective than homogeneous groups in the teaching of Mathematics.

### 4.2 Research question 1.3.2: Type of grouping preferred by pupils

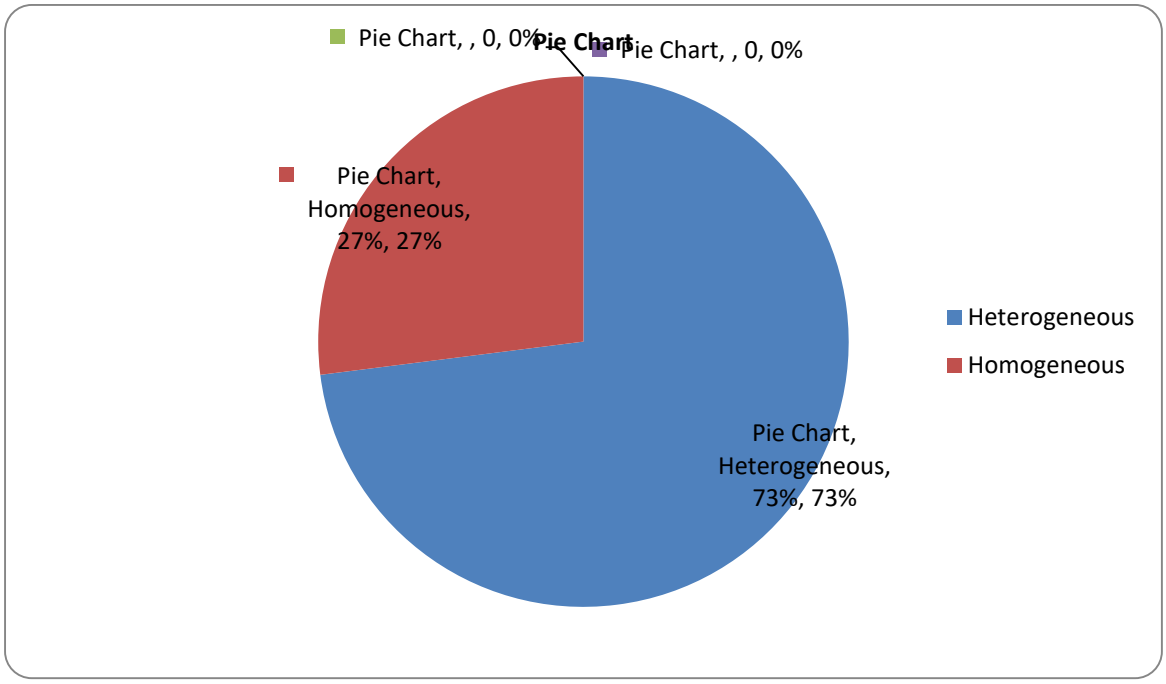



**Fig 2: Shows the type of grouping preferred by the respondents on questionnaires**

The pie chart shows that 73% of the respondents preferred working in heterogeneous groups as compared to only 27% who preferred homogeneous groups. The research findings show that more of the respondents favored working in heterogeneous groups than in homogeneous groups.

### 4.3 Research question 1.3.3

| Behavior | Homogeneous group | Heterogeneous group |
|---|---|---|
| There is free communication | 73% | 27% |
| All group members fully participate | 47% | 53% |
| There are too many disagreements | 13% | 87% |
| Group members are too playful | 73% | 27% |
| Improves performance | 47% | 53% |

| | | |
|---|---|---|
| **There is constructive competition** | **33%** | **67%** |
| **Improves attitude towards school work** | **40%** | **60%** |
| **Promotes sharing of ideas** | **27%** | **73%** |
| **Improves motivation** | **67%** | **33%** |

**4.3: Shows pupils' opinions on the use of homogeneous and heterogeneous groups**

Different reasons given by the respondents for preferring heterogeneous groups were that, they have different abilities and could share different ideas leading to improved performance. Some of the respondents note that there is no room for them to play and can find role models when they work in heterogeneous groups.

In support of homogeneous groups, 27% of the respondents highlighted that homogeneous groups enable outstanding pupils to compete at their own level. When mixed, some of the respondents argued that they have to carry the burden of slow learners. One of the respondents went further and described slow learners as 'parasites' who are there to take information from fast learners.

From the table above, 73% of the respondents were of the opinion that there is free communication in homogeneous groups. Maybe this is due to the fact that pupils will be of similar ability unlike when they are mixed in heterogeneous groups. However, the same percentage view that the group members are too playful when they work in homogeneous groups as compared to 27% who had an opposite viewpoint. This leads to low performance of pupils as shown by the test results. Respondents who viewed that there are too many disagreements in heterogeneous groups amounted to 87% whilst only 13% had a different opinion. This may indicate that heterogeneous groups consists pupils of various opinions as they struggle to reach a common ground in solving Mathematics questions. In homogeneous groups, pupils are almost of the same ability and disagreements are minimal as shown by 13% of respondents who held such an opinion.

Since 67% of the respondents were of the opinion that there is constructive competition in heterogeneous groups, this may mean that too many disagreements occur as pupils try to outwit each other. That should have attributed to a higher performance in heterogeneous than homogeneous groups as indicated by pupils' performance on the two tests that were administered.

In terms of performance, 47% of the respondents had the opinion that homogeneous groups improve their performance as compared to 53% who preferred heterogeneous groups. Considering the research findings, a difference of 6% between the respondents' opinions as to which type of grouping improves their performance is not quite significant. Research findings also show that there are quite a number of pupils who enjoy working in homogeneous groups though their performance on the tests was lower as compared to heterogeneous groups. Somehow, the respondents enjoy free communication which they indicated is present in homogeneous groupings as 73% of the respondents to questionnaire supported the view.

Improvement of pupils' attitude towards school work when using homogeneous and heterogeneous groups was 40% and 60% respectively. So from the research findings, the heterogeneous groups have the potential to enable pupils to enjoy coming to school. Pupil absenteeism especially in rural schools is likely to be minimised.

From the research findings, 73% of the respondents to questionnaires favoured heterogeneous grouping as their opinion was that it promotes sharing of ideas. The respondents agreed that in sharing ideas they acquire knowledge and better understanding of mathematical concepts. Only 27% of the respondents had a different opinion.

The researcher find that 67% of the pupils felt motivated when working out in homogeneous groups as compared to 33% who felt motivated when they solve mathematics questions in heterogeneous groups. Although a greater percentage of the respondents felt motivated working in homogeneous groups, they performed lower than when they worked in heterogeneous groups as shown by the test results.

With regards to research question 4, the independent samples t- test was used. A sample of 10 learners was taken when the researcher gave learners test 1 based on homogeneous grouping and a sample of 12 students was also taken when the researcher gave learners test 2 based on heterogeneous grouping. The results were noted and a hypothesis testing was performed with 5% level of significance as shown below.

4.4**: shows a sample of students marks obtained from two tests written.**

| STUDENT | HOMOGENEOUS (TEST 1) | HETEROGENEOUS (2) |
|---|---|---|
| A | 10 | 13 |
| B | 9 | 20 |
| C | 17 | 15 |
| D | 8 | 3 |

| | | |
|---|---|---|
| E | 6 | 10 |
| F | 15 | 7 |
| G | 2 | 14 |
| H | 1 | 9 |
| I | 20 | 15 |
| J | 21 | 18 |
| K | | 23 |
| L | | 25 |
| **TOTAL** | **109** | **172** |
| **MEAN** | **10.9** | **14.3** |

VARIANCE () = 50.29

VARIANCE () = 42.2

1. Hypothesis

   :

   :

2. Significance level

   **α** = 0.05

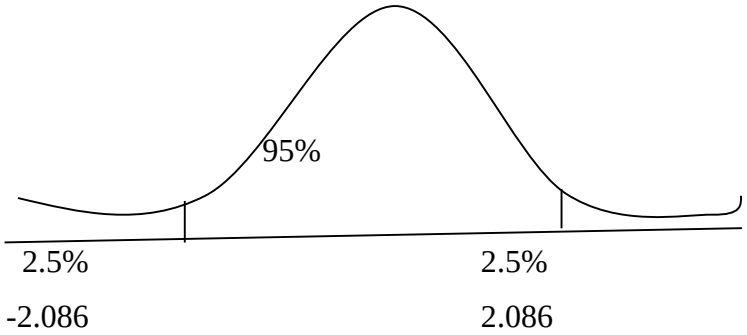
3. Degrees of freedom

   df = (- 1) + ( – 1)

   = (10 – 1) + (12 – 1)

   = 20

4. Decision




   If t is less than -2.086 or greater than 2.086 we reject

5. Test statistic t =

   = -1.129

6. Results

   Since lies between -2.086 and 2.086, we do not reject  and conclude that there is no great significance between the two types of groupings.

### 4.3 SUMMARY

The data collected from pupils through tests and questionnaires was presented and analysed in this chapter. The research findings were discussed linking with information collected in the review of related literature. The next chapter focuses on summary of the study, conclusion and recommendations.

## CHAPTER 5

## SUMMARY, CONCLUSION AND RECOMMENDATIONS

### 5.0 Introduction

This chapter presents a summary of the study. The researcher also draws a conclusion from the study based on the research findings. Some recommendations are given by the researcher for consideration by future researchers in the field and other classroom practitioners.

### 5.1 Summary of the study

The study sought to establish the comparative effectiveness of homogeneous and heterogeneous groups in the teaching of mathematics at secondary level.  A case study was used in carrying out the study and both quantitative and qualitative data was collected. Qualitative data was collected through pupils' questionnaires to assist in the study. A form three class of forty pupils was used in carrying out the research.  A sample of twelve pupils was selected using the purposive sampling technique to fill in some questionnaires. The

researcher arranged pupils in different types of groupings, homogeneous and heterogeneous groups, in teaching mathematics. The pupils were first exposed to homogeneous groups in teaching the right angled triangle before being tested. After that the pupils were arranged in heterogeneous groups in teaching the non right angled triangle and then tested after completing the topic. The test scores were used to compare the effectiveness of the two types of groupings. The study found out that heterogeneous groups performed better than homogeneous groups in the teaching of mathematics. From the test scores, the mean mark for homogeneous groups was 10.9% and it increased to 14.3% for heterogeneous groups. The researcher found out that heterogeneous groups were more effective than homogeneous groups in the teaching of mathematics as there was an improvement in pupils' academic performance.

The researcher managed to seek pupils' opinions on the use of homogeneous and heterogeneous groups in the teaching of mathematics through questionnaires. Respondents had different opinions on these types of groupings which were both positive and negative. Some respondents who favoured heterogeneous groups had the opinion that the type of grouping gave them the opportunity to share different ideas and at the same time encourages constructive competition. As a result, they suggested that their academic performance would improve. These respondents' opinions concurred with the researcher's findings as heterogeneous groups performed better than homogeneous groups from the tests administered. Other respondents argued that there are too many conflicts in heterogeneous groups and cannot successfully work out mathematics tasks in such groups. Respondents were of the opinion that pupils in homogeneous groups can be too playful instead of doing the tasks at hand. However, there are some of the respondents who favoured homogeneous groupings saying that there is free communication. Apart from that the respondents felt highly motivated to work in homogeneous groups. The researcher found out that pupils perform differently when taught in homogeneous and heterogeneous groups and that these pupils also hold different opinions on the use of these two types of groupings.

### 5.2 Conclusion

The study managed to identify a more effective type of grouping between homogeneous and heterogeneous groups in teaching mathematics. Pupils taught in heterogeneous groups performed better academically as compared to when they are taught in homogeneous groups. Analysis of test scores proved that after exposing pupils to these two types of groupings before they were tested. It was also found that pupils themselves hold different opinions on the use of these two types of groupings. Conflicts were said to be common in heterogeneous groups and

pupils in homogeneous groups were said to be too playful. In light of this, it therefore calls for close monitoring and supervision of pupils when they are engaged in group activities. In the classrooms we commonly find pupils of different abilities and all classroom practitioners need to take that into consideration when employing the group work technique in the teaching of mathematics. The pupils' opinions and behaviors are also important and need to be known when using these two types of groupings for effective delivery.

### 5.3 Recommendations

The researcher came up with the following recommendations from the above conclusions:

5.3.1 The researcher recommends mathematics teachers to use heterogeneous groups instead of homogeneous groups since they are more effective in improving pupils' performance.

5.3.2 Mathematics teachers should closely monitor pupils when they are working in heterogeneous groups since conflicts are common.

5.3.3 Classroom practitioners are also encouraged to sometimes use homogeneous groups as a way of motivating pupils and at the same time improving their communication skills which are vital at work and life in general.

5.3.4 Mathematics teachers should closely supervise pupils when they are working in homogeneous groups since the members are too playful.

5.3.5 There is need to encourage mathematics teachers to have an understanding of their pupils' opinions and behaviours on the two types of groupings for the benefit of pupils.

### 5.4 Suggestions for future research.

The research study looked at a comparison on the effectiveness of homogeneous and heterogeneous groupings in the teaching and learning of mathematics in secondary schools. In the researcher's mind, this study has the capacity for continuous replication in the future as mathematics would certainly continue to be an important subject worldwide and in Zimbabwe in particular. In addition, for future research there is need to investigate on how teachers can incorporate other teaching methods into the teaching and learning of mathematics to improve students' performance in the subject.

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## APPENDICES

## APPENDIX 1

## QUESTIONNAIRE FOR PUPILS

This questionnaire seeks pupils' opinions on the use of homogeneous and heterogeneous groupings when employing the group work method in the teaching of principles of Accounts at secondary level. The information gathered will be used for academic purposes only and treated with confidentiality. Your cooperation is greatly appreciated.

**INSTRUCTIONS**

1. Do not write your name, address, phone number etc on this questionnaire.
2. Answer all questions
3. Show your answer by ticking where appropriate ✓

Key terms:
**Homogeneous group** is a group that consists of pupils of similar ability.
**Heterogeneous group** is a group that consists of pupils of mixed ability.

1. Indicate the following set of behaviour to the appropriate type of grouping. *(Tick in the appropriate box)*

| Behaviour | Homogeneous group | Heterogeneous group |
|---|---|---|
| (a)There is free communication | | |
| (b) All group members fully participate | | |
| (c)There are too many disagreements | | |
| (d)Group members are too playful | | |
| (e)Improves performance | | |
| (f)There is constructive competition | | |
| (g)Improves attitude towards school work | | |
| (h)Promotes sharing of ideas | | |
| (i)Improves motivation | | |

2. Which type of grouping do you prefer when solving principles of Accounts questions?

| | |
|---|---|
| Homogeneous group | |
| Heterogeneous group | |

3. Why do you prefer the type of grouping that you have chosen in (2) above?

……
…
……
…
……
……

4. Which type of group is more effective in the learning of principles of Accounts?

| | |
|---|---|
| Homogeneous group | |
| Heterogeneous group | |

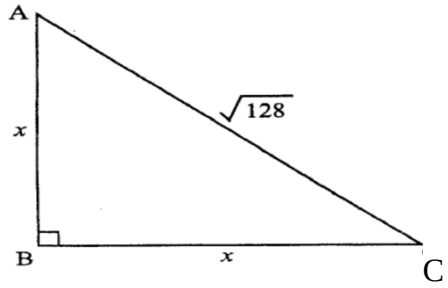
5. Any other comments:

……
…
……
…
……
…

**APPENDIX 2**

**TEST 1**

1.

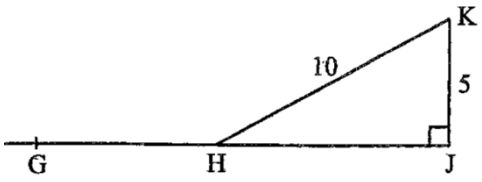



In the diagram AB = BC=, AC = cm and ABC =

(a) Form an equation in [2]

(b) Find the value of [2]

2.



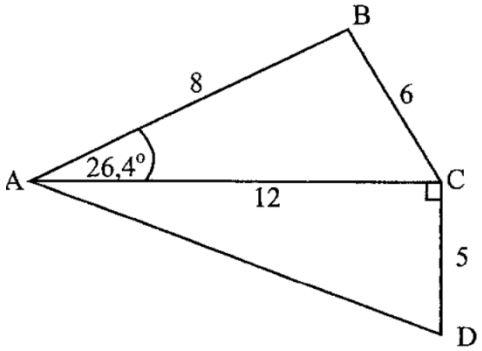

In the diagram GHJ is a straight line. HJK = .

JK = 5 cm and HK = 10 cm.

(a) Find sin GHK, [2]

(b) Calculate HJ leaving your answer in surd form. [3]

3.



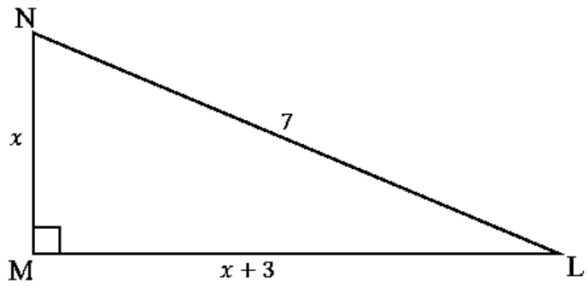

In the diagram, AB = 8 cm, BC = 6 cm, AC = 12 cm, CD = 5 cm, BAC = and ACD = .

Find,

(a) The area of triangle ABC. [2]

(b) AD [2]

4.



In the diagram, LMN = , MN = , ML = ( and LN = 7 cm.

(a) Form an equation in  And show that it reduces to  +

(b) Solve the equation  + -20 = 0, giving the answers correct to 2 significant figures. [5]

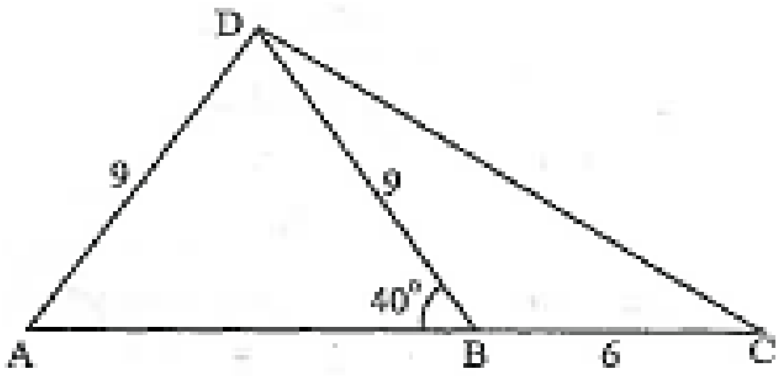
(c) Hence calculate the perimeter of the triangle LMN.
[2]

**23 MARKS**

**APPENDIX 3**

**TEST 2**

1.



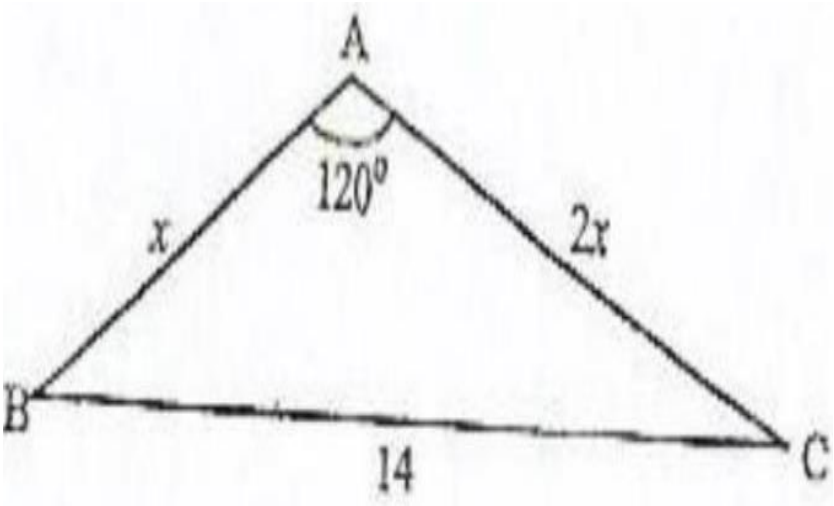

In the diagram, the points A, B, C and D lie on level ground. ABC is a straight road which runs in a west-east direction. AD = BD = 9 km, ADB =  and BC = 6 km.
Calculate

(a) the bearing of A from D,

(b) the distance CD,

(c) the area of triangle BCD. [8]

2.

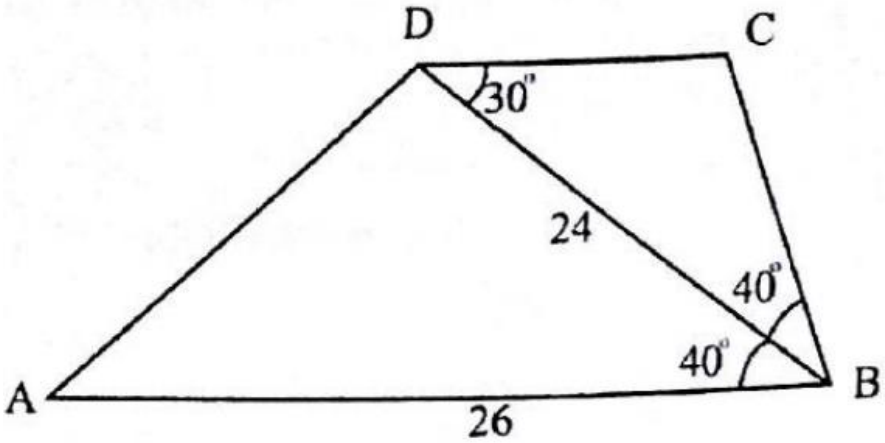



In the diagram, ABC is a triangle in which AB = , AC = , BC = 14 cm and BAC = .\
Calculate

(a) the value of leaving your answer in surd form, [4]

(b) the area of triangle ABC. [2]

3.




In the diagram, ABCD is a quadrilateral in which BD is a diagonal. AB = 26 cm, BD = 24 cm, ABD = CBD = and CDB = . Calculate the

(a) area of triangle ABD, [2]

(b) length of AD, [4]

(c) length of BC, [4]

(d) shortest distance from C to BD, [2]

**26 MARKS**

**APPENDIX 4**

## QUESTIONNAIRE FOR LEARNERS

This questionnaire seeks pupils' opinions on the use of homogeneous and heterogeneous groupings when employing the group work method in the teaching of Mathematics at secondary level. The information gathered will be used for academic purposes only and treated with confidentiality. Your cooperation is greatly appreciated.

### INSTRUCTIONS

1. Do not write your name, address, phone number etc on this questionnaire.
2. Answer all questions
3. Show your answer by ticking where appropriate ✓

Key terms:

**Homogeneous group** is a group that consists of pupils of similar ability.

**Heterogeneous group** is a group that consists of pupils of mixed ability.

1. Indicate the following set of behaviour to the appropriate type of grouping. *(Tick in the appropriate box)*

| Behaviour | Homogeneous group | Heterogeneous group |
|---|---|---|
| (a)There is free communication | | ✓ |
| (b) All group members fully participate | ✓ | |
| (c)There are too many disagreements | | ✓ |
| (d)Group members are too playful | | ✓ |
| (e)Improves performance | | ✓ |
| (f)There is constructive competition | ✓ | |
| (g)Improves attitude towards school work | | ✓ |

| | | |
|---|---|---|
| (i)Improves motivation | ✓ | |

2. Which type of grouping do you prefer when solving mathematics questions?

| | |
|---|---|
| Homogeneous group | |
| Heterogeneous group | ✓ |

3. Why do you prefer the type of grouping that you have chosen in (2) above?

It consists of pupils of mixed ability therefore motivation is improved

4. Which type of group is more effective in the learning of mathematics?

| | |
|---|---|
| Homogeneous group | |
| Heterogeneous group | ✓ |

5. Any other comments:

The heterogeneous group is more effective than the homogeneous group.

**APPENDIX 5**

| | SURNAMES | FIRST NAMES | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BHUNU | TANAKA | 44 | 53 | 50 | 48 | 36 | 79 | | 62 | 41 |
| 2 | CHAKANETSA | SARUDZAI | 48 | 53 | 66 | 48 | 71 | 60 | 68 | | 59 |
| 3 | CHAPWANYA | VIMBAI | 26 | 40 | 42 | 44 | 50 | 62 | | 60 | 59 |
| 4 | CHIKUKWA | NYASHA | 44 | 48 | 68 | 58 | 61 | 53 | | 70 | 45 |
| 5 | CHILUMBA | PRUDENCE | 40 | 47 | 58 | 60 | 50 | 57 | | 70 | 36 |
| 6 | CHIMANYIWA | TSUNGIRIRAI | 42 | 44 | 58 | 51 | 50 | 57 | | 72 | 48 |
| 7 | CHUKERA | CARREN | 20 | 39 | 26 | 39 | 36 | 40 | | 50 | 11 |
| 8 | GWANHOYA | RUMBIDZO | 44 | 40 | 68 | 53 | 58 | 68 | 68 | | 56 |
| 9 | GWARAZIMBA | PATRICIA | 26 | 41 | 40 | 41 | 55 | 12 | 36 | | 15 |
| 10 | KADEMBO | ELIZABETH | 34 | 51 | 62 | 52 | 69 | 45 | 72 | | 55 |
| 11 | MABAIRE | EMILIA | 56 | 45 | 50 | 46 | 52 | 47 | 66 | | 32 |
| 12 | MAHLATINI | EVIDENCE | 38 | 44 | 70 | 51 | 71 | 68 | 68 | | 52 |
| 13 | MANGWENDE | TINOTENDAISHE | 34 | 41 | 58 | 47 | 48 | 64 | 64 | | 36 |
| 14 | MAPURAZI | PRECIOUS | 20 | 43 | 38 | 36 | 41 | 60 | | 60 | 12 |
| 15 | MASAKADZE | MARTHA | 44 | 56 | 68 | 53 | 51 | 70 | | 65 | 29 |
| 16 | MASENGE | RUVARASHE | 32 | 45 | 52 | 41 | 48 | 51 | 68 | | 33 |
| 17 | MATOMBO | SHELTER | 30 | 53 | 58 | 48 | 30 | 60 | 68 | | 35 |
| 18 | MAVESERE | MAKANAKA | 64 | 59 | 62 | 57 | 67 | 70 | | 88 | 45 |
| 19 | MUCHAKATA | AGNETA | 54 | 55 | 82 | 68 | 74 | 55 | | 88 | 80 |
| 20 | MUHWIRIDZWA | GLADYS | 56 | 44 | 56 | 39 | | 39 | 66 | | 58 |
| 21 | MUKWAZHI | TANATSWA | 56 | 61 | 78 | 70 | 76 | 60 | 74 | | 73 |
| 22 | MUTODZA | LUCIA | 40 | 44 | 56 | 48 | 40 | 60 | | 75 | 48 |
| 23 | MWAZHA | CEASELAR | 54 | 48 | 76 | 51 | 53 | 42 | | 70 | 53 |
| 24 | NDINDIRI | NYARADZO | 64 | 61 | 58 | 48 | 50 | 45 | | 52 | 33 |
| 25 | NDLOVU | NYASHA | 28 | 56 | 66 | 50 | 61 | 72 | | 51 | 44 |
| 26 | NYONI | ROPAFADZO | 22 | 40 | 42 | 43 | 20 | 28 | 52 | | 21 |
| 27 | PADI | LLOYDUM | 58 | 59 | 62 | 48 | 62 | 42 | 74 | | 33 |
| 28 | PARWAUNGANA | TADIWANASHE | 56 | 57 | 82 | 54 | 77 | 75 | | 78 | 62 |
| 29 | PIKI | EVER | 32 | 35 | 46 | 59 | 59 | 72 | | 75 | 58 |
| 30 | PISIRA | THERESA | 52 | 48 | 50 | 53 | 64 | 58 | 72 | | 71 |
| 31 | RUGARA | RUTH | 54 | 53 | 88 | 69 | 84 | 55 | 88 | | 59 |
| 32 | TAZVIVINGA | RUTH | 54 | 58 | 58 | 46 | 37 | 40 | | 65 | 52 |
| 33 | VHUDZI | HAZEL | 26 | 28 | 44 | 31 | 22 | 40 | | 52 | 23 |
| 34 | ZIMUTO | TATENDA | 34 | 40 | 56 | 53 | 24 | 40 | 62 | | 35 |
| 35 | CHITANDO | TINOTENDA | 38 | 41 | 38 | 31 | 23 | 23 | 22 | | 23 |
| 36 | CHITIMERA | SHELTON | 54 | 60 | 42 | 56 | 69 | 70 | 76 | | 38 |
| 37 | GWANHOYA | TATENDA | 46 | 56 | 58 | 53 | 74 | 58 | 70 | | 32 |
| 38 | GWATIRINGA | EDSON | 58 | 51 | 60 | 41 | 24 | 58 | 22 | | 39 |
| 39 | KAMUDYARIWA | PROSPER | 40 | 48 | 58 | 52 | 40 | 55 | 62 | | 38 |
| 40 | MACHARAGA | BLESSED | 72 | 71 | 78 | 81 | 88 | 75 | 92 | | 83 |