# DIALOGIC APPROACHES IN MINIMIZATION OF LEARNER ERRORS IN MATHEMATICS CLASSES: A CASE OF PUBLIC PRIMARY TEACHER TRAINING COLLEGES IN NORTH RIFT REGION, KENYA

**BY**

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**2021**

# DECLARATION

## DECLARATION BY THE CANDIDATE

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## DEDICATION

This work is dedicated to my lovely wife Rose and our dear children, Valentine, Gloria, Gibson and Kaiser.

## ABSTRACT

Studies indicate that the majority of the learners do not perform well in Mathematics because they make different types of errors. The purpose of this study was to establish the use of dialogic approaches in minimizing learner errors in Mathematics classes in Public Primary Teacher Training colleges in Kenya. Specifically, it sought to determine how learner-learner, tutor-learner, whole class-group dialogue minimize learner errors in Mathematics classes and challenges faced in using the approach in Public Primary Teachers Training Colleges in the North rift region of Kenya. This study adopted a descriptive survey research design and was guided by social constructivist theory. Stratified and simple random sampling was used to select teacher trainees while purposive sampling was used to identify Heads of Mathematics department and Deans of Curriculum. Data was collected using structured interviews, structured observation schedules, document analysis and questionnaire. Data was analyzed using frequencies, percentages and the hypotheses were tested using chi-square at 0.05 level of significance. The study established that dialogic approach promotes talking and thinking together and help learners understand Mathematics better. Majority of teacher- trainees stated that it was necessary for more than one person to help solve challenging questions and that there was a great deal to be learned from listening to how others think. The study also established that majority of the teachers trainees did not feel left behind all the time during Mathematics lessons and that their Mathematics tutors were competent in teaching. Further, majority of the teacher-trainees operates together to improve knowledge. The teacher trainees showed understanding of how group process promote their learning and that assessment tasks are community products which demonstrate increased complexity of a rich web of Mathematical concepts. The study established that tutors allowed learners to talk freely during the lesson and they appreciated each learner's contribution in the lesson. The study also established that large class sizes affected the use of the dialogical approach in minimization of learners' errors in Mathematics classes. This approach requires more time in teaching during the initiative response feedback. Considering the scope of the content to be covered within the allocated time, it becomes difficult for the tutors to apply the approach. Personal characteristics of the teacher trainees like gender, personality and interpersonal relationships also affect the use of this approach. The study concludes that there is a significant relationship between learner-learner dialogue and minimization of learner errors (a chi-square of 18.272, d.f. =8 and p-value of 0.019). The findings also revealed that there is a significant relationship between teacher-learner dialogue and minimization of learner errors (a chi-square of 22.594, d.f. =8 and p-value of 0.004). Further, it was found that there is a significant relationship between whole class group dialogue and minimization of learner errors in Mathematics classes (a chi-square of 23.187, d.f. =8 and p-value of 0.003). This study will help understanding on problems regarding the development of Mathematical concepts and therefore help in pointing out the source of errors in Mathematics. The study will also increase awareness of the need for tutor educators to prepare a safe, friendly, motivating and productive classroom interaction. Further, the data generated will constitute part of the knowledge pool from which future research can borrow and form a basis for further related research.

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## LIST OF ABBREVIATION AND ACRONYMS

| | |
|---|---|
| **CPD** | Continuous Professional Development |
| **DJEE** | Department for Education and Employment |
| **DTL** | Dialogic Teaching and Learning |
| **DoC** | Dean of Curriculum |
| **HoD** | Head of Department |
| **IRF** | Initiative Response Feedback |
| **IRFRF** | Initiation Response Feedback – Response Feedback |
| **KNEC** | Kenya National Examination Council |
| **KTTCPA** | Kenya Tutor Training Colleges Principals' Association |
| **MoEST** | Ministry of Education, Science and Technology |
| **NASMLA** | National Assessment Monitoring Learning Achievement |
| **NACOSTI** | National Commission for Science, Technology and Innovation |
| **NCTM** | National Council of Tutors of Mathematics |
| **NRC** | National Research Council |
| **PPTTC** | Public Primary Teacher Training Colleges |
| **SACMEQ** | Southern Eastern Africa Consortium for Monitoring Education Quality |
| **SDoEST** | State Department of Education Science and Technology |
| **SPSS** | Statistical Package for Social Sciences |
| **TTDI** | Teaching Through Dialogue Initiative |

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To all I say, 'Thank you and may God bless you abundantly'.

# CHAPTER ONE

# INTRODUCTION OF THE STUDY

## 1.1 Overview

This chapter presents the background information to the study, the statement of the problem, the purpose of the study, objectives of the study, research questions, justification and significance of the study. It does also highlight the scope, limitations and assumptions of the study. The chapter further deals with the theoretical framework, conceptual framework and definition of operational terms used in the study.

## 1.2 Background of the Study

Over the years, teaching has taken place in the form of direct transmission of knowledge from the teacher to the learner. In this system of teaching and learning, teachers plan and execute a lesson and finally examine whether the desired behavior has been realized or not (Wells &Arauz, 2006). Dialogic instructing has been the subject of expanding conversation over the most recent couple of years and various scholars have contended that it holds the best psychological potential for students, while simultaneously demanding a lot from teachers (Alexander, 2006; Nystrand, Wu, Gamoran, Zeiser & Long, 2003). The term dialogic appears frequently in documents from the educational community (Bishop Grosseteste University College, 2007, National Literacy Trust, 2007, Tutornet, 2007). This suggests that dialogic teaching is a concept of growing importance in discussion of learning and teaching (Lyle, 2008).

Research over the past four decades has centered on how teachers and learners can work t ogether in the classroom dialog to co-construct awareness and definitions and build inter-subjectivity (Hower & Abedin, 2013). In particular, the groundbreaking work by

Alexander (2001) highlights the central role played by the quality of the classroom dialog in supporting learner learning and the cultural variability in how dialogical and other forms of pedagogy are manifested.

His term ‘dialogic teaching characterizes and exemplifies productive forms of dialogue in the classroom along time core principles: collective, reciprocal, supportive, cumulative, and purposeful (Alexander, 2008). Participants in dialogic conversation create meaning through chained utterance sequences and chained lines of thought and enquiry. As part of this, specific questions are asked and preliminary responses are pursued aggressively (Wells, 1999). An essential feature of dialogic dialogue is the principles of tolerance for diversity and equal participation. Nevertheless, some studies suggest that enhancing dialogic inquiry and genuine learner engagement in productive interactions is a highly demanding task (Kumpulainen & Lipponen, 2010). Research further demonstrates that dialogic connections are not usually seen in study halls and educators' consciousness of how open practices unfurl and their productive job in the process is constrained (Nystrand, M.A., Gamoran, S., Zeiser & Long, D.A., 2003). School culture as a rule anticipates that members should follow a specific arrangement of conversational 'ground jobs' that dishearten students' thinking, outer commitments question presenting and assessment of peer reactions (Mercer & Hower, 2012).

Classroom communication demonstrate that specific examples of communication exploratory talk, argumentation and exchange advance elevated level reasoning and scholarly improvement through their ability to include guides and students in joint demonstrations of importance making and information development. Analysts like

Alexander (2004) and Dawes, Mercer and Wegerif's (2002) contend that dialogic instructional methods are starting to make advances into customary examples of study hall correspondence in which students are situated as consistent supporters of the instructors reason, their voices scarcely recognized. Students come to study halls with fluctuated thoughts. Right now ought to be welcome to receive the propensities for basic request that question the current structures and challenge the request for things. Alexander sees that ask what establishes knowledge. How knowledge is sorted out, deciphered and imparted? Who claims the knowledge? Whose thoughts are remarkable? (Wolfe and Alexander, 2003).

A critical analysis of such questions poses dilemma to all those involved in education. Mercer and Littleton (2007) posit that dilemmas of tutors are elevated by research that youngsters learn all the more adequately and scholarly accomplishments are higher when they are effectively occupied with academic activity through conversation, exchange and argumentation.

These equips children with the necessary skills and habits of mind required in the modern world to develop the critical reasoning and inquiry skills that enable them participate effectively in the wider mathematical communicative practices to which they have increasing access. Alexander (1995) outlines five categories of talk that are commonly used. He recognizes them as: drilling of information, thoughts and routines through continuous repetition; Recitation: the aggregation of information and comprehension through inquiries intended to test or invigorate re-call of what has been recently experienced, or to assign students to work out the appropriate response from pieces of information gave in the inquiry; Instruction and article: guiding the understudies, or

potentially giving data as well as clarifying realities, standards and methodology; Discussion: the trading of thoughts with the end goal of sharing data and taking care of issues; Dialog: accomplishing basic comprehension through organized, combined addressing and conversation which guide and brief, lessen decisions, limit hazard and mistake, and assist handover of ideas and standards.

As per Alexander (2008), communicative practices in classes over the world assume a unique role that mirrors the manner by which specific social orders are sorted out, the way wherein people identify with society and one another, and contrasting conceptualizations of information. Too he notes there is a verifiable measurement to talk as difficulties after some time cut themselves into talks available for use. These bunch difficulties realize fluctuated rehearses. To start with, the essential trait of essential science training is the accentuation on singular cooperation. Given the low proportion of coaches to kids in numerous homerooms, students are regularly seriously associated with a round of 'think about what the guide is thinking' and quest for right answers (Alexander, 2008, p. 106).

In spite of calls for educating to turn out to be increasingly intuitive, explore proposes that the benchmarks drive in proficiency and numeracy has been counterproductive with customary examples of correspondence strengthened as opposed to diffused (Moyles et al, 2003; Smith et al, 2004). This requires a development towards change set in progress by expanding familiarity with the likelihood for open activity and potential effects on student learning and improvement.

Furthermore, conversation and discourse are singled out for their subjective potential instead of different types of talk noted previously. In discourse collaborations kids are

presented to elective viewpoints and are required to draw in with someone else's perspective in manners that challenge and extend their own calculated understandings. It's the component of 'rationalization'; comprehended as intelligent and sane contention, which recognizes discourse from standard oral or 'intuitive' instructing as right now comprehended by numerous coaches (Alexander, 2008a, p.27).This is supported by Game and Metcalfe (2009) who argue that actual teaching is conducted by both the teacher and the learner and an important element of teaching is that it is a shared process.

According to Brodie (2005) the cognitive and socio-cultural perspectives of learning explain learner reasoning that causes misconceptions during classroom Mathematics discourses. His study however did not show how dialogic interactions minimize learner errors in Mathematics classrooms. A study by Momanyi, Serem and Kitainge (2015) established that anxiety contributes significantly on learner errors in. Another researcher Wegerif (2007), contends that the dialogic space that opens between voices in discourse is the starting point of inventiveness. To figure out how to be innovative is to figure out how to "step back" from fixed character duties and 'intellectual patterns' and permit new voices and methods for seeing to rise. Educating for imaginative reasoning infers bringing students into real open-finished discourse. Right now, isn't to be comprehended as an apparatus that a self uses however as a venturing back of oneself to permit something bigger to course through. Training into a 'disseminated insight' framework that isn't seen dialogically is instruction just for upkeep for that prior framework.

This may be helpful, yet training likewise has the capacity of enabling students to address, challenge and change existing frameworks. Science instruction should, on a dialogic vision of training not just encourage students about what has been done

previously, significant for what it's worth yet in addition prepare students to think innovatively to be capable, conceivably to take arithmetic further in future. It is against this background the exploration looked to research how dialogic approaches are applied towards minimization of student mistakes in Mathematics classes.

### 1.3 Statement of the problem

The goal of Ministry of Education Science and Technology seeks to provide quality education to all learners irrespective of their social economic status. Many reforms have been undertaken to improve the education sector with the view to making it globally competitive. Initiatives such as National Assessment Monitoring Learning Achievement (NASMLA) and Southern Eastern Africa consortium for monitoring education quality (SACMEQ) indicate need for improvement in numeracy competencies. The ministry has had an increasing focus on the quality of education in lower primary particularly in areas of literacy and numeracy in grade one and two, since this is where most concepts are formed. Programs like TUSOME are meant to improve tutor's capacity for effective delivery methods of classroom pedagogy.

Much effort has been made to ensure qualified tutors are employed. Increased remuneration and improvement of terms of service for tutors, provision of teaching and learning resources in Kenyan public tutor training institutions have been promoted or attempts have been made to provide. Despite all these, nearly half of teacher-trainees who sit primary education training courses fail the final examinations in Mathematics. An analysis of the teacher-trainees' performance in P1 (certificate) training colleges over the past five years reveals shocking data of mass failure of teacher-trainees. An analysis of

the KNEC data reveals that for the last three years, a total of 29,595 out of 73,032 (41 per cent) failed (KNEC, 2018).

Only 29 teacher trainees passed with distinction in the last three years. Last year alone (2018), 10,723 of the 29,994 P1 teacher trainees who sat examinations across public and private colleges failed. Of these, 10,457 were given referrals, which mean that they will resit one or more subjects they failed. KNEC data shows that in 2018 PTE examination, only 21 teacher trainees passed with distinction while the majority – 12,388 – managed credit. Some 5,581 had a pass. In 2017 PTE examination, a total of 12,749 of the 24,946 teacher trainees who sat the examination failed. Only five teacher trainees got a distinction as 8,773 managed a credit and 2,570 a pass.

In 2016, some 19,430 teacher trainees sat the examination across all the training colleges. Of these, only three had a distinction. Some 6,389 failed while 8,526 teacher trainees managed a credit and 1,910 got a pass (KNEC, 2018). Mathematics is one of the subjects examinable in PTE examinations.

From the previously mentioned even where there are qualified guides or satisfactory gear and materials, educator learner accomplishment in the subject has not been essentially high. Then again, there are foundations with least offices, instructional material and coaches educate adequately, and assessment results have been moderately better. This could show that accomplishment of learning is straightforwardly connected to what goes on in the study hall. This could thusly point at the methodologies and techniques used to convey subject substance. In this manner, so as to likewise supplement coach planning, there is have to furnish them with chances to share and increase abilities and encounters

on approaches and techniques that can address the issue of value conveyance of substance.

As indicated by Brodie (2013), lion's share of the students don't perform well in arithmetic since they make various kinds of mistakes. Along these lines, the way wherein a guide manages student blunders is critical, as it can either improve or restrain students' comprehension of Mathematics. Philosophies for remediating blunders are not constantly palatable, particularly when extra work or re-clarifying of thoughts are utilized as cures. While much research has been done on the idea of students' mistakes and their hidden misguided judgments (Hansen, 2011; Nesher, 1987; Olivier, 1989) and how mentors may manage such blunders (Borasi, 1994; Swan, 2001), next to no work has shown how dialogic approaches impact minimization of student mistakes in Mathematics study halls in open essential educator preparing schools. This is the reason for this examination that was planned for building up how dialogic approaches were utilized by both instructor students and guides so as to limit blunders made by students in Mathematics study halls in open essential educator preparing colleges in the North Rift area, Kenya.

### 1.4 Purpose of the Study

The purpose of this study was to determine how dialogic approaches could be applied in the minimization of learner errors in Mathematics classes in public primary teacher training colleges.

### 1.5 Research Objectives

This section presents main research objective and specific research objectives.

### 1.5.1 Main Research Objective

The main objective of the study was to determine the use of dialogic approaches in minimization of learner errors in Mathematics classes in public primary teacher training colleges.

### 1.5.2 Specific Research Objectives

The study sought to achieve the following specific objectives:

i. To establish how learner-learner dialogic interaction could be applied in minimization of learner errors in Mathematics classes.
ii. To determine how teacher-learner dialogue could be applied in minimization of learner errors in Mathematics classes.
iii. To determine how whole class group dialogic approach could be applied in minimization of learner errors in Mathematics classes.
iv. To determine challenges encountered in using dialogic approaches in minimization of learner errors in Mathematics classes in public primary teacher training colleges.

## 1.6 Research Questions

The study was guided by the following questions:

### 1.6.1 Major Research Question

How do dialogic approaches minimize learner errors in Mathematics classes in Public Primary teacher training colleges in the North Rift region of Kenya?

### 1.6.2 Subsidiary Questions

The study specifically sought to answer the following questions:

i. How does learner-learner dialogic interaction apply in minimization of learner errors in Mathematics classes?
ii. Does teacher-learner dialogue apply in minimization of learner errors in Mathematics classes?
iii. How does whole class group dialogic approach apply in minimization of learner errors in Mathematics classes?
iv. What are the challenges encountered in using dialogic approaches in minimization of learner errors in Mathematics classes in public primary teacher training colleges?

## 1.7 Research Hypotheses

The study was guided by the following hypotheses.

**$H_{O1}$:** There is no significant relationship between learner-learner dialogue and minimization of learner errors in Mathematics classes in public primary teacher training colleges in the North Rift region of Kenya.

**$H_{O2}$**: There is no significant relationship between tutor-learner dialogue and minimization of learner errors in Mathematics classes in public primary teacher training colleges in North Rift region of Kenya.

**$H_{O3}$**: There is no significant relationship between whole class group dialogue and Minimization of learner errors in Mathematics classes in public primary teacher training colleges in North Rift region of Kenya.

### 1.8 Assumptions of the study

The study made the following assumptions;

i. Tutors training the teacher-trainees are well trained in tutor education, experienced and have a firm grip on the subject content.
ii. All teacher-trainees attained the minimum requirements for the course.
iii. The tutors apply traditional approaches in instruction that are largely routine and teacher centered.
iv. All teacher training colleges expose teacher-trainees to the same Mathematics Curriculum recommended by the ministry of Education, science and Technology (MoEST).

### 1.9 Significance of the Study

By focusing on the dialogical relations of learners in classes, the study hopes to be able to further my understanding on problems regarding the development of deliberating and enabling conceptions of Mathematics and therefore pointing out the source of errors in Mathematics. The study was also envisaged to increase awareness of the need for teacher educators to prepare a safe, friendly, motivating dynamic and productive classroom. It is also believed that the data generated has constituted part of the knowledge pool from which future research can borrow from and form a basis for further related research.

### 1.10 Justification of study

Learners in teacher training colleges have been making several errors in Mathematics that finally affect their performance in PTE. There was therefore need to look for ways of eradicating these errors.

The study of the use of dialogic approaches by both learner, teacher trainees and tutors in minimizing errors made by learners in Mathematics classes is considered to be important in enhancing learners' understanding of Mathematics concepts and therefore minimize or reduce errors (Penkonnen & Torner, 2002). Further, research suggests that there is need to deepen our understanding of the extent to which classroom discourse enable or restrict access to mathematical ideas through its potential influence on conceptions of Mathematics (Boaler, 1999).

### 1.11 Scope and Limitation of the study

This section gives an overview of the scope and limitations of the study.

#### 1.11.1 Scope of the Study

The purpose of this study was to determine how dialogic approaches were applied in the minimization of learner errors in Mathematics classrooms. The variables investigated included learner-learner dialogic interaction, teacher-learner dialogue, whole class group dialogic approach and the challenges encountered in using dialogic approaches in minimization of learner errors in Mathematics classes. The study was done in Public Primary Teacher Training colleges in North Rift, Kenya. The participants of the study were Deans of curriculum, heads of Mathematics department, tutors of Mathematics and teacher-trainees taking Mathematics in Public Primary Teacher training colleges in the North Rift Region in Kenya. Data was collected using questionnaires, interview schedule, observation and document analysis. Data was collected during the month of March and April 2019.

### 1.11.2 Limitation of the Study

One of the expected limitations was that some college departments may have poor documentation systems that may pose difficulty in accessing information. In such cases relevant data were sought from the colleges' registry departments. The period when the study was done coincided with second and third terms of teacher training colleges when final teaching practice assessments for second years take place.

This was however addressed through adjusting time schedules to meet the learners later in the evenings after they reported back to college from TP assessment. Meeting Heads of Mathematics Departments (HoDs) was also a challenge as they were busy and involved in assessment. The challenge was addressed by meeting them after teaching practice sessions.

## 1.12 Theoretical Framework

A hypothetical research system incorporates clear suppositions, ideas and types of clarifications concerning the examination issue and its proposed investigation (Neuman, 2003). This investigation will be guided by the social constructivist system hypothesis.

This methodology sees singular subjects and the domain of the social as insolubly interconnected with human subjects framed through their interconnections with one another (just as by their individual procedures) in social settings. As per Vygotsky, these settings are shared types of-life and situated in them including shared language and games. Here, mind is seen as social and conversational in light of the fact that as a matter of first importance, singular thinking about any unpredictability begins with and is shaped by disguised discussion. Second, all ensuing individual reasoning is organized

and natured by its starting point; and third some psychological working is aggregate as in bunch critical thinking (Vygotsky 1978). Vygotsky contends further that the most essential achievements made concerning improving approaches to manage informational research and appraisal of Mathematics instructing relies upon fundamental considerations with respect to learning through affiliation and correspondence. Ernest (1997) further attests that such an exploration approach in arithmetic instruction underlines the significance of the developments that people carry with them, the social setting where educating and learning happens and a consideration "to the convictions and originations of information on the student, coach and scientist… … " (p.31).

As indicated by Davis and Sumara (2003), "there is no constructivism? In any case, rather, an assorted variety of talks that have been grouped together under the constructivist standard" (p.125).

Key to all constructivist talk, nonetheless, are the epistemological suggestions that information is effectively developed by the student and not latently got from mentors or nature and that coming to know is a versatile procedure where the student doesn't find some goal, prior world (Lesh, Carmona and Hyamosson, 2003). This is like Davis Sumara and Luce-Kapler's (2000) recommendation that different constructivist talks join around the issues of elements, lucidness and a dismissal of "representationist" records of discernment.

Philips (1995) gives a system which isolates constructivism's along three measurements the main measurement, "Singular brain science versus open control" (p.7), which distinguishes the topic worries of constructivists.

The open order shaft frets about how human information all in all is developed while the previous looks to see how singular students approach building information. Numerical originations are here seen as exclusively held developments. The subsequent measurement, "human the makers versus nature the educator" p.7), is worried about the procedure in which knowers, those, come to know. The issue here is whether through the impacts of different personalities together with sociopolitical factors new information is made or whether information gives a layout from which new information is found. The researcher's perspective on Mathematics classes tends towards the previous position. Philips further notes that the third measurement additionally concerns the procedure engaged with information development as far as whether it is viewed as individual insight, socio-political procedures or a blend of both and whether this movement is physical, mental or both the shafts of this measurement may be spoken to by radical constructivists, for example, Piaget and von Gaserfeld toward the end, who accept information is first built inside and afterward externalized toward one side and socio-culturists, for example, Vygotsky who accept that information is first outer and afterward internality at the other.

My standing is firmly lined up with that of Longiro (1993) who contends that all together for the knower to have the option to investigate information claims he/she should utilize public guidelines. Right now is effectively "built not by people however by an intuitive

dialogic network" Longiro (1993). This present one's improvement of originations of Mathematics can be believed to include both individual and social features.

The social post has guided analysts towards exploring the character of associations occurring in study hall, instead of concentrating only on learning results. These viewpoints gives structure to looking at the connection among language and learning and has become an undeniably well-known methodology among researchers inside the circle of instruction as substantiated by (Alexander, 2006; Littleton and Houce, 2009; Mortimer and Scott 2003, Kelly and Durban, 2007). The probability of Socio-social hypothesis has additionally been recognized in Science (Lemke, 1990; Mortimer and Scott, 2003) and in Mathematics instruction look into as (Solomon, 2007) notes.

Directing examinations in Mathematics instruction through a socio-social focal point requires giving agreeable hypothetical load to the job of social interrelations occurring in Mathematics study halls as (Lemke, 2001; Scott, 1998) contends.

Wersch (1991) sees that however a couple of authorities take a gander at these joint efforts widely in the total of their structures, others single out teacher talk like the most great social gadget available to the instructor in controlling understudies' improvement of data. From a socio-constructivist point of view, a learning situation can be made where students develop their Mathematical information through intuitive request based exercises. A few key parts are significant for dialogic learning.

These are investigating process which can advance students' request and examination of the undertaking while at the same time guessing and summing up forms give a methods for students to build their own Mathematical information. The correspondence procedure

helps construct significance and perpetual quality of thoughts this is as per (NCTM, 2000). The Socio-constructivist point of view stresses the job of others in developing comprehension. Socio-constructivist speculations call for students to co-build their insight through joint effort with their friends on important exercises. Exchange and coordinated effort are viewed as key to learning achievement. The social substance developed throughout the students association assists with upgrading the students' reasoning and learning in study hall. Students' dynamic support and dynamic in the day by day life of the study hall and school manufacture obligation and responsibility for. These thusly, become inherent inspirations for additional learning. The focal point of this examination was on the verbal conduct discussion of the guide and the significant job that student reactions and inceptions play in student more slender, instructor student and entire class-bunch collaborations towards minimization of student mistakes in Mathematics classes in open essential educator preparing colleges.

### 1.13 Conceptual Framework

A conceptual framework is a scheme of concepts (or variables) which the researcher uses to operationalize in order to achieve set objectives. This conceptual framework is presented as a model where research variables and the relationship between them are translated into the visual picture below to illustrate interconnections between the independent and dependent variables. According to Ravitch and Riggan (2013), a conceptual framework is an argument about why the topic one wishes to study matters and why the means proposed to study it are apropriate and rigorous.

Figure 1.1 shows the conceptual frame work for this study.

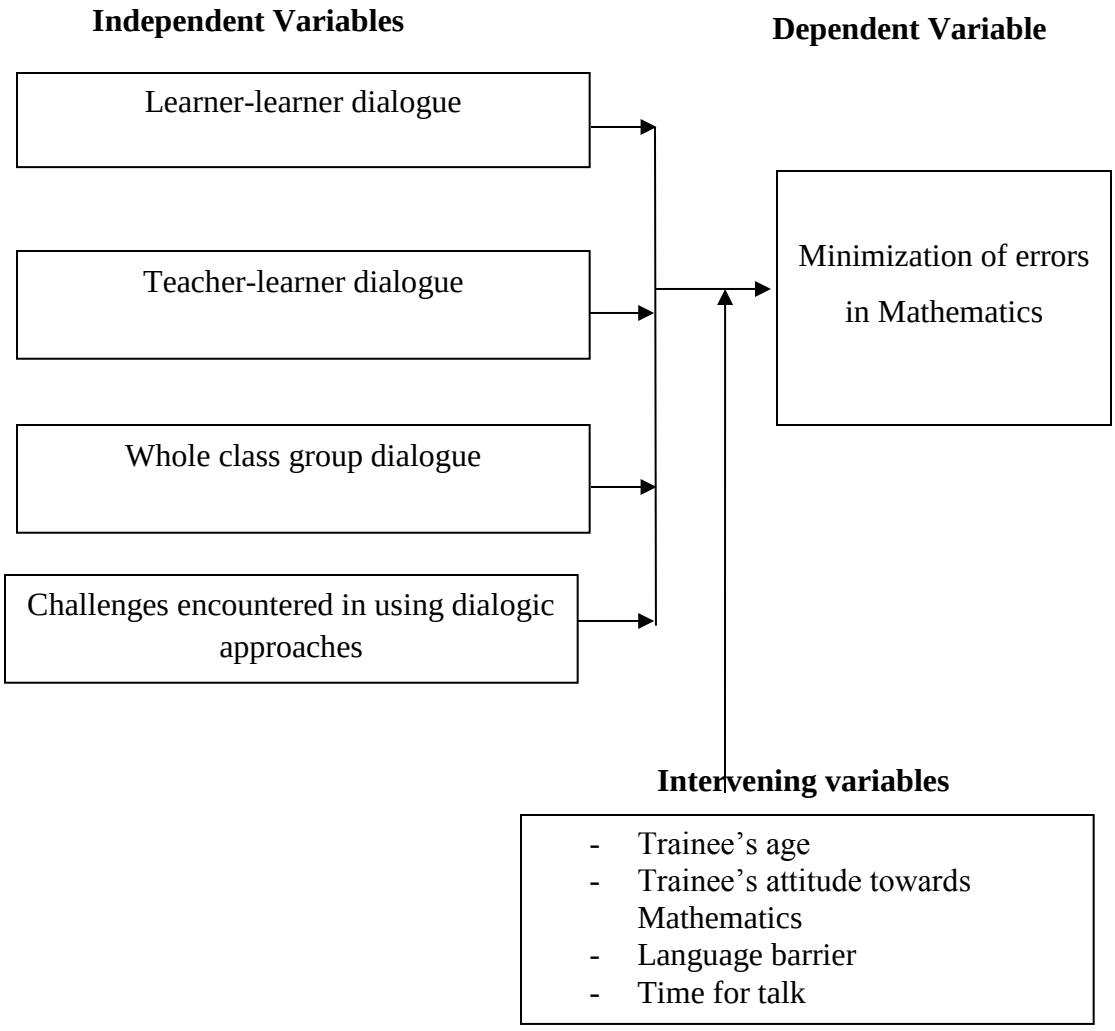


**Figure 1.1 Conceptual framework**

Source: Author (2018)

As shown in Fig.1.1, the minimization of errors can be influenced by learner-learner dialogue, teacher-learner dialogue and whole class group class dialogue. There are also challenges that the teacher trainees and tutors face in using dialogic approaches as a strategy to minimize errors in a Mathematics classes. For the intervening variables trainees' age, trainees' attitude towards Mathematics, language barrier and time for talk

was expected to affect errors in Mathematics. Tutors may argue that dialogic approaches require more time to effectively apply. This meant that the approaches were likely to be compromised not to realize intended results.

### 1.14 Definition of Operational Terms

**Dialogic:** As used in the study refers to the mutual appreciation of different ideas

**Dialogism:** This is an approach providing a means through which learners' and tutors' understanding of learning might shift, and also as a teaching style, with a practical application of concepts during Mathematics classes.

**Dialogic approach:** This will refer to the practice of informal conversation between learners themselves and the learners and the tutor aimed at stimulating thinking, advancing learning and understanding.

**Dialogic teaching: -** Dialogic training will allude to cooperation's in class where students Inquire questions, remark on thoughts that rise in exercises, clarify and state purposes of see, and are given more opportunity for speculation.

**Dialogue:** Refers to a reciprocal conversation between two or more people.

**Discourses:** Refers to the interactive and constructive meaning making process that occurs for learning purposes in Mathematics classrooms. These are the ways learners structure their thinking and talk about Mathematics concepts.

**Gender:** In this study gender is a social construct.

**Instruction:** This will mean teaching in actual Mathematics classes.

**Traditional teaching: -** This will mean the usual conventional style of teaching.

**Tutor:** This will refer to qualified and experienced tutor trainers in Public Primary Teachers Colleges.

## 1.15 Summary

This chapter has looked at the introduction and background of the study, the statement of the problem, the purpose of the study, research objectives and questions, research hypothesis, justification and significance of the study, theoretical and conceptual framework and operational definition of terms.

# CHAPTER TWO

# REVIEW OF RELATED LITERATURE

## 2.1 Introduction

This chapter reviews the related researches that have been conducted on dialogic discourse.

## 2.2 The Concept of Dialogue

There are many meanings that have been advanced for the term dialogue as is used in everyday oral interaction. It is combined from two Greek words (dia and logos) which have different meanings. Dia is translated to ‘through’ while ‘Logos’ is translated to “words, discourse, talk, thought, reason, knowledge, theory” (Linell, 2009 p.4). The idea of dialogism that illuminates a dialogic way to deal with instructing in advanced education depends on crafted by Russian scholarly pundit Mikhail Bakhtin, specifically his original investigation of the European tale, The Dialogic Imagination (1981, trans). Bakhtin's situation on the idea of language is that it is intrinsically 'in exchange' with something different: with different words and expressions as they have been utilized previously (and will be utilized once more) or with an interminably anticipated "other" on the less than desirable end of the articulation.

> “The word in languages is half someone else’s. it becomes “one’s own” only when the speaker populates it with his own intention, his own accent, when he appropriates the word (.-) Prior to this moment of appropriation, the word does not exist in a neutral and impersonal language (- --) but rather it exists in other people’s mouths , in other people’s contexts, serving other people’s intentions: it is from there that one must take the word, and make it one’s own” (Bakhtin, 1981; p. 294).

For Bakhtin, meaning in language, thus in content and talk, is produced through inventive interaction, emphasis and addressing; it lies not in a fixed semantic structure, at the same time, rather, in spaces that open up inside or outside of the structure, in a constant re-creating process incited by its fundamental dialogic nature. The dialogic basic is in this way: "If an answer doesn't offer ascent to another inquiry from itself, it drops out of dialogic" (Bakhtin, 1986; p. 168).

He proceeds to contend, language is destabilized with the goal that the fundamental importance of any articulation or content is dismissed for a various, digressive view, which isn't separated from its socio-social Context: 'words, phrases, expressions … .place themselves one next to the other in such a way, that their past settings meet up and interface in a transient flash of signifying' (Vice, 1997: p.47).

Dialogism sees discourse as fundamental to cognizance that is truly and socially arranged that importance is accomplished through battle and messages are consistently underway (Holquist, 1990). Inside an arithmetic study hall there are different voices, articulations, answers, and relations between these which establish a continuous discourse. Of this set of three of expression, answer and connection, connection is seen as generally significant since it joins the other two and permits them to have meaning. In a homeroom the dominating voices in exchange are those of the guide, the students and the socio-social ancient rarities, for example, course books. As indicated by Khan (2006), the relations between these when seen through a dialogical focal point are in a consistent procedure of development, deconstruction and recreation. This makes Kazepidez (2012) to contend that exchange changes the explanation of individual cooperation and sharing of thoughts

among individuals through reasoning and thinking for more noteworthy comprehension of an idea. While for educationalists drawing in with dialogism, the significance of dialogic changes from being an elective word for learning by means of educator student and student dynamic, communitarian conversation (Bruner, 1996; Lipman, 2003; Alexander, 2006 (an) and (b)), to appropriating social talks and 'setting up networks of request' in the study hall (Wells, 1999; Lipman, 2003; Ligorio, 2010), and to an increasingly unique thought of the potential outcomes of a creative (and radical) dialogic 'space' (Wegerif, 2007; Ligorio, 2010).

According to Alexander, while these readings of dialogism go over the range of instructive hypothesis from exacting to digest idea translations, what they share for all intents and purpose is the possibility that learning may be most significant when the material viable (realities, data, thoughts) isn't just 'transmitted' from coach to student Alexander (2006a; p.12) however is put into a desultory space which takes into consideration information producing conversation coming about, conceivably, in more significant levels of comprehension.

McLaughlin and other researchers note that dialogue has been differentiated from discussion. Another scholar argues that dialogue is not like conversation, chat, discussion or debate. Kazepidez (2012) notes that in chatting there is no certain goal and purpose to achieve, whilst in discussion and debate every individual tries to win argumentation. This means that the parties are holding fixed positions and impress their own ideas onto others. In a conversation the closing stages are not obvious as the opening, as well there are diverse exchanges of ideas among the participants without a logical connection of

ideas. When this is compared to classroom dialogue, one will realize that the end point is frequently apparent for the tutor and also there is a logical chain of ideas among the participants. Ness and William (2009) contend that:

> "Dialogue is a process of inquiry and learning that is based on openness, listening developing meaning, and sharing knowledge through conversation. It is a collaborative approach to discussion that seeks to build awareness, challenge assumption and reach deeper understanding of issues" (p.193).

According to Bakhtin (1986), he disputes this by saying that dialogue should not be used interchangeably with conversation. He makes a distinction by saying what matters is the act of questioning. He goes further to say "If an answer does not give rise to a new question from itself, then it falls out of the dialogue" (in Walse, 2013 p. 134).

Another scientist Mercer (2000), has featured the key job of exchange as 'a social method of reasoning' that permits members to take care of issues together, and in which students assume liability to co-build their comprehension: a procedure named, 'between intuitions'. His original work on peer connections has focused on 'exploratory talk', given that it has extraordinary educative worth. In exploratory talk, accomplices connect fundamentally however usefully with one another's thought. Proposition can be tested and countered through argumentation. Understanding is looked for as a reason for joint advancement. Mercer and Littleton (2007) through their novel program 'Thinking Together', have upheld the utilization of exploratory talk by British Primary School kids. The program effects affected youngster's sensible critical thinking, just as arithmetic and science. There are solid connections between the thought of exploratory talk and responsible talk in which members organizes improvement of thoughts and issues overrepresentation and protection of their own positions (Michaels, O'Connor& Resnick, 2008).

Different scientists (Rojas-Drummond, 2000; Rojas-Drummond and Mercer, 2003) have contended that dialogic styles of collaboration among guides and students are especially successful in advancing pre-younger students' taking care of numerical issues and elementary school understudies' understanding cognizance and learning of normal sciences. Rojas-Drummond, Mercer, Fernandez and Wegerif (2006) have likewise demonstrated that kids can receive the utilization of exploratory converse with the job needing to be done, as far as whether they make (or not) thinking express through argumentation. A more extensive method of co-valuable take was proposed for progressively open-finished undertakings, for example, collective composing which incorporates alternating for giving assessments, producing choices, re-detailing and explaining a data being considered, planning and arranging points of view and looking for understandings.

As indicated by Munter, Stein and Smith (2014), in the dialogic instructing, over a progression of exercises, students must have chances to (a) grapple with enormous thoughts, without coaches meddling rashly, (b) set forth asserts and legitimize them just as tuning in to and scrutinizing cases of others, and (c) take part in painstakingly planned intentional practice. This requires tutors to engage learners in two main types of tasks – tasks that initiate learners to new ideas and deepen their understanding of concepts, and tasks that help them become more competent with what they already know; to orchestrate discussions that make mathematical ideas available to all learners and steer collective understanding toward the mathematical goal of the lesson; to introduce tools and representations that have longevity (i.e. can be used and separated by overtime for different, but likely related, purposes, as learners understanding grows), and, finally to

sequence classroom activities in a way that is consonant with positions of learners as autonomous learners and users of Mathematics.

In the dialogic teaching communicating effectively with others is fundamental to knowing and learning. In this model, the sequence of learning experiences reflects both the progression of ideas that the structure of the discipline would suggest and the developmental pathways learner's current understanding and capabilities take. Such a perspective places importance on building on prior knowledge, which, in this case, refers to the skills and concepts required for learners to meaningfully engage in learning experiences and struggle for understanding, rather than knowing exactly how to solve the problem due to prior exposure to very similar examples (Munter , Stein & Smith, 2014).

Alexander (2005) notes that dialogue is "achieving common understanding through structured, commutative questioning and discussion which guide and prompt, reduce choices, minimize risk and error, and expedite "handover" of concepts and principles. To this effect then dialogue is taken to mean oral interaction between the tutor and the learner and among learners that is based on a great level of thinking, reasoning and exploring concept.

Mercer and Littleton (2007) define this approach as classroom teaching where tutors and learners both make substantial and significant contributions through which learners think on particular ideas and or themes moved forward.

### 2.3 Dialogue and Mathematics Education

A common mistake made in this era of reform is to pressure an isomorphic relationship between approaches of teaching and modes of learning. Radial constructivists have agreed that teachers must never tell students anything, and that knowledge must be

constructed independently of the tutors watchful back. However, a tutor might believe that learners are active constructors of their own knowledge yet still choose from a broad ray of instructional strategies, ranging from drill and practice of recitation, from cooperative groups to simulations.

While creating these educational opportunities for their student teachers use manipulative and historical artifacts they create scientific inquiries and mathematical problems. Since teachers take on different roles in the different instructional configurations much current talk of teaching explores the use of alternative metaphors to capture the essence of teaching; instead of teachers being thought of as tellers, we hear about teachers being coaches, guides and collaborators. But one metaphor alone will not do, for these times when teachers should inquire, using their laboratories for their own learning (as well as that of students). However, because coaches often utilize broad range of instructional strategies it is good to consider the teacher as a team coach. As they learn to demonstrate mastery and even excellence as independent artisans. Coaches as teachers must help players develop fundamental knowledge and skills, provide opportunities for practice, facilitate classroom discourse and keep an eye on the structure and training of players' learning. Heath (1991) distinguishes between "natural learning" from "traditional learning" as:

> "Natural learning sites shape the semantic and situational constraints of reasoning in basic ways. Identifying and solving problems, moving from known to unknown and creating meaning through reasoning, analogically mark everyday reasoning in situations that integrate individuals into teamwork and depend on guided learning in mixed age-groups (p. 103)"

This is the kind of learning that many reformers and Mathematics educators argue for.

The principle of a team coach applies from the fact that the coach supports players

Over 25 years or more a greater amount of re-conceptualize has seen changes from a perspective on Mathematics and science as an "assortment of theoretical ideas and procedural aptitudes to be aced" to a lot of human sense – making and critical thinking exercises dependent on scientific demonstrating of the real world" (De corte 2004, p.280). Subsequently, a definitive objective of arithmetic training is presently observed not just to be procurement of a capability with secluded numerical standards, ideas and techniques however the advancement of what has been known as 'a scientific mien (De Corte, 2004).

The first three levels of Mathematics teaching (rote, recitation and instruction/exposition) are important as they allow consolidation of work and enable learners to grasp routines. With skillful questioning, they can be very effective in promoting aspects of learning Mathematics. However, this constant use limits learners understanding of Mathematics to a body of fixed knowledge that has to be learnt. Taught this way learning Mathematics often becomes boring for learners as it devalues and restricts the learners own thought processes. This is an important reason why dialogic teaching is highly relevant in Mathematics classes.

Dialogue between tutors and learners and between learners teaching and learning Mathematics is important. Without listening to learners, how else do we understand what our learners are thinking. Well constructed dialogue is a powerful tool in ensuring learners become mathematically competent

As indicated by De Corte Verschaffeh and Of T Eynde (2000), it is important to incorporate dominance of space explicit information, authority of heuristics, meta-information capability, self-administrative aptitudes and positive science related

convictions. Therefore "Numerical demeanor" is fundamentally the same as the conceptualization of effective arithmetic learning named "Scientific Proficiency" set forward by Kilpatrick, Swafford and Findell (2001) where the interconnected segments are applied, understanding procedural familiarity, vital competency, versatile thinking and a beneficial air. This last class, beneficial demeanor, is disclosed as ongoing tendency to consider arithmetic to be reasonable, helpful and advantageous, combined with a confidence in the estimation of steadiness and in one's own viability (RAND Mathematics Panel, 2002 p.a.) while in De Corte et al order positive science convictions allude to" convictions" about self-according to math learning and critical thinking, about the social setting wherein scientific exercises occur, and about Mathematics learning and critical thinking".

Both of these classifications hence underscore and perceive the significance of non-psychological results just like a significant piece of a scientific air/capability and cause to notice the way that numerical action in school happens in a specific social setting.

Comprehensively, a significant objective of arithmetic instruction is long lasting, fair access to amazing scientific thoughts (English, 2002). Some portion of accomplishing this objective includes helping all students to create sound or empowering numerical demeanors. Moreover, this requires helping students to create positive originations of science and arithmetic training.

### 2.3.1 Errors in Mathematics

Blunders assume a focal job in the arithmetic classes as they are an impression of the way where students reason and they portray the procedure through which students endeavor to

develop their own insight (Oliver, 1989). Mistakes can be utilized by coaches to give students epistemological access to numerical students' reasonable comprehension (Brodie, 2013). Consequently, the way where a mentor manages a student's mistake is basic, as it can either improve or restrict student comprehension of science. Methods for remediating blunders are not constantly palatable particularly when extra work or re-clarifying of thoughts are utilized as cures (Borasi, 1987). While explore has been done on the idea of the students' blunders and their hidden misinterpretations (Hansen, 2011; Nesher, 1987; Oliver, 1989) and how guides may manage mistakes (Borasi, 1994; Swan, 2001), next to no work has outlined how coaches really manage mistakes in numerical study halls (Heinze and Reiss, 2007).

There are numerous reasons why students may not get the right answer for a scientific issue. These reasons may incorporate, yet are not restricted to, thoughtlessness, absence of information on a numerical idea or the students not understanding what is expected of them in a scientific errand (Swan, 2011). Terms like 'misinterpretation', 'blunders' and 'slip-ups' are regularly used to for each other to depict any arrangement that is a deviation from the normal outcome. Be that as it may, these three are not synonymous and allude to various types of slip-ups. According to Olivier (1989), the first is the thing that she calls 'slips', which are botches made because of thoughtlessness and which are effortlessly corrected when brought up.

Slips are not manifestations of calculated errors. Slips are normal; we as a whole make them as students and practitioners of science.

Slips are sporadic blunders, anyway are precise. They happen all the time and enticing and they are tireless, frequently across settings. Mistakes happen at a profound theoretical level than a slip. So rectifying mistakes is typically insufficient to address these calculated misjudging. The fundamental applied structure that causes the blunders is called misguided judgment as Nesher (1987) notes.

Nesher contends that misinterpretations lead to a group of mistakes, which are not sporadic. Misguided judgments create mistakes. In any case, how are confusions created? The hypothesis of constructivism suggests that we effectively develop information as an establishment to assemble another information. The procedure of osmosis and convenience empower us to rebuild our current plan. Settlement happens when new information is in strife with existing plan and rearrangement of necessities to happen to fuse the new information. Osmosis and settlement cooperating lead to remaking of information (Hataro, 1996) which implies that students are effectively captivating in valuable information, however they likewise re-arrange their insight into amazing outline. The procedure of digestion and obliging new information into existing plan by endeavoring to acclimatize information that we ought to suit. We tend to over sum up new information that is right in the space to another which never again works (Smith, Disessa and Roschelle, 1993). This why blunders are not arbitrary; they make them ground in students right earlier information. A constructivist structure proposes that mistakes are reasonable and sensible to students and that thinking is both substantial and invalid. In this manner, center is working with coaches to comprehend the thinking behind student mistakes and to manufacture or the thinking to build up some new numerical ideas (Brodie, 2013-14).

As per Elbrink (2007), students' numerical blunders can be sorted into three general gatherings; Calculation mistakes, procedural mistakes, and emblematic mistakes. Figuring blunders can be summed up as slip-ups furthermore, subtraction and increase, and division of individuals. Indiscreet and absence of consideration can bring about estimation mistakes they are likewise alluded to as truth blunders. Procedural blunders happen when a student figures or applies a technique erroneously. These kinds of mistakes recommend that students don't comprehend the idea identified with the strategy. Thus, students don't have a comprehension of why or how a method functions. Subsequently, students don't perceive the significance of applying and registering the system accurately. In conclusion, emblematic blunders happen when students dishonestly relate numerical issues that utilization comparative images. Students attempt to make significance in examples of scientific images that they find before them instead of attempting to comprehend what they are really doing. This quest for designs in the images prompts serve petitions, which thusly bring about scientific mistakes.

It is imperative to note here that these mistakes are constrained to essential and optional school science. A significant number of these mistakes result from lacking models given to the students. These mistakes are identified with fundamental scientific ideas that are establishments on which students fabricate their insight base as they progress through school and school. In the event that these mistakes are not tended to, students will be attempting to construct their insight base of arithmetic top misconstrued ideas, which isn't probably going to demonstrate effectiveness. Sorts of mistakes can once in a while be characterized utilizing word issue. These might be understanding blunders, appreciation

mistakes, change blunders, certainty mistakes on encoding blunders. In perusing blunders the student neglects to record a watchword or image or peruses the catchphrase inaccurately while in perception mistakes the student peruses all words in the issue precisely yet doesn't comprehend the general issue or explicit terms inside the issue.

In change blunders the student comprehends what the issue requires yet can't recognize the activity or the succession of tasks expected to illuminate them. Encoding blunders result from the students taking care of the issue however doesn't compose the arrangement in a suitable structure.

### 2.3.2 How tutors deal with errors

The word ‘error’ in the education system tends to have negative connotations. Summative assessments used widely in schools perpetuate the misconception that making errors is punishable through the system of deducting marks for wrong performance (Nesher, 1987). Treating errors as problems may disrupt learners’ confidence in their previous learned correct knowledge (Nesher, 1987). Ingram, Baldry & Pritt (2013) argue that although tutors may not explicitly tell the learners that making errors is problematic, the manner in which tutors deal with errors, by avoiding opportunities for learners to make and discuss mistakes in the classroom, implicitly suggest that errors are problematic (Heirize & Reiss, 2007). Hansen (2011) argues that tutors need to treat errors sensitively and productively, as errors can be used as tools not only to motivate learners but also to assist them in developing their conceptual knowledge by learning from their errors. This is reflected in Brodie’s (2014) research, wherein tutors blamed the learners or themselves for the errors made in classes.

Much of the research on errors and misconceptions argue that errors are a normal part of the learning process (Borasi, 1987; Brodie, 2013, 2014; Smith et al., 2013). Even experienced mathematicians make errors and by so doing create new knowledge (Borasi, 1994). In classrooms, errors make for points of discussions with the learner's current knowledge (Brodie, 2014). The notion of errors gives us a way to help tutors see learners as reasoning and reasonable (Ball & Bass, 2003). By tutors searching for ways to understand why learners may have made errors, they may come to value learners' thinking and find ways to engage their current knowledge in order to create new knowledge. An important issue for tutors' thinking about errors relates to the role and responsibility of the tutors in producing errors.

Errors are seldom taught directly by tutors and yet all learners, even 'strong' learners, develop them at same point (Brodie, 2014).

However, tutors sometimes exacerbate errors through taking them for granted use of language and concepts (Brodie, 2014) and, at another level through not making errors public and dealing with them (Ingram et al., 2013).

Brodie (2013) suggests a framework for analyzing how tutors interact with learner errors. Tutors can avoid, correct, probe or embrace errors. Tutors may avoid or ignore errors because they are insecure about their content knowledge, they may not regard errors as important tools for learning, they may not want to shame learners or they fear that errors may be 'contagious' (Swan, 2001, p. 157). Tutors often correct errors, thereby making the correct knowledge accessible to learners. Correcting errors suggest that tutors have identified and evaluated the errors than interpreted the errors from the learners' perspective. Probing involves tutors attempting to understand errors make sense to

learners, usually by asking learners 'probing questions' or pressing questions to gain access to learner thinking (Brodie & Shalem, 2011). By asking questions, tutors support learns' to develop reasoning and learners learn how to explain their thinking and justify their ideas. Embracing errors is where tutors use errors constructively to generate how knowledge for the other learner who has made the error and for other learners that is why they use errors as tools to enhance epistemological access (Brodie, 2013).

#### 2.3.2.1 Examples of how to deal with errors in Mathematics Classrooms

Most of the errors made in Mathematics classrooms can be categorized as slips, errors derived from conception, language-related errors and errors derived from the incorrect usage of the calculator. Examples of each categories are outlined below. A slip occurs when the tutor asks learners how many times 2 goes to 36. This learner could have treated 36 as 26. In this case, the error can be attributed to carelessness and can be easily corrected by checking the calculation. At this level, it is unlikely that the mistake indicates a conceptual misunderstanding, hence it can be classified as a slip.

An example of an error derived from a misconception is when a learner is asked to add $\frac{5}{10} + \frac{7}{8}$ . A learner can give answer of one and half. The first possible error is that the learner may have added the numerator and denominator separately; $\frac{5}{10} + \frac{7}{8} = \frac{12}{18}$. The error is evidence of a misconception because the learner over generalized through addition of the whole number to the addition of fraction. Addition of numerator and denominator could have also been over generalized through multiplication and division to get the same result.

Much research suggest that misconception is a result of prior correct knowledge interfering with new knowledge. However, how learning, such as multiplication and division of fraction can also interfere with prior correct learning (Olivier, 1989). The second error in the author is that 18 is divided by 12 instead of 12 divided by 18 is equivalent t to 18 divided by 12, a misconception that attributed to the overgeneralization of the cumulative properties of addition and multiplication of numbers to division.

A third example is a language-related error. For instance, when a tutor asks learners for definition of the word 'expansion' a learner regards as making the expression bigger or number bigger which suggests that may have confused the word "expansion' as 'expression'. Despite the familiar pronunciation, these concepts refer to different mathematic objects or processes and have different spellings (Adams, 2013). The language-related problem usually occurs where learner of an expression in Mathematics and there is interchangeable use with expansion language–related error than be idiosyncratic, once again highlighting their reasonableness of such error.

The error due to incorrect use of the calculator is the fourth one. The error occurs when a tutor asks the learners how to represents -1x in the expression$-3^2 - 1x$. Negative one (-1) is like zero when probed the learner said a calculator gave the answer as 0. There is tendency for variable in a scientific calculator in computer mode to represent number saved to zero. Hence, by typing and the incorrect usage of the calculator was used to get incorrect answers.

This error is conceptual because it relates to not understanding how the calculator works and is likely to be repeated and systematic in nature.

### 2.3.3 Dialogued Exploratory Talk

According to researchers in the field like Littleton and Howe, (2010), Mercer and Hodgkison, (2008) they agree on the view that quality of education dialogue is a key factor in academic attainment. While Mercer (2008) indicates that dialogic teaching can increase learner's capacity for dialogue and development of individual and group reasoning skills and therefore enabling attainment in Mathematics. While a research in Mexico posits generalized oracy and literacy gain through collaborative writing activities involving Exploratory Talk (Rojas & Drummond, 2010). There has been some debate whether being able to conduct effective dialogue is a valuable 'end in itself'. While it's certainly the case that tutors often feel under 'pressure of time to deliver curriculum', it is believed that there need to be no conflict between curriculum learning and to think and learn together with others as Philip and Wegerif (2016) put it.

> Being better at dialogue means learning how to ask better questions, how to listen better, not only the words but also the implicit meaning, how to be open to new possibilities and perspectives, while of course learning how to think critically about new perspectives through comparing different points of view. More than all these specific skills…to be more dialogic mean to be open to learn (Philip and Wegerif, 2016).

The learning includes tutors as well as their learners, tutors understanding of the teacher-learner relationship itself may change as they begin by 'dialogic' pedagogy and 'dialogic teaching' which essentially mean an approach to teach that is predicted on the active, extended involvement of learners as well as tutors in the spoken interaction of the classroom, so that teaching and learning becomes a collective endeavor in which knowledge and understanding are formally constructed rather than talk being used by tutors to transmit co-curriculum content and asses its acquisition by learner as argued in

the seminal work of other classroom researchers (Mortimer & Scott, 2003; Alexander, 2008).

Its however important to note that the pedagogy not only requires a tutor to engage learners in thoughtful tutor-led classroom discussions; it also needs learner to engage in explorations task when they are working collaboratively in groups without a tutor. Wegerif argues, as learners cannot be assumed, on the basis of them-out-of school experiences to be familiar with the kind of reasoned discussion represented by exploratory talk, part of implementing a dialogic pedagogy must involve ensuring that learners know how to engage in the type of dialogue to take a socio-cultural perspective, use opportunities to generate more productive dialogue with their learners, provide learners with guidance on how to think collectively. They can devise suitable activities to create spaces which form up dialogue (Wegerif, 2010).

A researcher referred to as 'Thinking Together' has great roots in the educational tradition (Mercer & Dawes, 2014). The Classroom Pedagogy developed a promoted type of talk considered to be effective for thinking and learning first described by Douglas Borasi in 1970s and later called 'Exploratory Talk' (Mercer, 1995, 2000). This has been defined as dialogue in which everyone engages critically but constructively with each other's idea; everyone offers the relevant information they have; everyone's ideas are treated as worthy considerations; partners ask each other questions and answer them, ask for reasons and give them members of the group try to reach agreement at each stage before progressing and an observer of the group, reasoning is 'visible' in talk.

There is growing evidence that dialogic teaching approaches can enhance faster development of substantiated curriculum knowledge. The evidence remains patchy and

mainly small scale and the use of digital technology that support a dialogic-pedagogy need more exploration; in this area is in its infancy, despite some encouraging results (Kerawalla, Petron, & Scanlon, 2013). Many institutions are now introducing tablets and other similar mobile devices to support teaching and learning. Institutions which had invested in these devices apply dialogic approaches have recorded considerable success.

### 2.3.4 Dialogic inquiry based teaching

In spite of the fact that inquiry-based teaching can give reasonable setting to various communications, there is a threat that solicitation based teaching isn't applied as it is proposed. Numerous multiple times the mentors might be exorbitantly be worried about the right substance during requests and not yield the desired mathematical concepts. So as to dodge this inadequacies, tutors ought to know about various ways to apply (Mortimer & Scott, 2003). As per Mortimer and Scotts structure for portraying classroom talk, there are four summed up classifications from a blend of two measurements. There is intelligent and non-intuitive and definitive/dialogic measurements. Intuitive talk permits students to take an interest while non-intelligent is of a talk type. The dialogic approach considers the differing thoughts while the legitimate methodology centers around a particular perspective regularly a numerical methodology constrained by a tutor.

In the interactive-autorative approach, the question and answer routine learner responses are not evaluated and tutor omits diverging ideas and focuses on mathematical concepts in view. The intelligent dialogic approach then again investigates and abuses students' thoughts and has no evaluative perspective. In this manner the dialogic approach as indicated by Mortimer and Scott is instituted when the coach isn't attempting to accomplish a particular perspective. Or maybe, the mentor attempts to inspire the

students' perspective and works with any differentiating mind. Non-intuitive definitive methodologies necessitate that the coach shows the substance by addressing and no dissimilar perspective are considered. The non-intuitive dialogic approach necessitates that the guide works differentiating perspective for instance the student consistently perspectives and moves in the direction of the idea in see. Despite the fact that the guide utilizes a talk, wandering thoughts are examined in this manner coach student approach is dialogic in nature.

Scott and Ametler (2007), stresses that significant instructing ought to incorporate both dialogic and legitimate angles. For example, if conversations are 'open-up' by dialogic approach and students are offered chance to work with various thoughts, sooner or later, conversation ought to likewise be 'shut down' through a definitive methodology.

The shutting down stage would be significant for example when clarifying what contrasts between students regular perspectives and the scientific perspectives are. The dialogic request based educating is described by the dialogic and social component of instructing and learning. The educating has three unmistakable stages: commencement stage, genuine request stage and the looking into stage. The commencement stage incorporates testing student assumptions and despite the fact that biases now could be considered as confusions, students ought to be given time and chance to communicate them. Utilizing an issue based methodology, the mentor could uncover the misinterpretations by utilizing a dialogic approach and opening up issues requiring request. Later on, the perspectives can be thought about against discoveries of the executed request. The real request stage incorporates arranging, executing and thinking about the outcomes. Speculations are made and tried and results are examined among students. The job of the guide ought to be

to a greater degree a mentor than an executive. Right now the ground for important arranging and requests. In spite of the fact that the students are required to do the reasoning, the mentor could at present bring up issues that direct students work and think further. Right now, mentor ought to particularly urge student to student cooperation. In any case, bunch elements are probably going to prompt associations that could be considered as definitive leaving sad for genuine request. This threat in peer conversations can be tended to by the idea of exploratory talk mirroring the attributes of Alexander's dialogic educating.

Exploratory talk incorporates students connecting basically, yet valuably with one another's thoughts. Bransford, Brown, Cooking (2000) Contends that;

> "To develop competence is an area of inquiry, learners must a) have a deep foundation of factual knowledge, b) understand facts and ideas in the context of conceptual framework, and c) organize knowledge in ways that facilitate retrieval and application…to develop competence…learners must have opportunities to learn with understanding. Deep understanding of subject useable knowledge. A profound difference between experts and novices is that experts' command of concept shapes their understanding of new information: it allows them to see patterns, relationships or discrepancies that are not apparent to the novices. (pp. 16-17)"

The exploring stage is basic with regards to accomplishing instructive objectives. Despite the fact that this stage utilizes increasingly legitimate correspondence, the pre-and confusions ought to be checked on against numerical ideas and speculations so as to make express associations between regular perspectives and scientific thoughts and conceivable slip by in the past reasoning. Since various thoughts are as yet considered, the dialogical approach is additionally present.

The legitimate methodology should at present be executed in making the last decision about the substance and about the technique itself. On the whole, when issues are open up

(dialogic approach) they ought to be shut down (definitive methodology) as indicated by Scott and Ametler (2007).

**2.4 Perceptions of Dialogic Approach**

The term dialogic has been related with various kinds of study hall talk, for example, investigation talk, argumentation and request. Therefore, there are differentiating views with respect to whether dialogic is comprehended to allude to types of communication in experimental settings or whether the hypothetical ramifications of dialogic hypothesis are considered. Right now the point is to consider both experimental and hypothetical angles when coordinating hypothesis based on portrayal into training, particularly inside the coach instruction setting.

Though the term dialogic instructional method alludes legitimately to the exact setting, dialogic educating is frequently utilized comparable to hypothetical portrayals. One of the general points of the investigation was to continue from a hypothetical comprehension of academic meanings of dialogic educating given in the writing towards the real usage of dialogic instructing in the truth of study hall as a dialogic teaching method. The qualities of dialogic instructional method can be arranged by the standards of dialogic teaching presented by Alexander (2006). Alexander separates discussion from discourse as far as what follows from students' answers.

In dialogic educating, trades are connected into lucid lines of enquiry as opposed to left disengaged. Alexander's dialogic educating incorporates the accompanying five standards:

- Collective: Teachers and students address learning errands together whether as a gathering or as a class;
- Reciprocal: Teachers and students hear each out other, share thoughts and consider elective view focuses;
- Supportive: Learners articulate their thoughts unreservedly, unafraid of shame over "wrong" answers; and they help each other to arrive at normal understandings;
- Cumulative: Teachers and students expand all alone and each other's information and encounters.
- Purposeful: Teachers design and encourage dialogic instructing with specific instructive objectives in see (Alexander, 2006 p.28).

In general terms, dialogic interactions are defined as interactions where learners ask questions, comment on ideas that emerge in lessons, explain and state points of view, and are given more time for talking. Learners need the support of the tutor who, in turn, must be sensitive to learners' initiatives and able to use talk to provide continuity and ensure reciprocity. However, as Alexander (2006) points out, there is "a risk of confusion" (p.119), as the term dialogic teaching has gained wider currency. Although Alexander (2006) sees dialogic teaching as applicable to the whole teaching process, in which dialogue builds on previous contributions and is targeted in specific direction, Mortimer and Scott (2003) make clear distinction between different approaches constituting communication in a Mathematics classroom. In this sense, the learner can either base their communications approach or taking different voices and ideas into account.

In this way adhering closely to the core characteristics of dialogic teaching, or they can lean more authoritatively towards the scientific point of view in order to steer learning in

the desired direction. In both cases, the tutor will, ideally, nurture socio-cultural principles as well as the essential role of language in learning.

In some interpretations there seem to be a theoretical contradiction between the socio-cultural approach and dialogic views of learning. The socio cultural approach can also be viewed as parallel to so called "dialectic" learning, in which learners aim collaboratively to establish the knowledge to be learned. In contrast, according to the dialogic view (Bakhtin, 1986) different perspectives are made mutually available without fear of being right or wrong (Moate, 2011; Wegerif, 2008). In dialogue, every day and scientific voices are equally present, thus enabling authentic creativity, imagination and problem solving which are fundamental to the development of Mathematics education. Conversely in dialectic process the emphasis is more on goal-oriented learning, and although collaboratively, interactive and reciprocal the learning process do not necessarily foster sufficient openness to accommodate diverging ideas, thus conforming more to a dialectic than dialogic approach.

In reality, upon reflection it might appear that the objective direction in Alexander's instructing resounds more with logic instead of dialogic thinking. Disputably, inside the Mortimer and Scott (2015) structure, dialogic correspondence is underlined as having its own space in homeroom conversations inside which diverse bona fide and even rudimentary thoughts rise, these being tended to all the more definitively just at a later stage. The above explanations are likewise fundamental with respect to the present work, since in spite of the fact that the term dialogic is underscored all through this examination it is comprehended that important Mathematics comprises of the mentor opening up spaces for various perspectives and having the option to profit by these conversations

thus moving towards Mathematics decisions by means of an increasingly legitimate methodology (Scott and Ametller, 2007).

Thinking about the above thoughts dialogic and rationalization (definitive) procedures should both be available in important Mathematics study hall correspondence. As shown, the particular accentuation on and the requirement for both of these angles begins from the idea of Mathematics and Scientific orders. In this way, the goal inside the examination won't be to see educating exclusively as dialogic, maybe instructing ought to develop towards being more to teaching method over explicitly hypothetical conceptualizations of dialogic.

In light of assessment of the various parts of correspondence the worldly idea of total is applied further right now. In total isn't just about tending to how friends expand on one another's articulations (Mercer, 2000), yet rather, as per later definitions, it tends to how the coach expands on students' commitments (Mercer, 2008) and, as featured right now, this is done by means of flexible exercises and correspondence. In request based learning, aggregately identifies with considering students' underlying consistently encounters and connecting them with progressively logical clarifications, along these lines encouraging advancement improvement of learning directions all through the homeroom setting (Littleton and Kerawalla, 2012). At the end of the day, as explained by Littleton and Kerawall (2012), the thought of the in total quality includes investigation of: "… … .. how associations are made among thoughts and settings after some time "(p. 31). All the more explicitly right now will be viewed as an important component for making association between the diverse informative methodologies connected to explicit showing purposes and exercises.

The total part of instructing is commonly viewed as hard to accomplish (Alexander, 2005) as it expects of the mentor a significant level of expert aptitude, including certified subject information, fitting academic abilities and comprehension of the limit of every youngster, so as to take students' suspecting forward. As alluded to before, utilizing students' own earlier information and endeavors has been talked about as being one of the key components of dynamic learning (Myhill and Brackley, 2004).

Correspondingly aggregate talk can be identified with purported responsible talk, which is described as reacting to what has been said and further creating what friends have said (Schmer, Michaels, O'Connor and Resnick, 2009). All the for the most part, the standards of responsible talk go corresponding with the general standards of dialogical teaching.

Over all, the ideas supporting the striking nature of dialogic instructional method in homeroom practice call for coaches to take part in profitable significance making forms by arranging undertakings that create exchange among kids and guides. At the core of these academic definitions is the point of relaxing the edges of evenness in talking rights (Cazden, 2001). All the more explicitly, this implies not just permitting students to alternate without mentor control, yet in addition giving students the option to communicate uninhibitedly and to not be right. Students ought to be qualified for play a progressively dynamic vocal job in the classroom.

Exploratory talk, for example, has been found to advance the individual and group thinking and argumentation capacities of students (Rojas-Drummond and Mercer, 2003; Mercer and Littleton, 2007). These sorts of approaches target testing student thinking and comprehension, challenge the force connections of the study hall and support student commitment, certainty, freedom and duty (Alexander, 2006). Anyway as recently called

attention to in the presentation, situations that advance youngster learning can be acknowledged uniquely with organized direction of coaches (Littleton and Mercer, 2009).

### 2.5 The Importance of Classes Dialogue

The aim of dialogic teaching in Mathematics is not only to teach concepts but also to teach mathematical dialogue in which concepts are questioned and developed (Kazak et al., 2015). Learners' construction of mathematical concepts cannot be considered as separate from the linguistic processes (Lemke, 1990). Learners are constantly in interaction with activities, gestures, conversations, and mathematical symbols while learning mathematical concepts (Airey & Linder, 2008). Language acts as a tool in meaning making mathematical processes.

Learners use language to think about their own ideas and their peers' ideas and to talk about and discuss mathematical concepts. In other words, learners construct mathematical knowledge using various forms of language. Hence, some researchers have offered suggestions about use of language in the mathematical knowledge construction process. Language use can take on the form of either a monolog or a dialog.

In a monolog, the tutor is dominant, and knowledge is transmitted from the tutor to learners, resulting in rote memorization. Each learner in a dialogue takes the perspective of the other into account when they speak.

Therefore, there is no boundary between the learners, rather a shared area is developed. According to Wegerif (2007), dialogue is the source of creativity. Although we can describe how we teach the ability to use mathematical concepts correctly, new things can be learned without explaining how to encourage children to think for themselves. Previously unknown, this means thinking creatively. Teaching for creative thinking

implies drawing learners into genuine open-ended dialogue. One goal of education is to move learners away from rote learning to meaningful learning. Meaningful learning requires making connections between newly introduced concepts and prior knowledge (Novak, 1993). In Mathematics Education there is a tradition of using discourse to analyze how mathematical concepts and connections are being understood by learners (Edwards, 1993; Greeno, 1997). Sfard (2002) especially offers "communication" and uses the metaphor of "thinking" as a form of communication. He thinks that "thinking is almost equal to communication, but not the other way around" (Sfard 2002, p.13). Sfard uses an instrument to analyze how learners enter into dialogue among themselves and how they support their discourse to explain or justify their answers. Sfard's study is also consistent with other research, such as Kieran (2002) and Wretch (1998), which recommend learning through participation.

According to Kieran and Dreyfus (1998), when learners solve a problem collectively, it is possible to have a few moments of "universes of thought" in which participants get to understand mathematical concepts. Dialogic discussion occurs when participants participate in discussions based on valid assertions. Participants who demonstrate this approach try to justify their answers by participating in discussions and using assertions that may have been verified by their peers.

In this sense, participants need to use mathematical objects (and their representations) to support their claims. Such an interaction may have the potential to encourage learning among participants in the group.

In spite of the fact that discussion is a focal component of tutoring and instruction and a developing zone of instructive research, there is by all accounts a hole between

homeroom real factors and hypotheses of learning and improvement that stress the significance of social association. Starting with examines supporting the highlights of dialogic teaching method, the discoveries of Nystrand et al (1997), for instance, show that various styles of correspondence impacts affect student learning. Notwithstanding this, student learning has frequently been related with utilization of open inquiries (She and Fisher 2002). Nystrand et.al, in any case, caution against estimating the connection among learning and open styles by concentrating on, for example, the kind of inquiries utilized through the span of an exercise (Molinari and Mameli 2010). Dialogic Pedagogy is upheld by expanded utilization of bona fide, point important inquiries with respect to the guide, however increasingly basic is the nature of the correspondence that encompasses those inquiries (Nystrand, Wu, Gamorgan, Zeiser and Long, 2003).

Talk, yet in addition to different highlights of interaction, for example, hold up time ought to be viewed as when posing these sorts of inquiries (Vanzee, 2000; Chin, 2004). All in all terms the most significant thought inside dialogic teaching method is the manner by which far the students are treated as dynamic operators in homeroom talk, for example members in the development of their own insight (Van Zee and Minstrell, 1997; Van Zee, Iwasyk, Kurose, Simpson and Wild, 2001). This sort of approach is additionally considered to incorporate an inspirational factor, which is component to long haul inspiration of students (Hill, 2000). While talking about the connection among talk and the improvement of information in schools, Wells (1999) exhibited the possibility of networks of enquiry, where the dialogic idea of talk is misused to empower information to be developed among students.

According to Wells (1999), the connection among tutors and students is dialogic it could be said however is still "not a dialogue between equals: (p.242). When arranging class room exercises ahead of time, the tutor has an obligation of choosing topics and related exercises identified with the educational plan; however once students examination gets going the tutor plays an increasingly consultative job, changing their help arrangement as indicated by student progress. Wells and Arauz (2006) inspected how the integration of inquiry approaches into educational plans influenced tutor communication.

They found that there was away from of increment extra time in the guides' reception of a "dialogic position," in spite of the fact that the commencement reaction – criticism design was as yet inescapable. The watched rarity of dialogic associations may result from correspondence in instructive settings being driven by pre-decided and over-burden curricular substance and goals obliging the breath of conversation and opportunity of members. Moreover, mentors are bound by legitimate and legally binding commitments. Coaches are ordered to restrain students' discourse, to allocate errands and to evaluate the nature of student exercises. As instructing includes more pre-decided, restricted, exact and scholarly portrayals of marvels in school Mathematics, it could lead at last to aversion towards Mathematics (Matusov, 2011).

The various methods for associating in the class room setting should be comprehended regarding their effect on giving or obliging student access to interest and open doors for learning. Frequently students are left to explore classroom connection with no help or devices. As intimated above, study hall examiners have discovered that expounded talk doesn't just happen when students are approached to attempt an undertaking together

(Gillies and Khan, 2008). The guides' job is to help students in participating in profitable correspondence, to bring out thoughts and sees, and to demonstrate thinking process and right now, upgrade significance making and information creation. Moving towards more dialogic teaching method expects of guides the academic aptitudes to have the option to follow and react to the different procedures occurring in the class room.

Notwithstanding monitoring various methods for opening up dialogic spaces, mentors ought to likewise be able to shape these spaces with the end goal of accomplishing exercise objectives, including, definitely, the capacity to define the limits for exchange (Wegerif, 2010). For example, as request based methodologies are progressively incorporated into Mathematics educational programs mentors should be increasingly mindful of how to open up bona fide periods of request and when to guide the conversation towards Mathematics ends. As a rule, mentors and coach instructors should be taught in how to utilize various sorts of talk during training successions for various educating purposes.

Research over the last four decades has focused on how classroom dialogue allows tutors and learners working together to construct knowledge and meanings and develop inter-subjectivity (Howe & Abedin, 2013). Alexander's (2001) ground-breaking work highlights the central role played by the quality of classroom dialogue in promoting learner learning, and cultural variation in how dialogic and other form of pedagogy are manifested.

Mercer (2001) has highlighted the role of dialogue as a "social mode of thinking" that allows participants to solve problems jointly, and in which learners take responsibility for co-constructing their understanding: a process termed 'interthinking'.

His seminal work on interaction has centered on exploratory talk given that it has special educational value. Exploratory talk partners engage critically but constructively with each other ideas. Ideas may be challenged and counter-challenged via argumentation. Agreement is sought on a basis of joint progress. Ras-Drummond, Torreblanca, Pedraza, Velez and Guzman (2013) posit that learners are active rather passive participants in the process of dialogic interactions. Likewise, Mercer and Littleton (2007) assert that the in tutor-learner as well as peer interaction, dialogue enables sharing of ideas and pursuit of common goals.

Ras-Drummond *et al*., (2013) in Dialogic Teaching and Learning (DTL), conceive DTL as that which harnesses the power of language to stimulate and extend learners' understanding, thinking and learning as collective, reciprocal supportive, cumulative and purpose; engages in 'social modes of thinking' where possibilities can be explored collectively through creative problem solving framed by open minded or authentic question/task and reasoning can be made visible to others. They also perceive DTL as that which encourages inquiry and equitable participation, where al including tutors are seen as co-learners construct knowledge jointly; is open to new ideas and critically constructive, where negotiation of perspectives allows joint problem solving; promotes the creation of environment where diverse voices can be expressed, explored, contrasted challenged cumulatively built upon each other and synthesized, allowing analysis, transformation and reconciliation of underlying points of view and brings into question the widely observed predominance of traditional and 'monologic' educational practices where only one voice (primarily the tutors) tend to be heard, legitimized and sometimes imposed (Nystrand *et al.*,2003; Drummond, 2000).

Good teaching requires using learner's constructively in class on the basis of tutors' professional knowledge and judgement. Embracing errors has the potential to allow learners to develop a rich understanding of concepts.

It is preferable to embrace errors rather than correcting or probing errors, which provide learners with limited access to knowledge in comparison to the access afforded by learners. However, tutor should not always embrace errors because as Hansen (2011) suggests embracing errors may be extremely time consuming. With the demands of the curriculum, it will be difficult for tutors to constantly embrace errors. However, embracing errors can be less time consuming than re-teaching and re-explaining ideas which are not useful to eradicating misconceptions (Borasi, 1987).

Tutors should be aware of the benefits and the limitation of coping and embracing errors. Using their professional errors, tutors should decide when and why it is appropriate to probe and to embrace errors in light of their knowledge of the content and the learner.
For instance, it may not make sense to embrace a slip. Probing or correcting slips may be more suitable method of dealing with mistakes. In probing and embracing errors, tutors are able to develop their learners' mathematical proficiency and reasoning skills help them to become aware of their own errors and develop a sense of urgency in relation to mathematical learning.

There is growing evidence advocating the importance of dialogue-rich interactions for learner learning and engagement in classrooms, albeit not a great deal in Mathematics. Research in primary schools addressing the impact of instructional dialogues in

Mathematics classrooms is lacking (Anderson, Chapin & O'Connor, 2011). Additionally, researchers and educators lack a framework for tutor-self assessment analyzing the impact of their dialogic strategies on learner's learning of Mathematics (Hennessey et al., 2016). Educational research across the globe overwhelming suggests that dialogic approaches to instruction provide an educationally productive environment that promotes learner learning and engagement (Alexander, 2017). Moreover, current research has shown that the nature and influence of pedagogy in classrooms is comprehensively and persistently dependent on the dialogic patterns at play in the sequential flow of tutor-learner exchanges in lessons (Edwards-Groves & Davidson, 2017).

Dialogically involves repertoires of classroom talk and interaction that promote learner participation (Sedova, Sedlacek & Svaricek, 2016); and as found by Edwards-Groves and Davidson (2017) include questioning by tutors and learners that provoke thinking, extended responses involving justifications and elaborations, critical evaluation of ideas, and explorations of different perspectives. Nevertheless, observational studies strongly indicate that these features are by no mean firmly embedded in classrooms around the world (Alexander, 2017; Skidmore, 2006). Instead, the Initiation-Response-Feedback (IRF) (Mehan, 1979) identified as the default pattern of classroom pedagogical talk remains dominant in classrooms (Skidmore, 2006). The IRF is centered on closed, leading questions with "low cognitive demand" (Sedova et al., 2016, p.14). Even more significant, is that less is known about dialogicality in Mathematics instruction (Anderson, Chapin & O'Connor, 2011).

Research has shown that the significance of dialogic pedagogies is the capacity for tutors to open up classroom exchanges to enable learners more time and opportunities for engaging in substantive productive discipline talk. Indeed, dialogicality in lessons focuses on tuning into others' perspectives and the continuous collective construction of knowledge through sharing, listening actively, and critiquing, problem-solving, questioning, extending and reconciling contrasting ideas. Importantly, these forms of talk are cumulative and often make links between past and future learning or to wider contexts beyond the immediate interaction. More fully developed pedagogical dialogues have not only been shown to assist learner's thinking and learning (Mercer & Littleton, 2007), but are also pivotal for developing learners' content knowledge in Mathematics through oral language use in discussions (Anderson et al., 2011). Yet, tutor understanding of dialogic approaches across the disciplines is limited (Hennessy, Dragovic & Warwick, 2017).

Dialogue-rich instructional strategies have been shown to be a high-leverage pedagogical tool for both constructing subject knowledge and as a valued process clearly linked with the development critical thinking and productive learning and the connection making between and within subject disciplines (Kazepides, 2012). What is striking is that the research worldwide reporting on the educational potential of participating in dialogues have not resulted in substantial changes in teaching. Rather, studies have consistently shown that in today's classrooms, discourse remains dominated by monologic teaching (Reznitskaya & Gregory, 2013). Further to this, and despite growing international evidence for the educational value of learner-learner and learner-tutor dialogues,

researchers and tutors lack an analytic framework for making sense of the form and function of dialogic approaches to instruction (Hennessy et al., 2016).

These issues have particular significance in Mathematics education, particularly when it is widely accepted and evident in curricula across the world, that mathematical processes are an integral and important aspect of learning Mathematics. While these 'processes' are multi-faceted and variously labelled, commonly they include aspects like reasoning, explaining and thinking mathematically (Clarke, Clarke, & Sullivan, 2012). Research implies that dialogue-rich pedagogical practices are valuable for enabling learners to develop mathematical processes, and as such it is important to understand how they are enacted in Mathematics classrooms, and specifically how these connect to the development of skills, knowledge and dispositions related to reasoning, explaining, thinking and communicating processes.

## 2.6 Challenges of Applying the Dialogic Approach

This review of current intuition on dialogic shows features in the hole between standard practice and the developing acknowledgment of the intensity of exchange during the time spent making meaning. One of the hindrances to the usage of dialogic practice in the educating of Mathematics is the strength of the mentor's voice to the detriment of students' own significance making voices.

The force connection among mentors and students is a hindrance to real discourse in study hall settings. Moreover, numerous coaches come up short on the fundamental abilities for arranging successful entire class exchange and subsequently the educational capability of learning through dialogic talk is unattainable.

Proof from observational investigations demonstrate that in an investigation of more than 100 center and secondary school classes dialogic talk took up under 15% of guidance time and when 'lower-track students' were locked in there was a virtual nonappearance of such talk (Nystrand et al., 1977). Myhill and Fisher (2005) found that youngsters had little chance to address or investigate thoughts in homerooms. Frequently there is minimal productive significance making and restricted open door for understudy investment. The accentuation is on authentic review as opposed to higher request associations including thinking. This may be the explanation behind low execution of students in their assessments.

The nearness of a National Curriculum in numerous nations implies coaches have a superseding pragmatic worry with covering the educational program. Numerous mentors work to severe time tables and substance drove educational plan necessities and battle to

perceive how dialogic can turn into an ordinary component of homeroom practice. This is especially valid for coach preparing schools.

Much will rely upon how current patterns towards the advancement of reasoning aptitudes require synergistic talk, are really installed in the statutory educational program. How guides can push ahead on this requires earnest consideration by specialists and experts.

Lefstein (2006) censures backers of educational discourse as excessively optimistic and requires a progressively even minded methodology. He takes a gander at the awkwardness in the circulation of assets for the activity of intensity in establishments and reminds that mentors are ordered to restrain students' development and discourse, relegate errands and decide the nature of less fatty action just as being vested with epistemological position. The way that school is necessary, student participation is constrained and coaches are bound by authoritative and lawful commitments. Considering all these, one is left to question if mentors can break down or rise above their conventional jobs. Beneficial to note is that numerous students originate from hindered and subjected bunches where cultural imbalances are generally recreated in the study hall. Connections outside homeroom obviously sway on study hall communication and should be problematized. Force relations limit correspondence and will be impacted by students' solid encounters of benefit and persecution (Ellsworth, 1989).

Backers of dialogic showing mourn the nonappearance of exchange, of authentic discussion in classes where youngsters are kept from creating voice and basic consciousness of their own closures, means and limits in learning. Testing such examples

of association requires a lot of exertion and duty for the benefit of coaches and shows extensive test to the individuals who wish to set up such procedures in science classes and schools.

One of the key challenges for tutors relates to knowing how to choose which type of teaching talk to involve and its timing in a lesson. Dialogic teaching is not the solution for every situation it is only part of the repertoire. For instance dialogic teaching can lend itself to areas of learning Mathematics where learners have naïve /common understanding of something in Mathematics in specific like the equal sign meaning and the place value decimals. This is to say where a coach can set up discussion which challenges ideas and has to be logical in form and which creates concepts which are useable across a range of application so that limitations can be tested. Dialogic teaching harnesses the power of talk to engage learners, stimulate and extend their thinking and advance understanding. Not all classroom talk secures all this outcomes, and some methods may even discourage them. Part of making dialogic teaching reflective is through developing learners' use of vocabulary. Developing learners' ability to narrate, explain, ask questions, speculate, argue, reason, use imagination and justify will go a long way in developing learner abilities and competencies.

Some of the strategies to develop mathematical competence in the learner's halls include: being a role model-use correct mathematical language as a tutor or coach, giving learners the opportunity to improve their answers so that the correct answer is used, listening to what learners say and gently challenging the incorrect use of terms, encouraging to give full rather than brief answers, explaining vocabulary when need arises, so that learners see how it is used in context, knowing the difference between a mistake and a

misconception; making sure that all learners can pronounce the correct new vocabulary and put it to different sentences, missing out the verbs in "close" exercise rather than nouns. Learners have to think about the ways ideas inter-relate. Having interesting displays in the classroom to encourage learners to think and conjecture Mathematics, get the opportunity to revisit and consolidate familiar terms, providing opportunity for the learners to engage in mathematical dialogue, asking learners to give explanation of mathematical ideas.

## 2.7 Learner-Learner Interactive Dialogue

Notwithstanding endeavors to set up a method of reasoning for conversations and desires for tuning in, rich conversations in Mathematics don't occur by some coincidence.

The unequivocal educating of how students are required to react and associate during a study hall conversation in Mathematics is essential. Students sharing their reasoning should realize that their clarification require something beyond a portrayal of the methodology they used to take care of an issue. Or maybe, (students) need to incorporate a type of virtual portrayal, alongside a clarification of how they created the issue and why they decided to take care of the issue that way (Anderson et al, 2009). Students who are listening ought to be mindful to the considering others, ponder the thoughts they have heard to assess their productivity, decide whether they concur or deviate, on the off chance that they comprehend the thinking about their friends and what similitudes or contrasts they see between their own reasoning and the considering others students should be instructed how to concur and differ and how to approach inquiries for explanation. So as to assist students with condensing and comprehend their deduction just as the considering others, it is basic to give chances to students "turn and talk" about thoughts. For example, subsequent to exhibiting an issue, students might be approached to speak to or state in their own words what the issue is asking, at that point share that with the accomplice. In the wake of finding a section point and taking care of an issue autonomously, students should impart their methodologies to an accomplice or in a gathering, before offering to the entire class. This gives students work on developing contentions, giving support and investigating the considering others.

Students find a good pace to tune in a way that sets them up to rehash their accomplices thinking in their own words, just as tuning in to comprehend and offer conversation starters of their accomplice. Organizations guarantee a more significant level of responsibility and students commitment than is conceivable with just entire gathering study hall discourse. A ground-breaking instructional move after students have heard the considering others is to send them back to work in accomplices or in little gatherings to think about the contentions of others. Painstakingly created questions are utilized to help manage the discourse.

On account of this examination, there is currently a reasonable level of agreement over which structures are particularly beneficial (Littleton and Mercer, 2013).

The qualities of ideal study hall exchange proposed by Alexander (2008) have demonstrated especially compelling. As per Alexander, study hall discourse ought to be: 1) aggregate with members arriving at shared comprehension of an assignment; 2) equal with thoughts shared among members; 3) strong with members urging each other to contribute and esteeming all commitments; 4) total, controlling members towards broadening and setting up joins inside their comprehension; and 5) deliberate, that is coordinated towards explicit objectives.

Comparative types of discourse have been featured with regards to student communication. Mercer (2000) identifies three types of learner –learner talk as cumulative talk, disputational talk and exploratory talk. Learners talk builds positively but critically on what each other has said. This is typically characterized by repetition, confirmation and elaborations. Disputational talk consists of divergences and

individualized decision making. The aforementioned is domineered by short exchange consisting of assertions and counter- assertions. The other talk is exploratory talk. In this the learners work on and elaborate each other's reasoning in collaborative, rather than competitive atmosphere. Exploratory talk enables reasoning to be become audible and constructive exchanges. The challenges are justified and alternate ideas are offered. Mercer goes further to note that learners engage critically but constructively with each other's ideas. They make proposals which can be challenged and counter- challenged, they give their reasons and at same time give alternate conjectures. Learners target to reach an agreement.

As per Littleton and Mercer (2013), they have recognized three sorts of student talk: disputational, total and exploratory. Portrayed by contradiction and individualized choices, disputational talk was believed to be the least instructively gainful. Some instructive worth was credited to total talk, as it was portrayed by general acknowledgment of thoughts, however absence of basic assessment. Exploratory talk was watched less as often as possible; yet, it was viewed as the most instructively compelling. It included members connecting basically with thoughts and endeavoring to arrive at agreement. Activities, similar to the 'Thinking Together' program (Dawes, Mercer & Wegerif, 2003) planned to advance grade younger students' utilization of exploratory talk, and demonstrated a positive effect on students' critical thinking, arithmetic and science achievement/learning. Similarly, 'responsible talk' has been advanced as the most scholastically beneficial study hall talk (Michaels, O'Connor and Resnick 2008).

It includes responsibility to: 1) the learning network, through tuning in to other people, expanding on their thoughts and extending suggestions; 2) acknowledged principles of thinking (RE), through accentuation on associations and sensible ends; and 3) information, with talk that depends on realities, writings or other openly available data and tested when there is absence of such proof.

Working in auxiliary study halls, Nystrand et al. (1997) portrayed dialogic guidance by means of three key talk moves that mentors may make: 1) legitimate inquiries, which are inquiries with no foreordained answers; 2) take-up, which happens when past answers are consolidated into ensuing inquiries; and 3) significant level assessment, which happens when coaches expound or ask follow-up inquiries in light of students' answers, rather than giving a basic assessment, for example, 'Great' or 'alright' (Nystrand et al 2003)

While there are contrasts between these methodologies, there are additionally stamped shared characteristics, whether or not the exploration alludes to entire class or little gathering settings. Mutual highlights include:

- Invitations that incite mindful reactions (for example true inquiries, requesting explanations and clarifications);

- extended commitments that may incorporate supports and clarifications;
- Critical commitment with thoughts, testing and expanding on them;
- links and associations;
- Attempts to arrive at agreement by settling disparities.

For these highlights to happen, a for the most part participative ethos is significant, with members regarding and tuning in to all thoughts. This requires making the talk standards available to all (Michaels, et al 2008) changing the study hall culture right now be a test for any mentor.

Studies demonstrating restricted achievement incorporate those of Pehmer, Gröschner, and Seidel (2015) their Dialogic Video Cycle program brought about guides' criticism getting increasingly centered on students' learning procedures and self-guideline. However, no change was watched for coaches' inquiries and students' discussion. Additionally, Wells and Arauz's (2006) seven-year program prompted an expansion in the quantity of conversation type arrangements. In any case, the extent of these successions stayed low. Lefstein and Snell's (2014) one-year program advancing interactional mindfulness surveyed guides' inquiries (for example open, shut, take-up), coaches' input (for example explained, non-expounded), and students' commitments (for example reaction to guide, unconstrained commitment, choral reaction). The sole increment was transparency in mentors' inquiries. At last, Ruthven, Mercer, Taber, Guardian, Hofmann, Luthan, and Rigger (2017) epiSTEMe intercession set solid accentuation on exchange in little gathering and entire class settings. A scope of markers was evaluated, including coaches requesting clarifications, explanations and Re – evaluation (RE), just as students giving reasons, and taking broadened turns. While a few mentors executed some objective highlights, the program was not effective for all highlights and all members. Different intercessions appear, be that as it may, to have been progressively effective.

Sedova, Sedlacek, and Svaricek (2016) see that in seven out of eight study halls their activity investigate program (counting workshops, video-recorded exercises and intelligent meetings) supported students' discussion with RE, mentors' utilization of open inquiries, coach take-up (for example expanding on students' commitments), and open conversation. Likewise, Chinn, Anderson, and Waggoner (2001) bolstered four mentors in utilizing a collective RE strategy through half-day workshops followed by conversations. They announced increments in the measure of student talk, students' expounded expressions with proof, and the extent of bona fide guide questions. Working with a solitary mentor, Haneda, Teemant, and Shearman (2017) announced proof for joint request, open trade of thoughts and commitment with different viewpoints. In a mediation advancing request discourse, Wilkinson et al. (2017) found that scores on their Argument Rating Tool, which estimated the 'nature of mentor assistance and student argumentation essentially expanded. Hennessy, Dragovic, and Warwick (2017) investigated their Professional Development (PD) program's effect on guides' training through video-invigorated conversations and a sight and sound asset bank. Meetings with coaches showed increments in comprehension and utilization of target discourse around intelligent whiteboards. At long last, Alexander et al. (2017) offered a considerable PD program of 11 patterns of tutoring and self-assessments to improve the nature of study hall talk. They announced a positive effect on a few markers of guides' and students' discussion.

Regardless of the positive results of certain projects, there is an issue of adaptability (Howe and Mercer (2017) in a large portion of the apparently fruitful projects (yet in addition a considerable lot of their less effective partners), there was colossal venture of

time and exertion from scientists and coaches. Wilkinson et al (2017) offered two 6-h workshop days, every other week gatherings with mentors and month to month singular training (30–40 min each). Haneda, Teemant, and Shearman (2017) offered a 30-h summer workshop and seven patterns of individualized instructing in study halls. Alexander et al. (2017) embraced 20 weeks of escalated mediation, and Sedova, Sedlacek, and Svaricek (2016) offered a one-year program. In this way, the potential for scaling these projects up for bigger gatherings of coaches is faulty.

Another issue is supportability. In spite of the serious help given by these projects, their long haul sway has only occasionally been estimated. Incredibly, Hennessy, Dragovic, and Warwick (2017) watched two exercises (English and science) ten weeks after the finish of their program. Field notes and materials from observed lessons illustrated that tutors continued to pose open-ended questions, construct shared interpretations and encourage learners to justify and build on others' ideas. However, the follow-up sample was small owing to resource limitations and it is unknown whether all participants sustained their practices beyond the intervention. Apart from this study, the long-term impact of Professional Development (PD) on the quality of classroom dialogue has not been investigated.

**2.8 Whole class-group Interactive Dialogue**

This methodology targets producing an exceptionally elevated level of consideration, commitment and dynamic investment by students through setting up a high reaction rate to mentors addressing and provoking. The coach may start the exercise by introducing realities utilizing a logical or educational methodology, yet then students are relied upon

to go into discourse and contribute their own thoughts, express their feelings, pose inquiries and disclose their deduction to the educator and others (Dickson, 2003; Reynolds and Farrell, 1996). Learning isn't accomplished here by receiving a shortsighted equation of a little talk to the class followed by 'drill and practice, or by anticipating that students should show themselves from books or different materials. Learning happens on the grounds that students are locked in subjectively in handling and utilizing applicable data, communicating it in their own words and getting criticism (Westwood, 2008).

As indicated by Alexander (2005), there are contrasts among guides by the way they decipher the idea of entire gathering intelligent educating and how they oblige it into their own style. To be powerful, a coach should be exceptionally talented at bringing all students into exercise by consolation, intrigue, and direct addressing.

Mentors likewise should be versatile and ready to 'think and react quickly' so as to react to and underwrite completely on students' commitments. At the point when occupied with intuitive instructing, a few mentors don't appear to perceive the benefit of empowering 'choral reacting' (Learners noting together at times) and what ought to be an exceptionally lively pace of progress through the exercise might be eased back inadvertently by requesting that singular students lift a hand on the off chance that they wish to respond to an inquiry or make a commitment.

Intelligent entire class discourse has been prescribed in government rules in the United Kingdom as a potential methods for bringing students' accomplishment step up in essential numeracy (DFEE, 1999). While containing the fundamental elements of different types of direct instructing, this dialogic model isn't compelled by scripted

exercises and can be substantially more handily suited into coaches' current educating styles. In any case, a few mentors despite everything experience issues moving right now ( Hargreaves et al., 2003). With the end goal for students to straightforwardly share their reasoning and hazard committing errors before their companions it is significant that there is strong homeroom condition. Everybody ought to comprehend their job in the study hall through the improvement of study hall standards.

The mentor is required to offer intriguing conversation starters, bolster students' understanding and confusions, energize student support in conversations and advance student reflection about the learning experience (Lengiz, 2013). She further proposes that guides train students the significance of and desires for numerical discussions. She clarifies how talking like Mathematics empowers them to be solid Mathematical masterminds.

Anderson et al. (2009) takes note of that setting up a justification for Mathematical talk which is basic for building up desire for conscious tuning in. Students should be situated where they can see and hear the speaker, and they are required to listen attentively and be set up to react to the thoughts of others. Students are instructed how to deferentially differ and address each other. Most importantly, there is acknowledgment all things considered and all commitments to the conversations are regarded.

Coaches should concentrate on allocating Mathematical errands that are properly testing and upgrade students' learning. Numerical assignments ought to examine significant Mathematical thoughts and have legitimate settings and importance for students.

The issues presented ought to have various arrangement, energize examination, advance thinking, and expect students to give avocation to their reasoning. Eventually Mathematical undertakings ought to be deserving of student conversation and accentuate significant Mathematical realities.

**2.9 Tutor-Learner Dialogue**

Baktin (1981) makes a differentiation among dialogic and monologic talk. He utilizes the case of mentor – understudy talk to outline the idea of monologic talk and contends that it blocks certifiable discourse (Skidmore, 2000). A monologic coach is to a great extent worried about the transmission of information to understudies and remains solidly in charge of the objectives of talk. Monologic talk is an instrumental way to deal with correspondence outfitted towards accomplishing the guide's objectives. Interestingly, dialogic talk is worried to advance correspondence through genuine trades. There is authentic worry for the perspectives on the discussion examples and exertion is made to assist members with sharing and construct meaning cooperatively. Baktin takes note of that dialogic importance includes the view that discourse isn't just between individuals yet between the edges individuals use to order encounters (Gutierrez & Larson 1995).

As indicated by Bakhtin monologic and dialogic talk can be conceptualized as parallel contrary energies and all things considered are demonstrating valuable data for those occupied with study hall based observational research where conventional examples of study hall talk are to a great extent monologic. Monologic talk centers power around the mentor, it smothers discourse and connections among understudies and their thoughts. Dialogic talk makes a space for numerous voices and talks that challenge the hilter kilter

power relations progressed by monologic rehearses. It is contended that homeroom observational specialists have delivered a predictable picture in that schools and study halls are brimming with talk, yet minimal communitarian talk between students.

It is commonly acknowledged that what is currently observed as a monologic style of talk structure between the mentor and the students known is the Initiation Response Feedback (I.R.F).

Commencement Response-Feedback (IRF) is a basic element of all official talk in study hall, comprising 60% of the instructing and learning process (Sinclair and Coulthard, 1975). This training, frequently alluded to as recitation, is seen well by mentors and assumes a focal job toward the path and control of student learning. There is across the board understanding dependent on various investigations that IRF gives the premise of educating by direct guidance and empowers coaches to remain in charge of occasions and thoughts in exercises. Its impact is to accentuate the hilter kilter nature of the connections among coaches and educated and the epistemological predominance of the guide.

Another face portrays particular talk configuration as the Initiation – Response – Feedback-Response – Feedback (IRFRF) chain in which understudy responses are trailed by the mentor organizing the pivot to the understudies without appraisal. For instance, the mentor may bring out understudies' point of view without evaluating their responses, in demonstrating inciting the understudies for extra thinking. This model could be related to the asserted "winding" IRF exchange building up a progressive (IRF) structure (Berland and Harmer, 2012), empowering progressively natural, network and consistent learning (Rojas-Drammond, Mercer and Dabrowski, 2001). The extended desire to manage follow

up inside the winding IRF configuration offers the potential for the headway of real dialogic cooperation (Sharpe, 2008; Wells, 1999). In contrast, if the mentor is simply renegotiating towards the correct answer and end, the complete strategy is being applied and the conversation follows the IRF structure with evaluative information.

The main role of the recitation is the gathering of information and comprehension through coach addresses intended to test or animate review, or to prompt students to work out answers from pieces of information in the inquiry. The recitation bolsters the customary force connections of the study hall which will in general duplicate an instructional method dependent on the transmission of prepackaged information (Lye, 1998). The development to advance dialogic talk styles needs to go up against this predominant type of study hall connection. It follows that executing a change from the conventional study hall to one that qualifies dialogic talk isn't a stroll over.

Without a doubt, observational examinations gave the solid impression that highlights of gainful homeroom exchange are not immovably implanted in current practice (Howe and Abedin 2013). Rather, the predominant structure in guide student communications is thought to remain the customary commencement reaction input (IRF) group, first saw by Sinclair and Coulthard (1975) and thusly revealed in study halls over the world (Nystrand et al. 1997, Wells and Arauz, 2006). This arrangement includes guides posing for the most part shut inquiries with 'low intellectual interest' (Sedova, Sedlacek, and Svaricek 2016). students delivering short and straightforward answers, and coaches assessing those answers dependent on their accuracy.

Without question, the universality of the IRF design is entrenched. For example, in their investigation of arithmetic exercises, Berry and Kim (2008) found that coach talk was 'mostly recitational', with the two primary kinds of inquiry, inspiring and steady, both shut and driving. Such inquiries force tight authority over student support, a finding embraced through Bleicher, Tobin, and McRobbie's (2003) investigation of talk during a science class. So also, Pontefract and Hardman (2005) found that mentor drove recitation, repetition and redundancy overwhelmed study hall connections with little spotlight on student understanding.

Besides, in arithmetic study halls, Sepeng (2011) found that triadic discourse won in any event, when information was dialogically co-developed.

**2.10 Summary**

This chapter has looked at literature related to the study. It has looked into the definition of dialogue, dialogue and Mathematics education, perception of dialogic approach, importance of dialogue in the classroom. Errors in Mathematics, how tutors deal with Mathematics examples of errors, exploratory teaching, inquiry teaching and challenges of applying dialogue approaches have been discussed. It has also looked into learner-learner interactive dialogue, tutor–learner, and whole class group interactive dialogue.

# CHAPTER THREE

# RESEARCH DESIGN AND METHODOLOGY

## 3.1 Introduction

This chapter describes the various methodological procedures that were employed in the study during its execution. The purpose of this section is to provide a description of the research area or setting, research design, the study population, sample size and sampling techniques, data sources and instruments, data collection procedures and data analysis and presentation that were employed in the study. Each of the sub-headings mentioned above are separately explained below.

## 3.2 The Study area

The study covered selected Public Primary Teacher Training Colleges in North Rift Region, Kenya. The colleges are spread in four out of seven counties in the region. It is a moderately populated Region. Its population comprises various tribes from other parts of the country. Majority of the people who live in this region are low income earners who own small pieces of land and others who live in trading Centre's and the outskirts of major towns. However, there are a few who own bigger farms though they are not utilizing them as expected.

Agriculture is the main economic activity in this area. Farmers grow maize for subsistence purposes but few of the people who own bigger farms, grow maize, wheat, sugarcane and keep dairy animals for commercial purposes. Agriculture sector has been affected by the unfavourable climatic conditions, exorbitant farm inputs and the high cost of use of farm machinery. In addition, the liberalization of market prices for farm

products has hit farmers who produce maize and wheat hence lowering the prices for these commodities. This has translated to low production. The other economic activities of people in this region include fishing, mining and commercial activities like small and large scale trading. The researcher believed that the study area gave a wide and varied view of the problem to be studied. It is, however, observed that choice of the study setting do not render other parts of the country less significant.

The public primary teacher training colleges in this region are Mosoriot TTC in Uasin Gishu County, Tambach TTC in Elgeyo Marakwet County, Baringo TTC in Baringo County and Chesta TTC in West Pokot County.

### 3.3 Philosophical Paradigm

The investigation was secured in social constructivism theory. This Philosophy holds that the very idea of human learning necessitates that every individual make their own comprehension of the world from direct understanding, activity and reflection, not from predigested data and abilities displayed by a mentor and a course reading (Zevenbergen, 1995). Productive cases that significance doesn't exist in its own privilege rather it's built by person as they associate and participate in translation. It perceives that the truth is a result of human knowledge connecting with involvement with this present reality. Constructivism acknowledges reality as a build of human brain and in this manner the truth is seen as abstract. For constructivism the truth is socially developed (Oleary, 2004; Andrew, Pedersen & McEray, 2011). Suppositions of socially built information guarantee hold that people look for comprehension of the world in which they live and work. They create emotional implications of their encounters – implications coordinated toward specific articles or things. These implications are changed and different (Crothy, 1998).

These are haggled socially and truly. They are not just engraved on people however are framed through collaboration with others (thus social constructivism) and through authentic and social standards that work in people lives.

Constructivists regularly address the "procedure" of communication among people. The intrigue, at that point, is to understand (or decipher) the implications others have about the world. This methodology is unmistakably student focused and fundamentally worries about realizing further theoretical comprehension and change in students. Adkisson and McCoy (2006) have named these as dynamic techniques.

As per Golalfshani (2003) constructivism is a worldview that considers information to be socially built and may change contingent upon conditions.

In a social viewpoint it is characterized as the view that all information and in this manner all significant the truth is dependent upon human works on, being built all through cooperation of people and their reality and advancement and inside a basically social setting. As per this view the truth is continually changing and staying in contact with one technique in the consistently changing world isn't significant. It would in this manner intend to get substantial and really different and assorted techniques for social occasion information be applied.

Since the 1990s, constructivism had spread a solid compelling power molding instruction change across numerous territories of the school educational program and separating numerous new student focused ways to deal with educating (Westwood, 2008). It is containing the significant impact on the setting exhibited in University strategy courses for learner guides as of now. The basic standards of constructivism are followed back to

the learning hypotheses of John Dewey (1933), Jean Piaget (1983) and Jerome Bruner (1961). In different manners these pioneers focused on the basic job of movement and direct involvement with forming human learning and comprehension. Bruner for instance, formulated the crossover Science and social examinations course known as Man: A course of study (MACOS) including youngsters in hands on revelation, critical thinking and inductive reasoning and thinking. These early scholars additionally perceived that learning can just happen to the degree that new data interfaces effectively with a student's earlier information and experience.

Different pioneers, for example, the Russian Psychologist Lev Vygotsky (1978) included that learning is extraordinarily improved by collective social cooperation and correspondence at the end of the day conversation criticism and sharing of thoughts are ground-breaking impacts on learning.

A most critical shift in the past 20years has been a move away from conception of "learner as sponge" towards an image of learner as active constructor of meaning. Early writers (scholars) like Plato, Socrates and Dewey noted long time ago, that learners were not empty vessels, blank slates, or passive observers. Tutors have argued: learners have been asked to listen. The assumption has been that if tutors speak clearly and learners are motivated, learning takes place. If learners do not learn, the topic is it is because they are not paying attention or they do not care. Certainly, this is advanced from behavior-learner theorists who argue that if tutors act in a certain way learners likewise act in a certain way.

Cognitive theorists note that learners from a very young age make sense of the world actively creating meaning while reading texts, interacting with the environment or talking with others. Even if learners are quietly watching a tutor/ coach speak they can be actively engage in the process comprehension or "minds on" work as many coaches describe it. Bransford, Brown and Cocking (2000) posits, "It is now known that very young children are competent, active agents of their own conceptual development. Put in short the young child has come to life (pp. 79-80)'. The cognitive turn is famously known as the constructivist approach to learning.

The constructivist learning theories have dealt a blow by behaviorist learning theories enthusiasts. Learners can learn as they still sit and be quiet and have their minds racing on important concepts. Learners need opportunities to learn in multiple ways, and coaches need to have a pedagogical repertoire that draws from myriad theorists.

There is a characteristic conventional intrigue to the thought of students building their own insight through their own undertakings, on the grounds that a large portion of what people realize in regular day to day existence unmistakably originates from individual disclosure and experience, not guidance (Westwood, 2008). Significant objectives for constructivist classes are to assist students with getting curious, creative, and intelligent, and to urge them to step up to the plate, think, reason and be certain to investigate and trade thoughts with others (Project Construct, 2004).

Constructivism has become the prevailing perspective on how students learn and it might be clear to compare dynamic learning with dynamic techniques for guidance notes (Mayer, 2004). The constructivist see favor instructing strategies that attention basically

on students assuming the dynamic job in obtaining data and creating ideas and aptitudes while collaborating with their social and physical condition (Westwood, 2008). The job of the mentor in this way turns into that of a facilitator and supporter, instead of an educator. The significance of social association, language and correspondence is perceived in helpful classes and along these lines a lot of gathering action, conversation and agreeable learning is empowered.

A wide impression of constructivist method of reasoning is that students are self-persuaded and automatic creatures who will procure the crucial abilities of perusing, composing, spelling of, taking part in, and conveying about age fitting, important exercises each day.

Direct instructing of these central aptitudes is in this manner disliked, and exercises, for example, drill and practice are rejected as drilling and trivial repetition learning (Westwood, 2008).

Albeit numerous constructivists stress the significance of students' social movement in getting information, it is consummately conceivable to animate psychological action by direct educating through verbal and visual methods, not really by physical action contends Mayer (2004). He proceeds to include that it doesn't really require 'hands on' to switch 'minds on'. Clear and direct clarifications can animate reasoning. The analyst doesn't overlook this reality. Pressley and Mc Cormick (1995) accept that great guidance that incorporates displaying and high-caliber, direct clarification includes students in a lot of mental action. They contend that demonstrating and clarification can animate information development. Wragg and Brown (1993, p.3) characterize clarifying as

"offering comprehension to another". It is conceivable that a clear away from a gathering of students limits contrasts in their earlier information about a given subject, and in this manner decreases the potential for misinterpretations of learning challenges to emerge.

Walter Dick (1992), an instructional structure master, recommends that the constructivist viewpoint wishes well with the current humanistic and formative direction apparent in the greater part of our foundations. There is no uncertainty in its different pretenses ( for example entire language approach, process composing, issue based learning, request approach and disclosure technique) the thought of a student focused constructivist approach has been promptly acknowledged without question by government divisions of training, college branches of system and showing practice, and numerous coaches. As of late constructivism has been practically the main perspective on learning displayed to prepare educators in schools and Universities (Farkota, 2005; Rowe, 2006; Westwood, 1999).

### 3.4 Research Design

According to Blaikie (2000), a research design is a plan, structure, and strategy of investigation conceived so as to obtain answers to research questions and to control variance. Further, that the plan is the overall scheme or program of the research that includes an outline of what the investigator will do from writing the hypotheses and their operational implication to the final analysis of data. Accordingly, structure is the outline of the scheme, the paradigm of the operation of variables while strategy refers to methods used to gather and analyze data. Another scholar, Yin (2003) argues that a research design is the process that links research questions, empirical data and research

conclusions. He notes that a research design is an action plan for getting from here to there, where 'here' may be defined as the initial set of questions to be answered and 'there' is some set of conclusions (answers) about these questions.

A descriptive survey design was used in the study. The convergent parallel design model according to Tashakkori and Teddlie (2009) was used. This design occurs when the researcher collects and analyzes both quantitative and qualitative data during the same phase of the research processes and merges the two results into an overall interpretation. The goal of both qualitative and quantitative research is to achieve a better understanding of the study problem. Mixed methods approach provides a transformative research structure for the development of more complete and full portrays of our social world through the use of multiple perspective and lenses (Mackenzie & Knipe, 2006). Somekh and Lewin (2007) argue that it allows for understanding of greater diversity of value, stances and position. These methodologies achieve this goal differently, beginning with the conceptualization and design of the study and moving on to the sampling frame, data collection strategies, and how the data is analyzed.

Bryman (2006) notes that many mixed methods studies make use of multiple reasons for mixing methods and that new reasons may emerge as the study is underway. The researcher makes for three reasons for this model; completeness, offset and process.

Completeness refers to the notion that the researcher can bring together a more comprehensive account of the area of inquiry while offset suggests that the research associated with both qualitative and quantitative research have their own strengths and

weaknesses so that combining them allows the researcher to offset their weakness to draw on the strengths of both.

The third reason, the process, refers to when quantitative research provides an account of structures in social life but qualitative research provides sense of the process. Qualitative data which focuses on how people make sense of their settings and experiences through symbols, social rules, identities and other element of culture and why people think and act as they do will bring out the picture of dialogic interactions in Mathematics classes. The emphasis in qualitative research is on individuals own interpretations of their experiences and studying what they say and do in detail. The data were observations of conversations and other forms of social interactions of their experiences and studying what they say and do in detail. Mixed methods research design involving both qualitative and quantitative technique was used in the study. Mixed methods research design is an approach to inquiry that combines or associates both qualitative and quantitative strands. It involves philosophical assumptions, the use of qualitative approaches and mixing of both approaches in the study. Thus, it is more than collecting and analyzing both kinds of data. It involves the use of both approaches in tandem so that the overall strength of a study is greater than either qualitative or quantitative or quantitative research (Crothy, 1999; Cress, 2002; Cresswell & Plano, 2007; Zohrabi, 2013).

More over the researcher feels that there is equal value for collecting and analyzing both quantitative and qualitative data as they each draw on the strengths of different data collection strategies to explore research to understand the problem. Quantitative data was

collected from the teacher trainees and tutors of Mathematics concerning the learner-learner dialogue, tutor-learner dialogue and whole class group interactive dialogue.

The qualitative data was obtained from deans of curriculum and heads of departments (Mathematics department) concerning the challenges encountered in using dialogic approaches in minimization of errors in Mathematics classes.

### 3.5 The Study Population

The target population of the study was four (4) public teacher training colleges in North Rift, Kenya. The targeted respondents were eight Mathematics Tutors, four HoDs (Mathematics Department), four DoCs (Deans of Curriculum), and the 1980 learners in the second year of study. Learners in their second year of the course was selected on the basis that they have vast knowledge in instructional approaches having taken three teaching practices. Table 3.1 shows how respondents in the study are distributed.

**Table 3.1: Distribution of the Study population per College**

| Region | Learner Population($2^{nd}$ years Mathematics ) | HoDs Mathematics Department | Deans of Curriculum (DoC) |
|---|---|---|---|
| Tambach | 652 | 1 | 1 |
| Mosoriot | 560 | 1 | 1 |
| Baringo | 448 | 1 | 1 |
| Chesta | 320 | 1 | 1 |
| Total | 1980 | 4 | 4 |

**Source: Kenya Tutor Training Colleges Principals' Association KTTCPA, 2017**

### 3.5 Sample Size and Sampling Procedures

Data was collected from all the four public primary teacher training colleges in the North Rift, Kenya. Out of the total 1980 second year teacher-trainees from the sampled colleges, the researcher selected 322 (16.3%) teacher-trainees according to Krejcie and Morgan (1970) study sample table. Purposively, 8 tutors of second year Mathematics teacher trainees, 4 HoDs and 4 DoCs participated in the study.

The respondents were selected proportionately from each of the colleges where the study was done. Simple random sampling was used to identify individual participants in the study.

Table 3.2 shows the study sample.

**Table 3.2: Distribution of Sample size**

| Region | Learner Sample(Mathematics -second years) | Percentage selected | HoDs Mathematics Department | Deans of Curriculum |
|---|---|---|---|---|
| Tambach | 106 | 16.3 | 1 | 1 |
| Mosoriot | 91 | 16.3 | 1 | 1 |
| Baringo | 73 | 16.3 | 1 | 1 |
| Chesta | 52 | 16.3 | 1 | 1 |
| Total | 322 | 16.3 | 4 | 4 |

Source: Author, 2018

### 3.6 Data Collection Instruments

The data was collected using questionnaire, document analysis, interviews and observations schedules. The tutors were subjected to interviews and filling of questionnaires. Observations were made during class interactions.

#### 3.6.1 Questionnaire

In interpretive researches, a questionnaire is a useful method of collecting data in which the interviewer directs the interaction with the participant and introduces ideas into the research process (Denzin & Lincolnn, 1994; Neuman, 2000). This makes it a very popular method of collecting data. A questionnaire is a set of questions used for data when carrying out social research (Robson, 2000; Blaike, 2002; Zohrabi, 2013). It is a structured technique for collecting primary data. Kothari (2008) and Kerlinger (1983) observe that a questionnaire is an appropriate data collecting instrument as it gives the respondent time to give well thought out answers. It is also effective in analyzing data particularly when computer coding is used. This tool is also free from bias of interviewer because answers are in the respondents' own words.

Open and close ended questions were used with the sole purpose of helping the researcher to obtain the respondents views. Two questionnaires were prepared. One questionnaire was prepared for the teacher-trainees, the other for the tutors, HoDs and Deans of Curriculum. The purpose of the questionnaire to the second year teacher trainees was to accord them an opportunity to express their points of view regarding the influence of dialogic approaches in minimization of errors in Mathematics classes. For convenience, and to maximize response rate, the questionnaire was group administered to

teacher trainees in the second year who were more prepared to participate in the study. The Likert scale was used to determine how learner-learner, tutor learner and whole class group apply in minimization of learner errors in Mathematics classes in PPTTCS. The scale had been identified since it permits measurement of views towards different aspects of a study on a single scale. Kothari (2008) observes that; it is easy to construct, more reliable and objective. Teacher-trainees questionnaire was divided into five sections.

The first section had items on the bio-data of the respondents while section B had items on dialogic approaches used while teaching and learning Mathematics. The items were in likert-scale where 1-strongly disagree, 2-disagree, 3-neutral, 4-Agree and 5- strongly agree. Section C had items on whole class group interaction whereas section D sought information on learner-learner dialogue. The last item had items on tutor-learner classroom interaction. Similarly, tutors questionnaire was also divided into five sections. The first section sought information on the bio-data of the respondents while section B had items on dialogic approaches used while teaching and learning Mathematics. The items were in likert-scale where 1-strongly disagree, 2-disagree, 3-neutral, 4-Agree and 5- strongly agree. Section C had items on whole class group interaction whereas section D sought information on learner-learner dialogue. Finally, section E had items on tutor-learner classroom interaction.

### 3.6.2 Document Analysis

In institutions records serve to provide deep insights of facts. The study described, analyzed and interpreted the data that was available from college magazines, videos, lesson notes, schemes of work, lesson plans and records of work in the Mathematics and

deans of curriculum offices. This is one of the suitable data collection techniques for qualitative research. Qualitative studies often weave together extensive quotes, dilated descriptions and a researchers' observation of the subject matter, tell a story about an incident, phenomenon or set of experiences or behavior. These helped to determine if the principles of dialogic teaching have been documented before and whether they were being used. The researcher was concerned with gathering evidence or information on whether dialogic approaches were included in the planning of Mathematics lessons in order to minimize errors.

### 3.6.3 Interview Schedule

An interview is a close contact interaction, focused talk between two or more people. It's a method of data collection that involves researchers asking questions basically open ended one through oral quiz using a set of preplanned core questions.

They are productive since the interviewer can pursue specific issues of concern that may lead to focused and constructive suggestions. One advantages of interview as a data collection instrument is that direct contact with the users often leads to specific constructive suggestions. They are good at obtaining detailed information and few participants are needed together rich and detailed data (Oleary, 2004; Zohrabi, 2013; Flic, 2006).

According to Cohen and Manion (2002), interviews are focused conversations initiated by the interviewer for the specific purpose of obtaining research relevant facts. Face-to-face interviews have the highest response rates and permit the longest questionnaire (Gillham, 2005; Neuman, 2003). Thus, the interview is an integral function of a research

in obtaining meaningful data. Within this context, an interview is a conversation, whose purpose is;

> "To obtain descriptions of the life world of the interviewee with respect to interpreting the meaning of the described phenomena" (Gillham, 2005 p. 117; Chase, 2005; Templeton, 1994).

Interview centers on the content specified by research objective of systematic description, prediction or explanation. Face to face interviews offer the possibility of modifying the researcher's line of inquiry, following up interesting responses and investigating underlying motives in a way that other tools of research cannot. The reason for interviews is that they are easy to administer since the questions are prepared in advance. They also allow a great deal of information to be gathered in a short period of time. Interviews also eliminate many sources of bias common to other instruments like observations. In addition, interviews help seek clarification through probing. In reference to this structured interview schedule were prepared for teacher-trainees, Mathematics subject tutors, Departmental head of Mathematics and the Deans of curriculum. The questions targeted their views on dialogic approaches, toward minimizing learner errors in Mathematics classes and challenges faced in its application.

### 3.6.4 Observation

As the actions and behavior of people are a central aspect in virtually any enquiry, a natural and obvious technique is to see what they do, how they do it and to record this in some way and then to describe it. A major advantage of structured observation schedule as a technique is its directness. You do not ask people their views, feelings or attitudes; you watch what they do and listen to what they say**.** Cohen and Manion (2002) note that

observational data is attractive as it affords the researcher an opportunity to gather 'live' data from 'live' situations.

Patton (2002:203-5) argues that the researcher is given the opportunity to look at what is taking place in site rather than at second hand. They further argue that this enables the researcher to understand the context of the programme, to be open minded and inductive, to see things that might otherwise be unconsciously missed, to disco things that participants might not freely talk about in interview situations, to move beyond perception based data and to access personal knowledge. According to Edson (1988) qualitative inquiry shares four common concerns. These are sensitivity to context, research done in natural settings, holistic study of experience and an interpretative stance in attempt to explain the significance of experience. In an effort to address the research questions, the researcher participated in Mathematics classroom dialogues. Mathematics lessons were observed and the researcher was able to identify whether the tutors were using dialogic approaches while teaching Mathematics concepts. In this way the researcher believed to get an insight to the holistic experience of dialogue as the participants interpret it within the context of a Mathematics classroom. This formed a strong case for suitability of the tool in collecting data in this research.

### 3.7 Study Variables

Variables are concepts relating to research designs, which take on different quantitative values. The study variables were categorized as independent and dependent variables. The independent variables were learner-learner dialogue, tutor-learner dialogue and whole class-group dialogue while the dependent variable was minimization of learner errors in Mathematics classrooms.

## 3.8. Validity and Reliability of Data Collection Instruments

### 3.8.1 Validity

Validity refers to the extent to which differences found with a measuring instrument reflects true differences among those being tested (Kothari, 2008). Validity in research therefore tells the readers whether an item measures or describes or produces the same or similar responses on multiple occasions (Bell, 1993). In this study, validity was addressed through honesty in reporting, interpreting the depth of experiences, the richness and scope of the data achieved, the participant approached and interviewed, the extent of triangulation and the disinterestedness of objectivity of the researcher (Cohen, Manion & Morrison, 2007 and IIEP, 2003). Multi methods approach was used in data collection in order to avoid the effects of bias as much as possible. The triangulation of various methods was used so as to seek connections in the data collected through different tools as to confirm the emerging categories and themes (Creswell, 2012). Berg (2001) contends that for many researchers, triangulation is restricted to the use of multiple gathering techniques to investigate the same phenomenon. This is interpreted as a means of mutual confirmation of measures and validation of findings. The important features of triangulation are not the simple combination of different kinds of data but the attempt to relate them so as to counteract the threats of validity identified in each.

The researcher also tested the content validity of the instruments. Content validity evidence involves the degree to which the content of the test matches a content domain associated with the construct. Content related evidence typically involves subject matter experts evaluating test items against the test specifications. Foxcroft, Paterson, le Roux and Herbst (2004, p.49) note that by using a panel of experts to review the test

specifications and the selection of items the content validity of a test can be improved. In this study, the researcher sought the assistance of experts in the field of Mathematics education, School of Education, University of Eldoret and guidance from fellow doctorial learners. Their comments were incorporated so as to improve the validity of the instrument.

### 3.8.2 Reliability

According to Orodho (2003), reliability is the accuracy achieved by a true score of the attribute under investigation. It is the extent to which the errors of measurement are absent from the obtained score. Kerlinger (1983) defines reliability as the consistency that an instrument demonstrates when applied repeatedly under similar conditions. The reliability of a measuring instrument is the instruments ability to yield consistent results each time it's applied. To achieve this, a preliminary testing of the questionnaire by academics, tutors and learners was taken to enhance its design, style, clarity of expression and appropriateness of questions.

This tested the questionnaires effectiveness and helped identify potential problems with its length, language and administration. Test retest was used to determine the reliability of research instrument. The researcher administered the instrument to two colleges in the neighboring counties and after two weeks revisited the colleges and re-administered the same instrument. The two weeks were sufficient to avoid the carrying over effects, memory practice or mood. A correlation coefficient was worked out and a Spearman Rank order correlation coefficient of 0.74 was obtained and considered sufficient to adapt the instrument for the study.

### 3.9 Data Collection Procedures

The study was facilitated through a letter of introduction that was sought from the school of education, University of Eldoret, introducing the researcher as a learner at the institution. The letter also confirmed that the research was solely meant for academic purposes. Research permit was sought from the National Commission for Science, Technology and Innovation (NACOSTI) before proceeding to the field. The permit was used to secure permission from the principals of the colleges where the study was carried. The researcher visited the study area before hand for familiarization and acquaintance with targeted respondents. During this visit, the researcher sought to inform the targeted respondents about the purpose of the intended study and booked appointments for the data collection.

On the actual date of the study, the researcher visited the individual colleges to conduct the research. The completed instruments were verified and collected within a period of two days from the day of distribution.

### 3.10 Data Analysis and Presentation Techniques

The researcher sought to analyze information in a systematic order to come to useful conclusion and recommendations by establishing patterns, trends and relationships. The data was analyzed using statistical package for social sciences (SPSS). Both descriptive and inferential statistics techniques was applied. Frequencies and percentages were used for descriptive statistics. Inferential statistics which deal with inference about population based on results obtained from samples was done using chi-squire. The level of significance was 5 %. Data was presented in terms of frequencies, tables, bar graphs and pie charts.

**Table 3.3 Summary of Data Analysis**

| | Research Hypotheses | Independent Variable | Dependent Variable | Method of Analysis |
|---|---|---|---|---|
| $HO_1$ | Learner-learner dialogue doesn't significantly influence minimization of learner errors in Mathematics classrooms in public primary teacher training colleges in North Rift Kenya | Learner-Learner dialogue | Minimization of Learner errors in Mathematics Classrooms | Frequencies, percentage and chi- square |
| $HO_2$ | Tutor-learner dialogue doesn't significantly influence minimization of learner errors in Public Primary teacher training colleges in North Rift Kenya | Tutor-Learner dialogue | Minimization of Learner errors in Mathematics Classrooms | Frequencies, percentage and chi- square |
| $HO_3$ | Whole class group dialogue doesn't significantly influence minimization of learner errors in Mathematics classrooms in Public Primary Teacher Training Colleges in North Rift Kenya | Whole Class group dialogue | Minimization of Learner errors in Mathematics classrooms | Frequency, percentage and chi- square |

### 3.11 Ethical Considerations

To promote the aims of research, such as knowledge, truth and elimination of error, the participants were briefed on the purpose of the study.

The study adhered to all the ethical requirements of the university that govern data gathering strategies. Approval was sought from NACOSTI. All learners and tutors received a letter outlining the nature and purpose of the research. They were made aware of ethical protocols that were applied. They were guaranteed privacy and confidentiality. This protected anonymity and sensitivity (Guba, 1989; Doucet & Mauther, 2002; Berg, 2004; Glense, 2006). Participation in the study was voluntary. Confidentiality meant removing all identifying information about individuals from research records and reports while anonymity meant there was no link at all between individuals' data and their contact information.

Participants were also accorded the opportunity to withdraw from the study if and whenever they chose. They were informed that the research was for academic purposes only. The researcher sought for the participant's informed consent and honestly reported data, results, methods and procedures. As well the researcher kept his promises and agreement; acted with sincerity, strived for consistency of thought and action and avoided or minimized biases. The researcher reached the participants at their convenient place and time.

### 3.12 Summary

This Chapter has outlined the procedure that was carried out in the study. It has presented the research design, the study population, the sample and the sampling procedures. The study variables, research instruments, validity and reliability of the research instruments, piloting of the research instruments, data collection, data analysis and presentation techniques, have also been highlighted.

# CHAPTER FOUR

# DATA PRESENTATION, ANALYSIS, INTERPRETATION AND DISCUSSION

## 4.1 Introduction

This chapter presents the findings of the study, analysis and interpretation. The purpose of this study was to determine how dialogic approaches could be applied in the minimization of learner errors in Mathematics classrooms in public primary teacher training colleges. The data was collected from teacher-trainees, tutors, heads of departments and deans of curriculum of the public primary teacher training colleges in the North Rift Region, Kenya using questionnaires, observation, document analysis and interview schedules. This analysis was based on the objectives of the study which were:

i. To establish how learner-learner dialogic interaction could be applied in minimization of learner errors in Mathematics classrooms.
ii. To determine how teacher-learner dialogue could be applied in minimization of learner errors in Mathematics classrooms.
iii. To determine how whole class group dialogic approach could be applied in minimization of learner errors in Mathematics classrooms.
iv. To determine challenges encountered in using dialogic approaches in minimization of learner errors in Mathematics classes in public primary teacher training colleges.

### 4.2 Return Rate

The questionnaire was administered to 322 teacher-trainees out of which 260 were completed and used for analysis representing 80.7% response rate. This is in agreement with Groves and Peytcheva (2008), who assert that high response rates are preferable in reducing the risk of non-response bias and ensure the sample is representative.

### 4.3 Background Information

Study sought information on gender, age bracket, marital status and educational level of the respondents. The responses are presented in the following subsections:

#### 4.3.1 Gender of Respondents

Findings on gender of teacher trainees who participated in this study is shown in Figure 4.1.

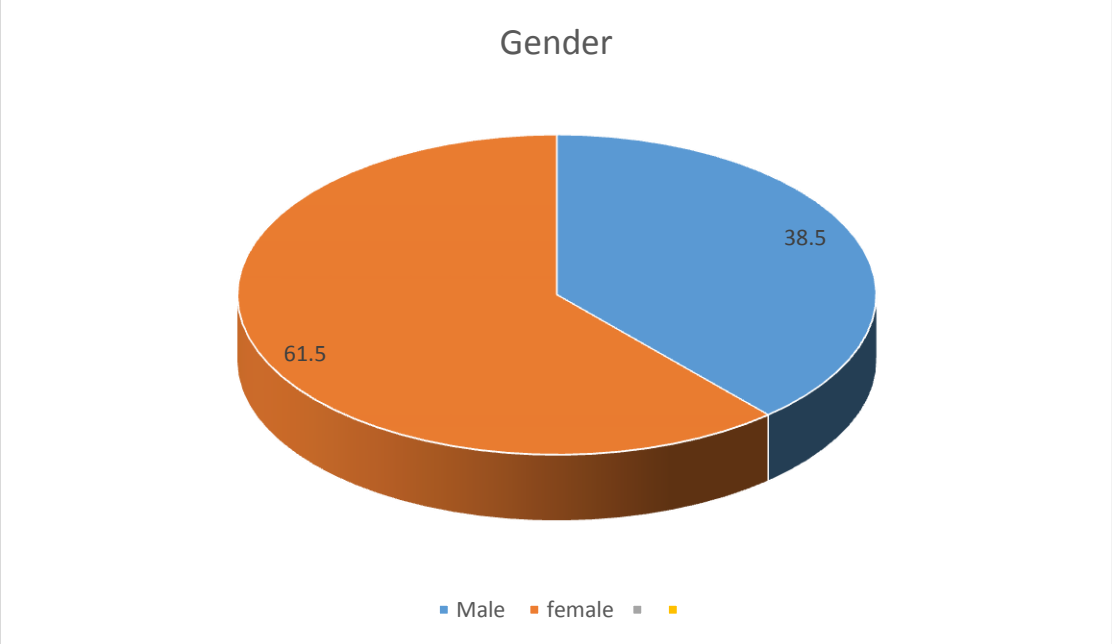


**Figure 4.1 Gender of Respondents**

As shown in Figure 4.1, majority (61.5%) of the teacher- trainees were female while 38.5% (100) were male. This shows that there were more female teacher- trainees than male teacher- trainees.

### 4.3.2 Age Bracket of Respondents

The respondents were asked to state their age bracket. The respondents are presented in Figure 4.2.

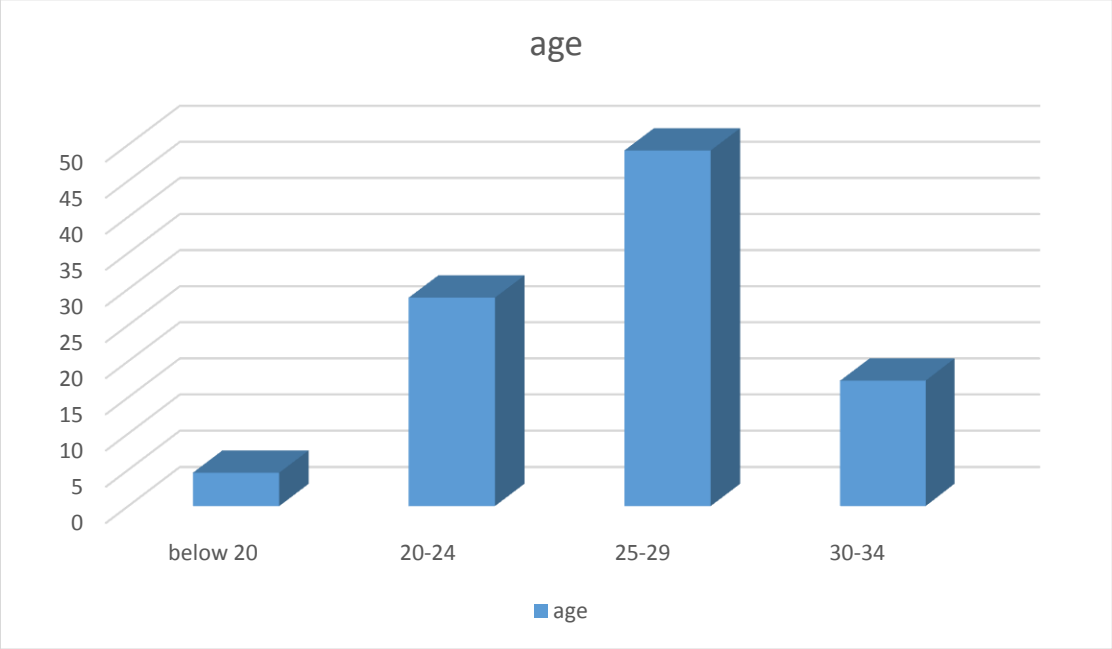


**Figure 4.2 Age Bracket of Respondents**

Figure 4.2 shows that 49.2% (128) of the teacher trainees were 25-29 years old while 28.8% (75) were 20-24 years old and 17.3% (45) were 30-34 years old. Only 4.6% (12) were below 20 years of age. Thus the majority of teacher-trainees were aged between 25-29 years.

### 4.3.3 Marital Status of Respondents

Findings on the marital status of the teacher trainees are presented in Figure 4.3.

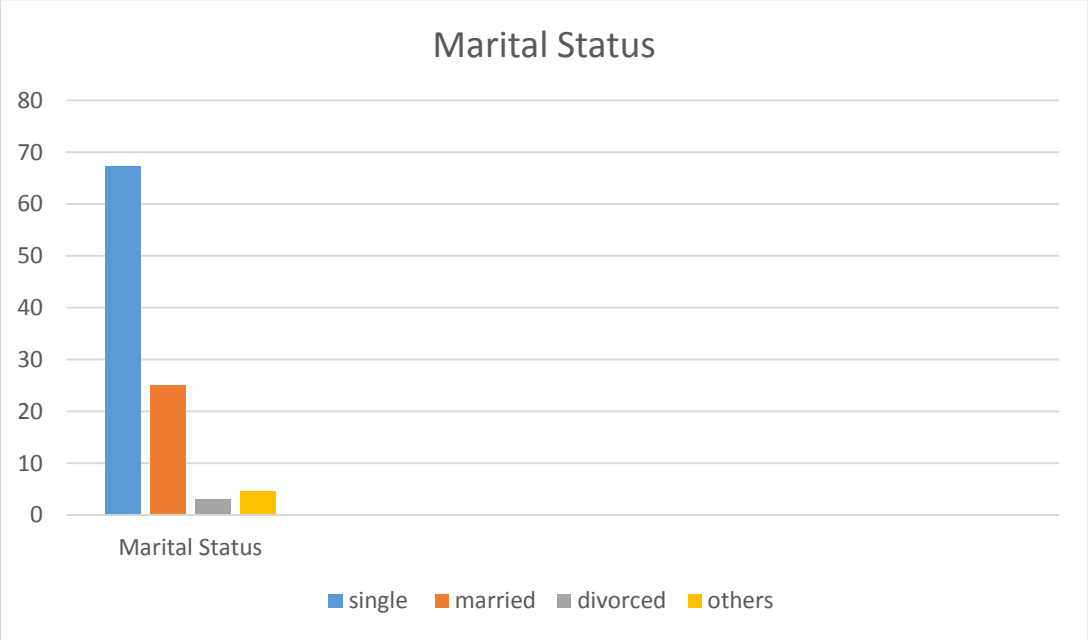


**Figure 4.3 Marital Status of Respondents**

It was noted that majority (67.3%) of the teacher trainees who participated in this study were single whereas 25% (65) were married.

### 4.3.4 Educational Level of Respondents

The study sought information concerning the level of education of the teacher trainees. Their responses are shown in Figure 4.4.

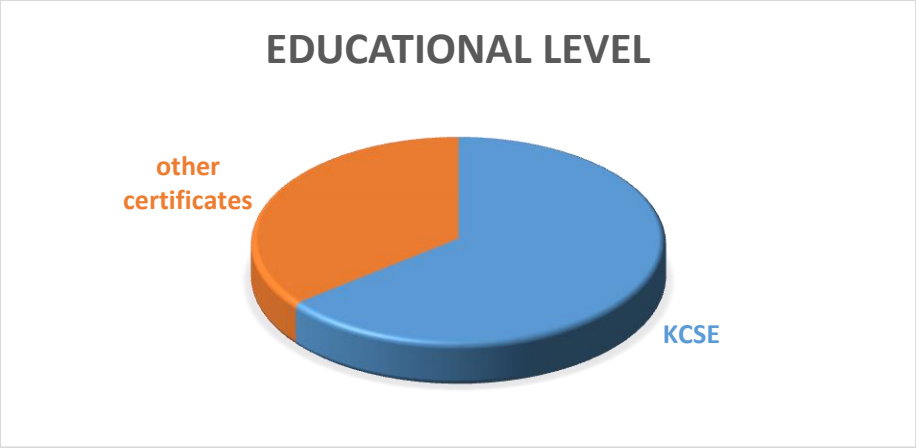


**Figure 4.4 Educational Level of Respondents**

As shown in Figure 4.4, majority (64.3%) were KCSE holders while 35.7% (84) were holders of other certificates.

### 4.4 Dialogic Approaches

Teacher trainees who participated in this study were asked to state their opinion concerning the use of dialogic approaches. Their responses are presented in Table 4.1.

**Table 4.1 Dialogic Approaches**

| Statement | SD | | D | | N | | A | | SA | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | % | F | % | F | % | F | % | F | % | F | % |
| Dialogic approach promotes talking and thinking together and help learners understand Math better | 6 | 2.3 | 18 | 6.9 | 0 | 0.0 | 135 | 51.9 | 101 | 38.8 | 260 | 100.0 |
| It is necessary for more than one person to help solve challenging questions | 8 | 3.1 | 19 | 7.3 | 5 | 1.9 | 126 | 48.5 | 102 | 39.2 | 260 | 100.0 |
| There is a great deal to be learned from listening to how others think | 10 | 3.8 | 17 | 6.5 | 45 | 17.3 | 125 | 48.1 | 63 | 24.2 | 260 | 100.0 |
| Talking about your thinking helps you to clarify your own thoughts. | 5 | 1.9 | 7 | 2.7 | 10 | 3.8 | 126 | 48.5 | 112 | 43.1 | 260 | 100.0 |
| When talking about the Mathematics, you practice using important math vocabulary. | 21 | 8.1 | 16 | 6.2 | 26 | 10.0 | 105 | 40.0 | 92 | 35.4 | 260 | 100.0 |
| You can learn a great deal about what it takes to understand the ideas of others. | 0 | 0.0 | 19 | 7.3 | 26 | 10.0 | 115 | 44.2 | 100 | 38.5 | 260 | 100.0 |

It is revealed that 90.7% (236) of the respondents agreed that dialogic approach promotes talking and thinking together and help learners understand Mathematics better. However, 9.2% (24) disagreed. There were 87.7% (228) of the teacher trainees who stated that it was necessary for more than one person to help solve challenging questions while 10.4% (27) disagreed, and 1.9% (5) remained neutral. Further, the study established that 72.3% (188) of the respondents agreed that there was a great deal to be learned from listening to how others think, 10.4% (27) disagreed.

Majority (91.6%) of the respondents stated that talking about their thinking helps them to clarify their own thoughts while 4.6% (12) disagreed and 3.8% (10) were neutral.
The study also established that 75.8% (197) of the teacher trainees who participated in this study stated that when talking about the Mathematics, they practice using important math vocabulary. However, 14.2% (37) disagreed. It was also revealed that 82.7% (215) of the respondents stated that they can learn a great deal about what it takes to understand the ideas of others whereas 17.3% (45) disagreed and 10% (26) were neutral.

In spite of the fact that talk is a focal element of tutoring and training and a developing zone of instructive research, there is by all accounts a hole between homeroom real factors and hypotheses of learning and advancement that stress the significance of social communication. Starting with examiners supporting the highlights of dialogic teaching method, the discoveries of Nystrand et al (1997), for instance, show that various styles of correspondence impacts affect student learning. Regardless of this, student learning has regularly been related with utilization of open inquiries (She and Fisher 2002). Nystrand

et.al (1997), in any case, caution against estimating the connection among learning and informative styles by concentrating on, for example, the sort of inquiries utilized through the span of an exercise (Molinari and Mameli 2010). Dialogic Pedagogy is upheld by expanded utilization of legitimate, theme pertinent inquiries with respect to the guide, however progressively fundamental is the nature of the correspondence that encompasses those inquiries (Nystrand, Wu, Gamorgan Zeiser and Long, 2003).

Not only talk, but additionally different highlights of interaction, for example, hold up time ought to be viewed when posing these sorts of inquiries (Vanzee, 2000; Chin, 2004). When all is said and done in terms of the most critical thought inside dialogic instructional method is the manner by which far the students are treated as dynamic specialists in study hall talk, for example members in the development of their own insight (Van Zee and Minstrell, 1997; Van Zee, Iwasyk, Kurose, Simpson and Wild, 2001).

This sort of approach is additionally considered to incorporate a persuasive factor, which is component to long haul inspiration of students (Hill, 2000). While talking about the connection among talk and the improvement of information in schools, Wells (1999) exhibited the possibility of networks of enquiry, where the dialogic idea of talk is misused to empower information to be built among students.

According to Wells (1999), the connection among tutor and students is dialogic as it were however is still "not a dialogue between equals: (p.242). When arranging classroom exercises ahead of time, the guide has initiative obligation of choosing topics and related exercises identified with the educational program; however once students examination

under way the mentor plays an increasingly consultative job, changing their help arrangement as per student progress. Wells and Arauz (2006) inspected how the joining of request approaches into educational plans influenced guide correspondence.

They found that there was away from increment of extra time in the coaches' appropriation of a "dialogic position," despite the fact that the commencement reaction – input design was as yet inescapable. The watched rarity of dialogic cooperations may result from correspondence in instructive settings being driven by pre-decided and over-burden curricular substance and goals compelling the breath of conversation and opportunity of members. Further-more mentors are bound by legitimate and legally binding commitments. Guides are commanded to constrain students' discourse, to allocate assignments and to survey the nature of student exercises. As instructing includes more pre-decided, restricted, exact and scholarly depictions of wonders in school Mathematics, it could lead eventually to repugnance towards Mathematics (Matusov, 2011).

The various methods for interaction in the classroom set up should be comprehended as far as their effect on giving or compelling student access to interest and open doors for learning. Regularly students are left to explore study hall communication with no help or instruments.

As suggested above, study hall contemplates have discovered that expounded talk doesn't just happen when youngsters are approached to embrace an undertaking together (Gillies and Khan, 2008). The tutors' job is to help students in participating in profitable correspondence, to inspire thoughts and sees, and to show thinking process and right

now, upgrade importance making and information creation. Moving towards more dialogic instructional method expects of coaches the educational abilities to have the option to follow and react to the different procedures occurring in the study hall.

Notwithstanding being aware of the various methods for opening up dialogic spaces, mentors ought to likewise be able to shape these spaces with the end goal of accomplishing exercise objectives, including, unavoidably, the capacity to define the limits for exchange (Wegerif, 2010). For example, as request based methodologies are progressively incorporated into Mathematics educational programs mentors should be increasingly mindful of how to open up true periods of request and when to direct the conversation towards Mathematics ends. All in all, mentors and guide instructors should be taught in how to utilize various kinds of talk during training arrangements for various educating purposes.

Research in the course of the most recent four decades has concentrated on how study hall exchange permits coaches and students cooperating to build information and implications and create between subjectivity (Howe and Aberdin, 2013). Alexander (2001) on noteworthy work features the focal pretended by the nature of homeroom discourse in advancing student learning, and social variety in how dialogic and other type of instructional method are showed.

Mercer (2001) has featured the job of exchange as a "social method of reasoning" that permits members to tackle issues together, and in which students assume liability for co-developing their comprehension: a procedure named 'interthinking'.

His original work on connection has fixated on exploratory talk given that it has extraordinary instructive worth. Exploratory talk accomplices connect fundamentally however helpfully with one another thoughts. Thoughts might be tested and counter-tested through argumentation. Understanding is looked for on a premise of joint advancement. Ras-Drummond, Torreblanca, Pedraza,Velez and Guzman (2013) set that students are dynamic rather aloof members during the time spent dialogic cooperations. Moreover, Mercer and Littleton (2007) affirm that the in coach student just as friend connection, exchange empowers sharing of thoughts and quest for shared objectives.

Ras-Drummond et al., (2013) in Dialogic Tutors and Learning (DTL), imagine DTL as that which saddles the intensity of language to animate and broaden students' getting, thinking and learning as assemblages proportional steady, combined and reason; participates in 'social methods of reasoning' where prospects can be investigated by and large through inventive critical thinking confined by liberal or credible inquiry/errand and thinking can be made obvious to other people.

They likewise see DTL as that which supports request and even handed cooperation, where al including guides are viewed as co-students build information mutually; is available to new thoughts and basically valuable, where exchange of viewpoints permits joint critical thinking; advances the formation of condition where assorted voices can be communicated, investigated, differentiated tested in total based upon one another and

integrated, permitting examination, change and compromise of basic perspectives and brings into question the generally watched transcendence of conventional and 'monologic' instructive practices where just one voice (principally the coaches) will in general be heard, legitimized and once in a while forced (Nystrand et al.,2003; Drummond, 2000).

Great instructing requires utilizing student usefully in class based on coaches' proficient information and judgment. Grasping blunders can possibly permit students to build up a rich comprehension of ideas. It is desirable to over grasp mistakes as opposed to adjusting or testing blunders, which furnish students with constrained access to information in contrast with the entrance managed by students. Notwithstanding, coach ought not generally hold onto blunders in light of the fact that as Hansen (2011) proposes grasping mistakes might be very tedious. With the requests of the educational program, it will be hard for mentors to continually grasp mistakes. However grasping mistakes can be less tedious than re-educating and re-clarifying thoughts which are not valuable to killing misguided judgments (Borasi, 1987).

Guides ought to know about the advantages and the restriction of adapting and grasping mistakes. Utilizing their expert mistakes, coaches ought to choose when and why it is fitting to test and to grasp blunders considering their insight into the substance and the student. For example, it may not bode well to grasp a slip.

Examining or amending slips might be progressively appropriate strategy for managing botches. In testing and grasping mistakes, coaches can build up their students' scientific capability and thinking abilities help them to get mindful of their own blunders and build up a need to keep moving comparable to numerical learning.

### 4.5 Learner-Learner dialogue

The other objective of the study was to establish how learner-learner dialogic interaction could be applied in minimization of learner errors in Mathematics classes. Teacher trainees who participated were asked to state their opinion concerning the eight items measuring learner-learner dialogue. Their responses are presented in Table 4.2.

**Table 4.2: Learner-Learner Dialogue**

| Statement | SD | | D | | N | | A | | SA | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | % | F | % | F | % | F | % | F | % | F | % |
| Learners operate together to improve knowledge | 5 | 1.9 | 15 | 5.8 | 11 | 4.2 | 87 | 33.5 | 142 | 54.6 | 260 | 100.0 |
| Learners help each other to learn through dialogue | 7 | 2.7 | 12 | 4.6 | 12 | 4.6 | 124 | 47.7 | 105 | 40.4 | 260 | 100.0 |
| Learning goals emerge and develop during dialogue | 0 | 0.0 | 14 | 5.4 | 28 | 10.8 | 116 | 44.6 | 102 | 39.2 | 260 | 100.0 |
| Learners create ideas for each other and for others | 18 | 6.9 | 16 | 6.2 | 27 | 10.4 | 108 | 41.5 | 91 | 35.0 | 260 | 100.0 |
| Learners review how best the community of learners support learning | 3 | 1.2 | 31 | 11.9 | 55 | 21.2 | 96 | 36.9 | 75 | 28.8 | 260 | 100.0 |
| Learners show understanding of how group processes promote their learning | 0 | 0.0 | 26 | 10.0 | 14 | 5.4 | 95 | 36.5 | 125 | 48.1 | 260 | 100.0 |
| The classroom social structures promote interdependence | 32 | 12.3 | 43 | 16.5 | 53 | 20.4 | 101 | 38.8 | 31 | 11.9 | 260 | 100.0 |
| Assessment tasks are community products | 34 | 13.1 | 22 | 8.5 | 56 | 21.5 | 58 | 22.3 | 90 | 34.6 | 260 | 100.0 |

The findings shown in Table 4.2 reveals that 78.1% (229) of the respondents agreed that the teacher trainees operate together to improve knowledge while 7.7% (20) disagreed. Another 88.1% (229) asserted that teacher trainees help each other to learn through dialogue whereas 7.3% (19) disagreed and 4.6% (12) were neutral. Majority (83.8%) (218) of the respondents stated that learning goals emerge and develop during dialogue while 16.2% (42) disagreed and 10.8% (28) were neutral. There were 76.5% (199) of the teacher trainees who agreed that they review how best the community of trainees support learning whereas 13.1% (34) disagreed and 21.2% (55) were neutral.

There were 84.6% (220) of the teacher-trainees who stated that they show understanding of how group processes promote their learning while 15.4% (40) disagreed and 5.4% (14) were neutral. As stated by 50.7% (132) of the respondents, classroom social structures promote interdependence while 28.8% (75) disagreed and 20.4% (53) were neutral. More than half (56.9%) (148) of the respondents stated that assessment tasks are community products which demonstrate increased complexity and a rich web of mathematical concepts. However, 21.5% (56) disagreed and 21.5% (56) were neutral.

Chi-square was used to establish whether there existed a significant relationship between learner-learner dialogue and minimization of learner errors in Mathematics classes in public primary teacher training colleges in the North Rift Region of Kenya. The first hypothesis was stated as:

**$HO_1$**: There is no significant relationship between learner-learner dialogue and minimization of learner errors in Mathematics classes in public primary teacher training colleges in Kenya. The results are shown in Table 4.3.

**Table 4.3: Chi-square results on relationship between learner-learner dialogue and minimization of learner errors in Mathematics**

| | Value | Df | Asymp. Sig. (2-sided) |
|---|---|---|---|
| Chi-Square | 18.272 | 8 | .019 |
| N of Valid Cases | 260 | | |

As shown in Table 4.3, a chi-square of 18.272, d.f. =8 and p-value of 0.019 was obtained. Since $p<0.05$, the null hypothesis is rejected which implies that there is a significant relationship between learner-learner dialogue and minimization of learner errors in Mathematics classes in public primary teacher training colleges in Kenya.

Regardless of endeavors to set up a justification for conversations and desires for tuning in Mathematics, rich conversations in don't occur by some coincidence. The unequivocal instructing of how students are relied upon to react and collaborate during a homeroom conversation in Mathematics is important. Students sharing their reasoning should realize that their clarification require something beyond a depiction of the procedure they used to take care of an issue. Or maybe, (students) need to incorporate a type of virtual portrayal, alongside a clarification of how they demonstrated the issue and why they decided to take care of the issue that way (Anderson et al, 2009). Students who are listening ought to be mindful to the considering others, ponder the thoughts they have heard to assess their proficiency, decide whether they concur or deviate, on the off chance that they comprehend the thinking about their companions and what likenesses or contrasts they

see between their own reasoning and them considering others students should be instructed how to concur and differ and how to approach inquiries for explanation.

So as to assist student's to condense and comprehend their deduction just as them considering others, it is fundamental to give chances to students "turn and talk" about thoughts. For example, in the wake of introducing an issue, students might be approached to speak to or state in their own words what the issue is asking, at that point share that with the accomplice. In the wake of finding a passage point and taking care of an issue freely, students should impart their techniques to an accomplice or in a gathering, preceding offering to the entire class. This gives students work on developing contentions, giving defense and investigating them considering others.

Students find a workable pace to tune in a way that sets them up to repeat their accomplices thinking in their own words, just as tuning in to comprehend and offer conversation starters of their accomplice. Organizations guarantee a more significant level of responsibility and students commitment than is conceivable with just entire gathering study hall discourse. An amazing instructional move after students have heard them considering others is to send them back to work in accomplices or in little gatherings to think about the contentions of others. Cautiously all around made inquiries are utilized to help manage the exchange.

### 4.6 Tutor-Learner Classroom Interaction

The study also sought to determine how tutor-learner dialogue could be applied in minimization of learner errors in Mathematics classes.

The responses are presented in Table 4.4.

**Table 4.4: Tutor-Learner Classroom Interaction**

| **Statement** | **SD** | | **D** | | **N** | | **A** | | **SA** | | **TOTAL** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tutor:** | **F** | **%** | **F** | **%** | **F** | **%** | **F** | **%** | **F** | **%** | **F** | **%** |
| Allows all learners to talk freely during the lesson | 23 | 8.8 | 53 | 20.3 | 6 | 2.3 | 62 | 23.8 | 116 | 44.6 | 260 | 100.0 |
| Appreciates each learners contribution in the lesson | 12 | 4.6 | 11 | 4.2 | 10 | 3.8 | 82 | 31.5 | 145 | 55.8 | 260 | 100.0 |
| Avoids spoon feeding the learners with concepts | 21 | 8.1 | 32 | 12.3 | 36 | 13.8 | 74 | 28.5 | 97 | 37.3 | 260 | 100.0 |
| Begins from the known to the unknown | 5 | 1.9 | 3 | 1.2 | 4 | 1.5 | 67 | 25.8 | 181 | 69.6 | 260 | 100.0 |
| Does not talk enthusiastically about what needs to be done during discussion | 46 | 17.7 | 52 | 20.0 | 45 | 17.3 | 73 | 28.1 | 44 | 16.9 | 260 | 100.0 |
| Encourages each learners to share their views and articulate them appropriately | 12 | 4.6 | 17 | 6.5 | 26 | 10.0 | 136 | 52.3 | 69 | 26.5 | 260 | 100.0 |
| Rebukes learners who make noise during the lesson and discussion | 50 | 19.2 | 48 | 18.5 | 4 | 1.5 | 101 | 38.8 | 57 | 21.9 | 260 | 100.0 |
| Emphasizes the importance of having collective sense of purpose during learning | 12 | 4.6 | 18 | 6.9 | 40 | 15.4 | 116 | 44.6 | 74 | 28.5 | 260 | 100.0 |
| Laughs heartily with the learners during Mathematics lessons | 56 | 21.5 | 54 | 20.8 | 32 | 12.3 | 88 | 33.8 | 30 | 11.5 | 260 | 100.0 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Prefers learners working on their own individually | 65 | 25.0 | 58 | 22.3 | 43 | 16.5 | 70 | 26.9 | 24 | 9.2 | 260 | 100.0 |
| Prefers correct answers from the learners whenever poses questions | 29 | 11.2 | 21 | 8.1 | 69 | 26.5 | 91 | 35.0 | 50 | 19.2 | 260 | 100.0 |
| Articulates a compelling vision for the class | 0 | 0.0 | 22 | 8.5 | 45 | 17.3 | 102 | 39.2 | 91 | 35.0 | 260 | 100.0 |
| Explains every concept on the chalkboard and gives learners assignments | 15 | 5.8 | 28 | 108 | 23 | 8.8 | 60 | 23.1 | 134 | 51.5 | 260 | 100.0 |
| Has to be in class for meaningful learning to take place. | 20 | 7.7 | 45 | 17.3 | 60 | 23.1 | 44 | 16.9 | 91 | 35.0 | 260 | 100.0 |

It is instructive to note that 68.4% (178) of the respondents stated that their tutors allow all learners to talk freely during the lesson while 33.1% (76) disagreed and 2.3% (6) were neutral. Another 87.3% (227) of the teacher trainees stated that their tutors appreciate each learners' contribution in the lesson. However, 8.8% (23) disagreed and 3.8% (10) were neutral. Further, 63.8% (171) of the trainees agreed that their tutors avoid spoon feeding the learners with concepts whereas 20.4% (53) disagreed and 13.8% (36) were neutral.

Another 95.4% (248) of the respondents stated that their tutors begin from the known to the unknown while only 3.1% (8) disagreed and 1.5% (4) were neutral. It is also indicated that 45% (117) of the respondents stated that their tutors do not talk enthusiastically about what needs to be done during Mathematics discussion while 37.7% (98) disagreed and 17.3% (45) were neutral.

Majority (78.8%) of the respondents stated that their tutors encourage them appropriately whereas 11.2% (29) disagreed and 10% (26) were neutral.

According to 60.7% (158) of the respondents, tutors rebuke learners who make noise during the lesson and discussion. However, 37.7% (98) disagreed and 1.5% (4) were neutral. The study also established that 73.1% (190) of the teacher trainees agreed that their tutors emphasize the importance of having collective sense of purpose during learning while 11.5% (30) disagreed and 15.4% (40) were neutral. Further, 43.3% (118) of the teacher trainees agreed that their tutors laugh heartily with the learners during Mathematics lessons. However, 42.3% (110) disagreed and 12.3% (32) were neutral.

Similarly, 36.1% (94) of the teacher trainees asserted that their tutors prefer learners working on their own individually while 47.3% (123) disagreed.

Another 54.2% (141) of the trainees stated that their tutors prefer correct answers from the learners whenever they pose questions while 19.2% (50) disagreed. There were 74.2% (193) of the respondents who stated that their tutors articulate a compelling vision for the class while 25.8% (67) disagreed. According to 74.6% (193) of the respondents, the tutors explain every concept on the chalkboard and give learners assignments whereas 16.5% (43) disagreed and 8.8% (23) were neutral. Half (51.9%) (135) of the respondents agreed that their tutors have to be in class for meaningful learning to take place. However, 25% (65) disagreed.

Baktin (1981) makes a differentiation among dialogic and monologic talk. He utilizes the case of mentor – student talk to outline the idea of monologic talk and contends that it blocks veritable exchange (Skidmore, 2000). A monologic guide is generally worried about the transmission of information to students and remains solidly in charge of the

objectives of talk. Monologic talk is an instrumental way to deal with correspondence outfitted towards accomplishing the guide's objectives. Interestingly, dialogic talk is worried to advance correspondence through real trades. There is certified worry for the perspectives on the discussion examples and exertion is made to assist members with sharing and construct meaning cooperatively.

Baktin takes note of that dialogic significance includes the view that discourse isn't just between individuals however between the edges individuals use to arrange encounters (Gutierrez et al., 1995). This example could be identified with the supposed "winding" IRF trade comprising a successive (IRF) design (Berland and Harmer, 2012), encouraging increasingly intuitive, synergistic and steady learning (Rojas-Drammond, Mercer and Dabrowski, 2001). The expanded expectation of mentor follow up inside the winding IRF design offers the potential for the advancement of bona fide dialogic cooperation (Sharpe, 2008; Wells, 1999). In contrast, if the guide is just renegotiating towards the right answer and conclusion, the legitimate methodology is being applied and the discussion follows the IRF design with evaluative input. The basic role of the recitation is the collection of information and comprehension through guide addresses intended to test or animate review, or to sign students to work out answers from hints in the inquiry.

The recitation bolsters the customary force connections of the study hall which will in general duplicate a teaching method dependent on the transmission of prepackaged information (Lye, 1998). The development to advance dialogic talk styles needs to go up against this prevailing type of homeroom connection. It follows that actualizing a change from the conventional homeroom to one that qualifies dialogic talk isn't a stroll over.

Further, chi-square was used to test the second hypothesis that was stated as:

**$H_{O2}$**: There is no significant relationship between tutor-learner dialogue and minimization of learner errors in Mathematics classes in public primary teacher training colleges in Kenya.

The results are presented in Table 4.5

**Table 4.5: Chi-square results on relationship between tutor-learner dialogue and minimization of learner errors**

| | Value | Df | Asymp. Sig. (2-sided) |
|---|---|---|---|
| Chi-Square | 22.94 | 8 | .004 |
| N of Valid Cases | 260 | | |

As shown in Table 4.5, a chi-square of 22.594, d.f. =8 and p-value of 0.004 was obtained. Since $p<0.05$, the null hypothesis is rejected which implies that there is a significant relationship between tutor-learner dialogue and minimization of learner errors in Mathematics classes in public primary teacher training colleges in Kenya.

### 4.7 Whole Class Group Interaction

The study sought to determine how whole class group dialogic approach could be applied in minimization of learner errors in Mathematics classes. To achieve this objective, the teacher trainees were asked to provide their level of agreement to 14 items that were measuring whole class group dialogic approach. The responses were in a five-point Likert scale from 'Strongly Disagree, to Strongly Agree' in a scale of 1 to 5 respectively.

The responses are shown in Table 4.6

**Table 4.6 Whole Class Group Interaction**

| Statement | SD | | D | | N | | A | | SA | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | % | F | % | F | % | F | % | F | % | F | % |
| I feel left behind all the time during Mathematics lessons | 90 | 34.6 | 81 | 31.2 | 27 | 10.4 | 43 | 16.5 | 19 | 7.3 | 260 | 100.0 |
| My Mathematics tutor is quite competent | 26 | 10.0 | 18 | 6.9 | 21 | 8.1 | 108 | 41.5 | 87 | 33.5 | 260 | 100.0 |
| When I answer any question, I receive no recognition for it | 92 | 35.4 | 85 | 32.7 | 40 | 15.4 | 30 | 11.5 | 13 | 5.0 | 260 | 100.0 |
| We have the best communication in our class | 40 | 15.4 | 23 | 8.8 | 53 | 20.4 | 101 | 38.8 | 43 | 16.5 | 260 | 100.0 |
| My Mathematics tutor is always fast and harsh | 119 | 45.8 | 77 | 29.6 | 23 | 8.8 | 34 | 13.1 | 7 | 2.7 | 260 | 100.0 |
| Many of the approaches of teaching only favour the bright learners | 107 | 41.2 | 43 | 16.5 | 21 | 8.1 | 60 | 23.1 | 29 | 11.2 | 260 | 100.0 |
| Our Mathematics tutor is as good as any other tutor | 10 | 3.8 | 29 | 11.2 | 62 | 23.8 | 100 | 38.5 | 59 | 22.7 | 260 | 100.0 |
| I do not feel my efforts to improve is appreciated | 85 | 32.7 | 89 | 34.2 | 47 | 18.1 | 31 | 11.9 | 8 | 3.1 | 260 | 100.0 |
| I always feel withdrawn prior to our Mathematics lesson | 80 | 30.8 | 90 | 34.6 | 12 | 4.6 | 46 | 17.7 | 32 | 12.3 | 260 | 100.0 |
| Our Mathematics tutor makes up for the missed lessons | 3 | 1.2 | 11 | 4.2 | 37 | 14.2 | 135 | 51.9 | 74 | 28.5 | 260 | 100.0 |
| Our class participation positively correlates with our performance | 8 | 3.1 | 20 | 7.7 | 29 | 11.2 | 92 | 35.4 | 111 | 42.7 | 260 | 100.0 |
| We always engage in lively discussions | 15 | 5.8 | 19 | 7.3 | 33 | 12.7 | 90 | 34.6 | 103 | 39.6 | 260 | 100.0 |
| I find learning Mathematics enjoyable every time | 10 | 3.8 | 24 | 9.2 | 31 | 11.9 | 76 | 29.2 | 119 | 45.8 | 260 | 100.0 |
| The tutor is always responsible for our lack of interest in Mathematics | 45 | 17.3 | 37 | 14.2 | 57 | 21.9 | 72 | 27.7 | 49 | 18.8 | 260 | 100.0 |

As shown in Table 4.6, 65.8% (171) of the teacher trainees did not feel left behind all the time during Mathematics lessons while 23.8 %( 62) agreed that they felt left behind all the time during Mathematics lessons. Majority 75.0% (195) of the respondents stated that their Mathematics tutors were quite competent in teaching while 16.9% (44) disagreed and 8.1% (21) were neutral. Another 68.1% (177) of the respondents stated that they received recognition from the tutors when they answered the questions correctly, while 16.5% (45) do not receive recognition for the correct answer from the tutors. It is also shown that 55.3% (144) of the respondents agreed that they have the best communication in their class and 24.2% (63) disagreed while 20.4% (53) were neutral. Further, 15.8% (41) of the tutors were always fast and harsh. However, majority 75.4% (196) disagreed and 8.8% (23) were neutral. This implies that majority of the Mathematics tutors were not fast nor harsh.

Table 4.6 also shows that 24.3% (89) of the teacher trainees agreed that many of the approaches of teaching and learning Mathematics only favor the bright learners while majority (57.7%) disagreed and 8.1% (21) were neutral. According to 61.2% (159) of the teacher trainees, their Mathematics tutors were as good as any other Mathematics tutors in other institutions. Only 15.0% (39) disagreed and 23.8% (62) were neutral. The findings also show that 15% (39) of the respondents did not feel that their effort to improve in Mathematics was appreciated whereas 66.9% (174) disagreed and 18.1% (47) were neutral. This indicates that majority of the teacher trainees feel that their effort to improve in Mathematics was appreciated.

As stated by 30% (78) of the respondents, teacher trainees always feel withdrawn prior to their Mathematics lesson while 65.4% (170) disagree and 4.6% (12) were neutral.

Majority (80.4%) of the teacher trainees who participated in this study stated that their Mathematics tutors make up for the missed lessons while only 5.4% (14) disagreed. Further, 78.1% (203) of the teacher trainees agreed that their class participation positively correlates with their performance in tests and examinations while 10.8% (28) were of the contrary opinion and 11.2% (29) were neutral.

The study also established that 74.2% (193) of the teacher trainees agreed that they always engage in lively discussions during their Mathematics lessons whereas 13.1% (34) disagreed and 12.7% % (33) were neutral. There were 75% (195) of the respondents who stated that they find learning Mathematics enjoyable every time while 13.1% (34) disagreed and 11.9% (31) were neutral. Another 46.5% (121) of the teacher trainees agreed that tutors are always responsible for their lack of interest in Mathematics whereas 31.5% (82) disagreed and 21.9% (57) were neutral.

There was need to establish statistically whether there existed a relationship between whole class group dialogue and minimization of learner errors in Mathematics classes in public primary teacher training colleges in Kenya. This was the third hypothesis that was stated as:

**$H_{O3}$**: There is no significant relationship between whole class group dialogue and minimization of learner errors in Mathematics classes in public primary teacher training colleges in the North Rift region of Kenya.

This hypothesis was tested using Chi-square and the results are presented in Table 4.7.

**Table 4.7: Chi-square results on relationship between whole class group dialogue and minimization of learner errors**

| | Value | df | Asymp. Sig. (2-sided) |
|---|---|---|---|
| Chi-Square | 23.187 | 8 | .003 |
| N of Valid Cases | 260 | | |

As revealed in Table 4.7, a chi-square of 23.187, d.f. =8 and p-value of 0.003 was obtained. Since $p<0.05$, the relationship is significant. The null hypothesis is rejected implying that there is a significant relationship between whole class group dialogue and minimization of learner errors in Mathematics classes in public primary teacher training colleges in the North Rift region of Kenya.

This methodology targets producing an exceptionally elevated level of consideration, commitment and dynamic support by students through setting up a high reaction rate to guides addressing and inciting. The guide may start the exercise by introducing realities utilizing a logical or educational methodology, yet then students are required to go into exchange and contribute their own thoughts, express their feelings, pose inquiries and disclose their speculation to the coach and others (Dickson, 2003; Reynolds and Farrell, 1996). Learning isn't accomplished here by embracing an oversimplified recipe of a little talk to the class followed by 'drill and practice, or by anticipating that students should show themselves from books or different materials. Learning happens in light of the fact that students are locked in psychologically in preparing and utilizing pertinent data, communicating it in their own words and getting criticism (Westwood, 2008).

Jones and Tanner (2005) have comments that there are contrasts among guides by the way they decipher the idea of entire gathering intuitive instructing and how they suit it into their own style.

To be viable, a coach should be exceptionally gifted at bringing all students into exercise by consolation, intrigue, and direct addressing. Guides likewise should be versatile and ready to 'think and react quickly' so as to react to and underwrite completely on students' commitments. At the point when occupied with intelligent instructing, a few mentors don't appear to perceive the benefit of empowering 'choral reacting' (Learners noting together now and again) and what ought to be an extremely lively pace of progress through the exercise might be eased back unexpectedly by requesting that singular students lift a hand in the event that they wish to respond to an inquiry or make a commitment.

Intelligent entire class discourse has been prescribed in government rules in the United Kingdom as a potential methods for bringing students' accomplishment step up in fundamental numeracy (DFEE, 1999). While containing the principle elements of different types of direct educating, this dialogic model isn't obliged by scripted exercises and can be substantially more effectively suited into coaches' current instructing styles. Be that as it may, a few guides despite everything experience issues moving right now (Hargreaves et al., 2003).

With the end goal for students to straightforwardly share their reasoning and hazard committing errors before their companions it is basic that there is steady study hall

condition. Everybody ought to comprehend their job in the study hall through the advancement of study hall standards.

The coach is relied upon to suggest provocative conversation starters, bolster students' understanding and confusions, and energize student interest in conversations and advance student reflection about the learning experience (Lengiz, 2013). She further recommends that guides train students the significance of and desires for numerical discussions. She clarifies how talking like Mathematics empowers them to be solid Mathematical masterminds.

Anderson et al. (2009) contends that setting up a basis for Mathematical talk is basic for building up desire for aware tuning in. Students should be situated where they can see and hear the speaker, and they are required to listen effectively and be set up to react to the thoughts of others. Students are instructed how to deferentially differ and address each other. Most importantly, there is acknowledgment of all things considered and all commitments to the conversations are regarded.

Guides should concentrate on allotting Mathematical assignments that are fittingly testing and improve students' learning. Scientific undertakings ought to explore significant Mathematical thoughts and have valid settings and importance for students. The issues presented ought to have different arrangement, support examination, advance thinking, and expect students to give legitimization to their reasoning. At last Mathematical errands ought to be deserving of student conversation and accentuate significant Mathematical realities.

### 4.7 Challenges Encountered in Using Dialogic Approaches in Minimization of Errors

The fourth objective of this study was to determine challenges encountered in using dialogic approaches in minimization of learner errors in Mathematics classes in public primary teacher training colleges. To achieve this objective, the respondents were asked an open ended question that required them to state the challenges encountered in using dialogic approaches in minimization of learner errors in Mathematics classes. This elicited multiple responses.

Majority of the respondents stated that large class sizes affected the use of dialogic approach in minimization of learner errors in Mathematics. The high numbers of learners in a class make it difficult for effective dialogue between tutor and learners and among the learners in class as a group or as individual learners. This response was stated by all the categories of respondents who participated in this study that included the teacher trainees, tutors, Heads of departments and deans of curriculum in the colleges where the study was done.

The other challenge mentioned by majority of the respondents through questionnaire and interview was lack or inadequate time allocated for the Mathematics lesson. Considering the scope of content to be covered within the time allocated, it becomes difficult for the tutors to use dialogic approach in minimization of learner errors in Mathematics.

Dialogic approach requires more time because it entails giving chance another party to provide his/her opinion concerning a mathematical problem. This is why the dialogic approach might not be effectively used in minimizing learner errors in Mathematics.

The respondents also asserted that learners' attitude towards each other and towards the Mathematics tutors affects the use of dialogic approach in minimizing errors. There are situations where the learners perceive others as people whom they cannot work with or had previously been in bad terms with. This implies that they cannot have a dialogue with the colleagues they have a negative attitude towards. Cultural diversity was another challenge that affects the implementation of the dialogic approach towards minimization of errors in Mathematics. There are cultural beliefs that are retrogressive and might affect the use dialogic approach in minimizing errors in Mathematics.

The study also established that personal characteristics of learners like gender, personality and interpersonal skills affect the use of dialogic approach in minimizing errors in Mathematics. This was stated by majority of the respondents who participated in the study.

It was the opinion of the respondents that for effective use of dialogic approach, the learners require good interpersonal skills that will enable them relate well with the learners in class and even with the tutors during Mathematics lesson.

This diagram of current deduction on dialogic teaching, features the hole between standard practice and the developing acknowledgment of the intensity of exchange during the time spent in making meaning. One of the obstructions to the usage of dialogic practice in the instructing of arithmetic is the predominance of the mentor's voice to the detriment of students' own significance making voices. The force connection among guides and students is a hindrance to certified discourse in study hall settings.

Likewise, numerous guides do not have the essential abilities for arranging successful entire class discourse and thus the instructive capability of learning through dialogic talk is unattainable.

Proof from observational examinations demonstrate that in an investigation of more than 100 center and secondary school classes dialogic talk took up under 15% of guidance time and when 'lower-track students' were locked in there was a virtual nonappearance of such talk (Nystrand et al., 1977). Myhill and Fisher (2005) found that students had little chance to address or investigate thoughts in homerooms. Frequently there is minimal useful significance making and constrained open door for student interest. The accentuation is on real review as opposed to higher request associations including thinking. This may be the explanation behind low execution of students in their assessments.

The nearness of a National Curriculum in numerous nations implies mentors have an abrogating down to earth worry with covering the educational plan. Numerous guides work to exacting time tables and substance drove educational plan necessities and battle to perceive how dialogic can turn into a standard element of study hall practice. This is especially valid for open essential instructors preparing schools. Much will rely upon how current patterns towards the advancement of reasoning aptitudes require synergistic talk, are really installed in the statutory educational program. How mentors can push ahead on this requires earnest consideration by specialists and experts.

Lefstein (2006) condemns supporters of instructive discourse as excessively hopeful and requires an increasingly down to earth approach.

He takes a gander at the unevenness in the appropriation of assets for the activity of intensity in schools and reminds that coaches are ordered to confine students' development and discourse, dole out undertakings and decide the nature of understudy movement just as being vested with epistemological power. The way that school is obligatory, student participation is constrained and mentors are bound by authoritative and legitimate commitments. Considering all these, one is left to question if guides can break up or rise above their customary jobs. Advantageous to note is that numerous students originate from hindered and subjected bunches where cultural disparities are usually repeated in the study hall. Connections outside homeroom plainly sway on study hall communication and should be problematized. Force relations confine correspondence and will be affected by students' solid encounters of benefit and persecution (Ellsworth, 1989).

Backers of dialogic showing regret the nonattendance of exchange, of certified discussion in classes where kids are kept from creating voice and basic familiarity with their own closures, means and limits in learning. Testing such examples of collaboration requires a lot of exertion and duty for the benefit of guides and shows extensive test to the individuals who wish to set up such procedures in science classes and schools.

# CHAPTER FIVE

# SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

## 5.1 Introduction

This chapter presents summary of the findings, conclusion and recommendations based on the findings of the study.

## 5.2 Summary of the Findings

The summary of findings focuses on the following sub-headings that formed the study objectives:

### 5.2.1 Dialogic Approaches

It is revealed that 90.7% (236) of the respondents agreed that dialogic approach promotes talking and thinking together and help learners understand Mathematics better. However, 9.2% (24) disagreed. There were 87.7% (228) of the teacher trainees who stated that it was necessary for more than one person to help solve challenging questions while 10.4% (27) disagreed, and 1.9% (5) remained neutral. Further, the study established that 72.3% (188) of the respondents agreed that there was a great deal to be learned from listening to how others think, 10.4% (27) disagreed.

Majority (91.6%) of the respondents stated that talking about their thinking helps them to clarify their own thoughts while 4.6% (12) disagreed and 3.8% (10) were neutral. The study also established that 75.8% (197) of the teacher trainees who participated in this study stated that when talking about the Mathematics, they practice using important math vocabulary. However, 14.2% (37) disagreed. It was also revealed that 82.7% (215) of

the respondents stated that they can learn a great deal about what it takes to understand the ideas of others whereas 17.3% (45) disagreed and 10% (26) were neutral.

### 5.2.2 Learner-Learner dialogue

The other objective of the study was to establish how learner-learner dialogic interaction could be applied in minimization of learner errors in Mathematics classes. The findings revealed that 78.1% of the respondents agreed that the teacher trainees operate together to improve knowledge while 7.7% disagreed. Another 88.1% asserted that teacher trainees help each other to learn through dialogue whereas 7.3% disagreed and 4.6% were neutral. Majority (83.8%) of the respondents stated that learning goals emerge and develop during dialogue while 16.2% disagreed and 10.8% were neutral. There were 76.5% of the teacher trainees who agreed that they review how best the community of trainees support learning whereas 13.1% disagreed and 21.2% were neutral.

There were 84.6% of the teacher-trainees who stated that they show understanding of how group processes promote their learning while 15.4% disagreed and 5.4% were neutral. As stated by 50.7% of the respondents, classroom social structures promote interdependence while 28.8% disagreed and 20.4% were neutral. More than half (56.9%) of the respondents stated that assessment tasks are community products which demonstrate increased complexity and a rich web of mathematical concepts. However, 21.5% disagreed and 21.5% were neutral.

### 5.2.3 Tutor-Learner Classroom Interaction

The study also sought to determine how tutor-learner dialogue could be applied in minimization of learner errors in Mathematics classes. It is instructive to note that 64.6%

of the respondents stated that their tutors allow all learners to talk freely during the lesson while 33.1% disagreed and 2.3% were neutral. Another 87.3% of the teacher trainees stated that their tutors appreciate each learners' contribution in the lesson. However, 8.8% disagreed and 3.8% were neutral. Further, 68.4% of the trainees agreed that their tutors avoid spoon feeding the learners with concepts whereas 20.4% disagreed and 13.8% were neutral. Another 95.4% of the respondents stated that their tutors begin from the known to the unknown while only 3.1% disagreed and 1.5% were neutral.

It is also indicated that 45% of the respondents stated that their tutors do not talk enthusiastically about what needs to be done during discussion while 37.7% disagreed and 17.3% were neutral. Majority (78.8%) of the respondents stated that their tutors encourage them appropriately whereas 11.2% disagreed and 10% were neutral.

According to 60.7% of the respondents, tutors rebuke learners who make noise during the lesson and discussion. However, 37.7% disagreed and 1.5% were neutral. The study also established that 73.1% of the teacher trainees agreed that their tutors emphasize the importance of having collective sense of purpose during learning while 11.5% disagreed and 15.4% were neutral. Further, 43.3% of the teacher trainees agreed that their tutors laugh heartily with the learners during Mathematics lessons. However, 42.3% disagreed and 12.3% were neutral.

Similarly, 36.1% of the teacher trainees asserted that their tutors prefer learners working on their own individually while 47.3% disagreed. Another 54.2% of the trainees stated that their tutors prefer correct answers from the learners whenever they pose questions while 19.2% disagreed. There were 74.2% of the respondents who stated that their tutors articulate a compelling vision for the class while 25.8% disagreed. According to 74.6% of

the respondents, the tutors explain every concept on the chalkboard and give learners assignments whereas 16.5% disagreed and 8.8% were neutral. Half (51.9%) of the respondents agreed that their tutors have to be in class for meaningful learning to take place. However, 25% disagreed.

### 5.2.4 Whole Class Group Interaction

The study sought to determine how whole class group dialogic approach could be applied in minimization of learner errors in Mathematics classes. The study established that 65.8% of the teacher trainees did not feel left behind all the time during Mathematics lessons while 23.8% agreed that they felt left behind all the time during Mathematics lessons. Majority (75.0%) of the respondents stated that their Mathematics tutors were quite competent in teaching while 16.9% disagreed and 8.1% were neutral.

Another 68.1% of the respondents stated that they received recognition from the tutors when they answered the questions correctly, while 16.5% do not receive recognition for the correct answer from the tutors. It is also shown that 55.3% of the respondents agreed that they have the best communication in their class and 24.2% disagreed while 20.4% were neutral. Further, 15.8% of the tutors were always fast and harsh. However, majority (75.4%) disagreed and 8.8% were neutral. This implies that majority of the Mathematics tutors were neither fast nor harsh.

Further, the study found that 24.3% of the teacher trainees agreed that many of the approaches of teaching and learning Mathematics only favour the bright learners while majority (57.7%) disagreed and 8.1% were neutral. According to 61.2% of the teacher trainees, their Mathematics tutors were as good as any other Mathematics tutors in other institutions. Only 15.0% disagreed and 23.8% were neutral. The findings also show that

15% of the respondents did not feel that their effort to improve in Mathematics was appreciated whereas 66.9% disagreed and 18.1% were neutral. This indicates that majority of the teacher trainees feel that their efforts to improve in Mathematics were appreciated.

As stated by 30% of the respondents, teacher trainees always feel withdrawn prior to their Mathematics lesson while 65.4% disagree and 4.6% were neutral. Majority (80.4%) of the teacher trainees who participated in this study stated that their Mathematics tutors make up for the missed lessons while only 5.4% disagreed. Further, 78.1% of the teacher trainees agreed that their class participation positively correlates with their performance in tests and examinations while 10.8% were of the contrary opinion and 11.2% were neutral.

The study also established that 74.2% of the teacher trainees agreed that they always engage in lively discussions during their Mathematics lessons whereas 13.1% disagreed and 12.7% % were neutral. There were 75% of the respondents who stated that they find learning Mathematics enjoyable every time while 13.1% disagreed and 11.9% were neutral. Another 46.5% of the teacher trainees agreed that tutors are always responsible for their lack of interest in Mathematics whereas 31.5% disagreed and 21.9% were neutral.

### 5.2.5 Challenges Encountered in Using Dialogic Approaches in Minimization of Errors

The fourth objective of this study was to determine challenges encountered in using dialogic approaches in minimization of learner errors in Mathematics classes in public primary teacher training colleges. To achieve this objective, the respondents were asked

an open end question that required them to state the challenges encountered in using dialogic approaches in minimization of learner errors in Mathematics classes. This elicited multiple responses. Majority of the respondents stated that large class sizes affected the use of dialogic approach in minimization of learner errors in Mathematics. The high number of learners in a class makes it difficult for effective dialogue between tutor and learner and among the learners in class as a group or as individual learners. This response was stated by all the categories of respondents who participated in this study that included the teacher trainees, tutors, Heads of departments and Deans of curriculum in the colleges where the study was done.

The other challenge mentioned by majority of the respondents through questionnaire and interview was lack of inadequate time allocated for the Mathematics lesson. Considering the scope of content to be covered within the time allocated, it becomes difficult for the tutors to use dialogic approach in minimization of learner errors in Mathematics. Dialogic approach requires more time because it entails giving chance another party to provide his/her opinion concerning a mathematical problem. This is why the dialogic approach might not be effectively used in minimizing learner errors in Mathematics.

The respondents also asserted that learners' attitude towards each other and towards the Mathematics tutors affects the use of dialogic approach in minimizing errors. There are situations where the learners perceive others as people whom they cannot work with or had previously been in bad terms with. This implies that they cannot have a dialogue with the colleagues they have a negative attitude towards. Cultural diversity was another challenge that affects the implementation of the dialogic approach towards minimization of errors in Mathematics.

There are cultural beliefs that are retrogressive and might affect the use dialogic approach in minimizing errors in Mathematics.

The study also established that personal characteristics of learners like gender, personality and interpersonal skills affect the use of dialogic approach in minimizing errors in Mathematics. This was stated by majority of the respondents who participated in the study. It was the opinion of the respondents that for effective use of dialogic approach, the learners require good interpersonal skills that will enable them relate well with the learners in class and even with the tutors during Mathematics lesson.

It has been suggested that academic literature presents dialogic teaching as an effective and desirable teaching method. Although from observed tutors they do not follow such sources, they have spontaneously reported their attempts to engage learners in dialogue and discussion. That is why tutors find the concept of dialogic teaching difficult to apply. Why is realization of dialogic teaching so difficult for tutors in spite of their apparent good will to do so? Alexander claims that dialogic teaching is: 1) Collective 2) Reciprocal 3) Supportive 4) Cumulative and 5) Purposeful. In reality of the classroom, these features are believed to be very difficult to achieve.

Starting with the first feature which implies that dialogic teaching should be collective and therefore the whole classroom or at least some of its groups should participate in it. Alexander suggests that educational tasks need to address all the learners. However, this feature crashes with strong heterogeneity of learners because not all learners are interested in the subject and their aptitude differs. Such heterogeneity complicates the realization of the collectivity criterion (Nystrand et al 2001). Tutors find it difficult to

plan scaffolding because it presupposes more or less individual diagnosis of acquired knowledge and skills. On one hand, tutors should give learners such tasks that are within the range of their zone of proximate development. On the other hand, this is difficult to fulfill since each learners' zone of proximal development is unique and hence different than others.

Tutors who are aware of heterogeneity of them learners can adopt two strategies. First, they can choose to leave out low-track learners out of the more demanding communication sequences. The second is tutors can set their standards low so that each learner can exceed them. While the first strategy does not meet the criterion of collectivity, the second makes dialogic teaching almost impossible by preferring its social functions. Collectivity could be one of the reasons which motivates the tutor not to elicit further elaboration of responses and argumentation from learners. The tutor could believe that such a task would be too difficult for the learners. Further, the intention includes a higher number of learners in communication, motivates the tutor to quickly change the communication pattern and therefore lacks time to elaborate their answers.

The second feature implies that dialogic teaching should be reciprocal. According to Alexander (2006) this means that the tutors and learners listen to each other, share their thoughts and consider alternative viewpoints. The believe is that the criterion of reciprocity can be based to feedback. This means that a dialogue is only reciprocal when its participants comment on each other's thoughts and develop them further. This clashes with Alexander's first criterion. From observation it showed that wherever a tutor concentrated on a single learner's response for a longer period of time, the other learners

become gradually less and less interested in their communication exchange, the noise here in the classroom increases and so did of task activities of the learners. This therefore means that activation of all learners takes place at the expenses of concentration of one learner and elaboration of his or her thoughts.

Dialogic teaching is supportive when learners share ideas freely, participate in communication and are not afraid of making mistakes Alexander (2006). The level of support is directly influenced by the relationship of tutors and their learners. If tutors fear that the learners might misbehave, they decrease the level of their support. It is important to say from observation, tutors were supportive and learners did not find it difficult to participate in classroom communication.

However, this is potentially problematic as too much support leads to over-emphasis of the social functions of dialogic teaching. In such cases discussion deteriorates and the value of learner's comments is not high. Further, tutors might not evaluate the value of the comments nor the accuracy. Possibly, tutors behave this way to be supportive not to discourage learners with critical comments and generally welcome all comments.

According to Alexander (2006), the most challenging feature is to make dialogic teaching cumulative. If communication is to be cumulative, then the process of acquiring new skills and knowledge continues. This process makes use of previous stages and emphasis straight forward and thorough examination of content matter. Insubstantial reciprocity brings about lack of cumulative features.

Purposeful is the last feature of dialogic teaching according to Alexander (2006). It means that a tutor teaches with specific educational goals in view. Interviews with tutors showed that this feature is particularly problematic in attempts at realization of dialogic teaching. On several occasions, tutors claimed that dialogic methods cannot be used often as they would not manage to cover the subject matter which they are supposed to. They perceived dialogue as carefree conversation whose aim was to make a lesson enjoyable rather than deepen the trainees understanding. It was noted that the tutors main aim was to make learners comfortable so that they would participate in communication. This was motivated by their opinion that if learners participate in communication then that particular lesson was well taught. However, it is important to note the complicating factor of the openness of the lesson plan; despite its important position in dialogic teaching. Learners responses can be surprising for tutors because they were not anticipated to their pre-prepared lessons plans or because they require knowledge that the tutors don't have. Only tutors who are very knowledgeable in their fields can manage situations when the lesson plan is open and when learners can influence the course of the lesson. Generally, the features of dialogic teaching are interrelated.

### 5.3 Conclusion

Based on the findings of the study, it can be concluded that dialogic approach promotes talking and thinking together and help learners understand Mathematics better. Majority of the teacher trainees stated that it was necessary for more than one person to help solve challenging questions and that there was a great deal to be learned from listening to how others think. It was also established that when teacher-trainees talk about their thinking helps them to clarify their own thoughts.

In relation to learner-learner dialogic interaction, the study established that teacher trainees operate together to improve knowledge. They help each other to learn through dialogue in which learning goals emerge and develop during dialogue. The teacher-trainees show understanding of how group processes promote their learning. The respondents stated that classroom social structures promote interdependence and that assessment tasks are community products which demonstrate increased complexity and a rich web of mathematical concepts.

The other concern was to determine how tutor-learner dialogue could be applied in minimization of learner errors in Mathematics classes. The study established that tutors allow all learners to talk freely during the lesson and they appreciate each learners' contribution in the lesson. Further, tutors avoid spoon feeding the learners with concepts. However, they begin from the known to the unknown and they encourage teacher-trainees appropriately. It was also found that tutors rebuke learners who make noise during the lesson and discussion and they emphasize the importance of having collective sense of purpose during learning. It can also be concluded that tutors prefer correct answers from the learners whenever they pose questions and that they articulate a compelling vision for the class. The tutors explain every concept on the chalkboard and give learners assignments.

Concerning the whole class group dialogic approach in minimization of learner errors in Mathematics classes, the study established that majority of the teacher trainees did not feel left behind all the time during Mathematics lessons and that their Mathematics tutors

were quite competent in teaching. Further, teacher-trainees received recognition from the tutors when they answered the questions correctly and that the tutors communicate well with them. According to majority of the teacher trainees, their Mathematics tutors were as good as any other Mathematics tutors in other institutions. Majority of the teacher trainees feel that their effort to improve in Mathematics was appreciated. Mathematics Tutors make up for the missed lessons. It was also established that teacher trainees' class participation positively correlates with their performance in tests and examinations. The study also established that teacher trainees engage in lively discussions during their Mathematics lessons and that they find learning Mathematics enjoyable every time.

The fourth objective of this study was to determine challenges encountered in using dialogic approaches in minimization of learner errors in Mathematics classes in public primary teacher training colleges. To achieve this objective the respondents were asked an open end question that required them to state the challenges encountered in using dialogic approaches in minimization of learner errors in Mathematics classes. This elicited multiple responses. Majority of the respondents stated that large class sizes affected the use of dialogic approach in minimization of learner errors in Mathematics. The high numbers of learners in a class make it difficult for effective dialogue between tutor and learners and among the learners in class as a group or as individual learners. This response was stated by all the categories of respondents who participated in this study that included the teacher trainees, tutors, Heads of departments and deans of curriculum in the colleges where the study was done.

The study established that considering the scope of content to be covered within the time allocated, it becomes difficult for the tutors to use dialogic approach in minimization of learner errors in Mathematics. Dialogic approach requires more time because it entails giving chance another party to provide his/her opinion concerning a mathematical problem. The other challenge was learners' attitude towards each other and towards the Mathematics tutors that affect the use of dialogic approach in minimizing errors. There are cultural beliefs that are retrogressive and might affect the use dialogic approach in minimizing errors in Mathematics. The study also established that personal characteristics of learners like gender, personality and interpersonal skills affect the use of dialogic approach in minimizing errors in Mathematics.

### 5.4 Recommendations of the Study

Basing on the findings and conclusions of this study, the following recommendations are made:

i. Tutors and teacher-trainees agreed that they should talk in the lessons. Teacher trainees should not be limited to merely convey correct answers to the tutors. The learners like communicative classes and therefore a good lesson is one where teacher trainees share their opinions on any topic and say something interesting at least to be taught about for a while.

ii. Teacher trainees should be encouraged to explain their responses and connections of ideas not just voice their opinions. The rational argument which supports the fact that the tutor encourages teacher trainees to explain their ideas is the key reason why tutors prefer dialogic teaching.

iii. Dialogic teaching is only infrequently realized in everyday teaching because of the large class sizes, It is therefore necessary to take into account the number of learners in the classrooms and the fact that dialogue is not free but limited by curriculum

## 5.5 Suggestions for Further Studies

The following suggestions are made for future research.

i. A study should be conducted on how semantic noise complicates understanding of concepts between tutors and teacher trainees in Mathematic classes.

ii. Further research should be conducted on how the relationships outside classroom impact on interaction and the effects they bring to Mathematics classes.

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# APPENDICES

## APPENDIX I: INTRODUCTION LETTER TO THE COLLEGE PRINCIPAL

**UNIVERSITY OF ELDORET**
**P O BOX 1125**
**ELDORET.**

**THE PRINCIPAL**

_____

_____

_____

Dear Sir/Madam,

**RE: REQUEST TO CARRY OUT RESEARCH IN COLLEGE**

I am a learner at University of Eldoret taking a Doctor of Philosophy degree in Mathematics Education. As part of my course, I am required to carry out a research. I am doing one on "Dialogic approaches in minimization of learner errors in Mathematics classes. A case of teacher trainees in Public Primary Teacher Training Colleges in the North Rift Region, Kenya."

The purpose of this letter is to request you to allow me collect the relevant information from tutors and teacher trainees in the North Rift colleges towards the same. If allowed, I promise to abide by college rules and regulations.

Attached herein find my research abstract and a letter from the University.

Yours faithfully,

**Gideon Shem Marokoh**

## APPENDIX II: TUTOR TRAINEE'S QUESTIONNAIRE

I am a learner at University of Eldoret, currently studying for a PhD degree in Mathematics Education. I am conducting a research titled "Dialogic Approaches in minimization of learner errors in Mathematics classes: A case of Teacher Trainees in Public Primary Teacher Training Colleges, in the North Rift Region, Kenya".

You have been identified as a respondent in this study. Kindly supply the information that has been requested. Any information given will be used for this study only and will be used for this study only and will be treated with utmost confidentiality.

Yours sincerely,

Gideon Shem Marokoh

**(Researcher)**

**SECTION A: BIO- Data (Personal Information)**

Tick ( ✓ ) the correct option

1. Gender: Male ( ) Female ( )
2. Age bracket: Below 20 years ( ) 20-24) years ( ) 25-29 years ( ) 30-34 years ( ) Above 34 years ( )
3. Marital Status: Single ( ) Married ( ) Divorced ( ) Separated ( ) Others ( )
4. Education level: KCSE ( ) Diploma ( ) Specify ( ) Others ( ) Specify…….

**SECTION B: Dialogic Approaches**

Please indicate, by placing a tick (√) in the appropriate box, your degree of agreement with each of the following statements where: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.

| | **Statement** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|---|
| 1 | Dialogic approach promotes talking and thinking together and help learners understand Math better | | | | | |
| 2 | It is necessary for more than one person to help solve challenging questions | | | | | |
| 3 | There is a great deal to be learned from listening to how others think | | | | | |
| 4 | Talking about your thinking helps you to clarify your own thoughts. | | | | | |
| 5 | When talking about the Mathematics, you practice using important math vocabulary. | | | | | |
| 6 | You can learn a great deal about what it takes to understand the ideas of others. | | | | | |

**SECTION C: Whole Class Group Interaction**

Please tick ( ✓ ) response for each statement that depicts your feeling about the whole group class interaction, where: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.

| | **Statement** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|---|
| 1 | I feel left behind all the time during Mathematics lessons | | | | | |
| 2 | My Mathematics tutor is quite competent in his/her teaching | | | | | |
| 3 | When I answer any question, I receive no recognition for it that I should receive from my tutor and/or my fellow learners | | | | | |
| 4 | We have the best communication in our class | | | | | |
| 5 | My Mathematics tutor is always fast and harsh | | | | | |
| 6 | Many of the approaches of teaching and learning Mathematics only favour the bright learners | | | | | |
| 7 | Our Mathematics tutor is as good as any other tutor n other schools | | | | | |
| 8 | I do not feel my efforts to improve in Mathematics is appreciated | | | | | |
| 9 | I always feel withdrawn prior to our Mathematics lesson | | | | | |
| 10 | Our Mathematics tutor makes up for the missed lessons | | | | | |
| 11 | Our class participation positively correlates with our performance in tests and examinations | | | | | |
| 12 | We always engage in lively discussions during our Mathematics lessons | | | | | |
| 13 | I find learning Mathematics enjoyable every time | | | | | |
| 14 | The tutor is always responsible for our lack of interest in Mathematics | | | | | |

**SECTION D: Descriptions on Learner-Learner Dialogue**

Please tick (✓) response for each statement that depicts your feeling about the learner-learner dialogue, where: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.

| | **Statement** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|---|
| 1 | Learners operate together to improve knowledge | | | | | |
| 2 | Learners help each other to learn through dialogue | | | | | |
| 3 | Learning goals emerge and develop during dialogue | | | | | |
| 4 | Learners create ideas for each other and for others | | | | | |
| 5 | Learners review how best the community of learners support learning | | | | | |
| 6 | Learners show understanding of how group processes promote their learning | | | | | |
| 7 | The classroom social structures promote interdependence | | | | | |
| 8 | Assessment tasks are community products which demonstrate increased complexity and a rich web of mathematical concepts. | | | | | |

**SECTION E: Tutor-Learner Classroom Interaction**

Please judge how frequently each of the statements comes closest to describing the rating tutor-learner classroom interaction (Tick your response). Where: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.

| | **Statement** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|---|
| 1 | Allows all learners to talk freely during the lesson | | | | | |
| 2 | Appreciates each learners contribution in the lesson | | | | | |
| 3 | Avoids spoon feeding the learners with concepts | | | | | |
| 4 | Begins from the known to the unknown | | | | | |
| 5 | Does not talk enthusiastically about what needs to be done during discussion | | | | | |
| 6 | Encourages each learners to share their views and articulate them appropriately | | | | | |
| 7 | Rebukes learners who make noise during the lesson and discussion | | | | | |
| 8 | Emphasizes the importance of having collective sense of purpose during learning | | | | | |
| 9 | Laughs heartily with the learners during Mathematics lessons | | | | | |
| 10 | Prefers learners working on their own individually | | | | | |
| 11 | Prefers correct answers from the learners whenever poses questions | | | | | |
| 12 | Articulates a compelling vision for the class | | | | | |
| 13 | Explains every concept on the chalkboard and gives learners assignments | | | | | |
| 14 | Has to be in class for meaningful learning to take place. | | | | | |

## APPENDIX III: PUBLIC PRIMARY TEACHER TRAINING TUTORS'

## QUESTIONNAIRE

**SECTION A: BIO- Data (Personal Information)**

Tick ( ✓ ) the correct option

1. Gender: Male ( ) Female ( )

2. Age bracket: Below 20 years( ) 20-24 years ( ) 25-29 years ( ) 30-34 years ( ) Above 3 years ( )
3. Marital Status: Single ( ) Married ( ) Divorced ( ) Separated ( ) Others( )
4. Education level: KCSE ( ) Diploma ( ) Specify( ) Other ( ) Specify( )

**SECTION B: Dialogic Approaches**

Indicate level of agreement to the statement listed in the table below. Please tick ( ✓) appropriately. Where: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.

| | **Statement** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|---|
| 1 | Dialogic approach promotes talking and thinking together and help learners understand Math better | | | | | |
| 2 | It is necessary for more than one person to help solve challenging questions | | | | | |
| 3 | There is a great deal for learners to learn from listening to how others think | | | | | |
| 4 | Talking about your thinking helps you to clarify your own thoughts. | | | | | |
| 5 | When talking about the Mathematics, learners practice using important math vocabulary. | | | | | |
| 6 | Learners can learn a great deal about what it takes to understand the ideas of others. | | | | | |
| 7 | Tutors establish a safe environment where learners can take risk and where there are norms for classroom dialogue | | | | | |
| 8 | Tutors inform learners the expectations for classroom talk | | | | | |
| 9 | Tutors present meaning in solving problems | | | | | |
| 10 | Tutors build opportunities for independent work | | | | | |
| 11 | Tutors build opportunities to partner up or form small groups. | | | | | |
| 12 | Tutors facilitate the sharing of strategies with the whole class | | | | | |
| 13 | Tutors promote learner reflection on the different strategies | | | | | |
| 14 | Tutors promote vocabulary development in learners | | | | | |

**SECTION C: Whole Class Group Interaction**

Please tick (✓) response for each statement that depicts your feeling about the whole group class interaction. Where: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.

| | **Statement** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|---|
| 1 | Learners feel left behind all the time during Mathematics lessons | | | | | |
| 2 | I am quite competent in teaching | | | | | |
| 3 | I recognize learners' responses | | | | | |
| 4 | There is effective communication in Mathematics lesson | | | | | |
| 5 | I am always fast and harsh | | | | | |
| 6 | Many of the approaches of teaching and learning Mathematics only favour the bright learners | | | | | |
| 7 | I am able to tutor as any other Mathematics tutor in other schools | | | | | |
| 8 | I appreciate the efforts of learners to improve in Mathematics | | | | | |
| 9 | Learners always feel withdrawn during Mathematics lesson | | | | | |
| 10 | I make up for the missed lessons | | | | | |
| 11 | Learners class participation positively correlates with learners' performance in tests and examinations | | | | | |
| 12 | I always engage learners in lively discussions during Mathematics lessons | | | | | |
| 13 | Learners enjoy learning Mathematics | | | | | |
| 14 | I am always responsible for learners lack of interest in Mathematics | | | | | |

**SECTION D: Mathematics Classroom Learner-Learner Dialogic Practice**

Please tick (✓) response for each statement that depicts your feeling about the learner-learner dialogue. Where: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.

| | **Statement** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|---|
| 1 | I show concerns for the needs of learners | | | | | |
| 2 | I do not involve learners in discussion and group work | | | | | |
| 3 | I encourage learners to communicate their point of view | | | | | |
| 4 | I encourage learners to explore alternative methods of solving challenging sums before seeking the tutor's help. | | | | | |
| 5 | I encourage learners to think and plan ahead with others | | | | | |
| 6 | I help the learners to break up a task into small but simple components before finding solutions to the tasks | | | | | |
| 7 | I dominate the class discussion by directing our thinking | | | | | |
| 8 | I use lecture method as the most acceptable approach. | | | | | |
| 9 | I explain the meaning of every question and allow learners to give the answers | | | | | |
| 10 | Learners enjoying the power of group discussion as the best learner-centred approach | | | | | |
| 11 | Learners thinking ahead of the tutor in attempting solutions beforehand | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 12 | I encourage learners to maintain silence during Mathematics lessons | | | | | |
| 13 | I allow varied interpretation of questions by all the learners | | | | | |
| 14 | Learners engage each other and the tutor in most of Mathematics lessons | | | | | |
| 15 | I engage in intimate learner interactions in tasks given for discussion | | | | | |
| 16 | I accept all answers as valid during the classroom discussions | | | | | |

**SECTION E: Tutor-Learner Classroom Interaction**

Please judge how frequently each of the statements comes closest to describing the rating tutor-learner classroom interaction (Tick your response). Where: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.

| | **Statement** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|---|
| 1 | I allow all learners to talk freely during the lesson | | | | | |
| 2 | I appreciate each learners contribution in the lesson | | | | | |
| 3 | I avoid spoon feeding the learners with concepts | | | | | |
| 4 | I begin from the known to the unknown | | | | | |
| 5 | I do not talk enthusiastically about what needs to be done during discussion | | | | | |
| 6 | I encourage each learner to share their views and articulate them appropriately | | | | | |
| 7 | I rebuke learners who make noise during the lesson and discussion | | | | | |
| 8 | I emphasize the importance of having collective sense of purpose during learning | | | | | |
| 9 | I laugh heartily with the learners during Mathematics lessons | | | | | |
| 10 | I prefer learners working on their own individually | | | | | |
| 11 | I prefer correct answers from the learners whenever I pose questions | | | | | |
| 12 | I articulate a compelling vision for the class | | | | | |
| 13 | I explain every concept on the chalkboard and give learners assignments | | | | | |
| 14 | I have to be in class for meaningful learning to take place. | | | | | |

**Section F: Challenges of dialogic teaching in classes**

What do you think are the major challenges of dialogic approach to Mathematics classes in minimization of learner errors in public primary teacher training colleges?

## APPENDIX IV: INTERVIEW SCHEDULE FOR HODS AND DOCS

1 What do you think is good Mathematics teaching?

2 What teaching methods would you like to use in teaching Mathematics in public primary teacher training colleges

3 Which of these methods is your preferred one?

4 What do you think dialogic teaching is in classrooms?

5 During the course there has been a talk about dialogic teaching. Do you think you have acknowledged the idea of dialogic teaching?

6 What kind of teaching is dialogic teaching?

7 What do you consider as a good dialogic learning process? Give an example.

8 How do you think a tutor should act if learners clearly indicate signals of misconceptions about some concept?

9 What is the role of the tutor in dialogic teaching?

10 What is the role of the learner in dialogic instruction?

11 What is the aim of dialogic approach to instruction?

## APPENDIX V: Observation Schedule

College_____

| ITEM | Available | Partially available | Not available |
|---|---|---|---|
| Does the approach generate very high level of attention?<br><br>Does it make learners engage and active through a high response rate to tutors' questions and prompting.<br><br>Are the learners contributing their own ideas?<br><br>Do they ask questions and explain their thinking to others | | | |
| Are they expressing information in their own words and receiving the feedback<br><br>Is the tutors drawing learners into the lessons by encouragement interest and direct questioning?<br><br>Is the tutor adaptable and able to think on learner's feet in order to respond to and capitalized fully on the learners' contribution.<br><br>What form of response are given eg choruses, individuals etc. | | | |

# APPENDIX VI: RESEARCH PERMIT

AIC KESSUP GIRLS HIGH,

PO BOX 318.

ITEN.

21st February, 2020.

THE COUNTY DIRECTOR OF EDUCATION,

PO BOX 40-30100,

ELDORET,

Dear Sir,

**RE: RESEARCH PERMIT NO 155819**

I hereby write to inform you of my academic research in your county. The research title: DIALOGIC APPROACHES AND MINIMIZATION OF ERRORS IN MATHEMATICS CLASSES, A CASE OF PUBLIC PRIMARY TEACHER TRAINING COLLEGES IN THE NORTH RIFT REGION OF KENYA.

I will be grateful of your support.

Thank you.

Yours sincerely,

Gideon Shem Maroko

0725029643.

# APPENDIX VII: AUTHORIZATION LETTERS FROM COUNTY DIRECTORS OF EDUCATION

**REPUBLIC OF KENYA**
**MINISTRY OF EDUCATION**
**STATE DEPARTMENT OF EARLY LEARNING AND BASIC EDUCATION**

**TELEGRAM:**.....
**TELEPHONE NO: 0534142207**
**WHEN REPYLING PLEASE QUOTE OUR REFERENCE**
**EMAIL:** *cdeelgeyomarakwet@gmail.com*

**COUNTY DIRECTOR OF EDUCATION**
**ELGEYO MARAKWET COUNTY**
**P.O. BOX 214-30700**
**ITEN.**

**DATE: 4th December, 2019**

**REF No: CDE/EMC/R/26/VOL.III/ (6)**

Gideon Shem Maroko
University of Eldoret
P.O. Box 1125
**ELDORET**

**RE: RESEARCH AUTHORIZATION- GIDEON SHEM MAROKO**

Following the authorization by the National Commission for Science, Technology and Innovation **(NACOSTI)** to carry out research in **Elgeyo Marakwet County** Vide Authority letter **Ref. No. NACOSTI/P/ 19/2834 dated 20th November, 2019 you** are hereby formally granted authority by this office to proceed with your study on "***The use of dialogue approaches towards minimization of learner errors in Mathematics classesrooms: A case of teacher trainees in public primary training teachers college in North Rift' in Elgeyo Marakwet County, Kenya"*** for a period ending **20th November, 2020.**

You are further required to report to the Sub-county Directors of Education –Elgeyo Marakwet County.

FOR: COUNTY DIRECTOR OF EDUCATION
ELGEYO MARAKWET
P. O. Box 214 - 30700,
ITEN.

Getrude Kibet
**For:** County Director of Education
**ELGEYO MARAKWET**
**Copy to:**
1. The Director General/CEO -NACOSTI
2. The Sub-County Directors of Education –Elgeyo Marakwet County

## APPENDIX VIII: AUTHORIZATION LETTERS FROM COUNTY COMMISSIONERS

OFFICE OF THE PRESIDENT
MINISTRY OF INTERIOR & COORDINATION OF NATIONAL GOVERNMENT

Telegrams:
Telephone: (053) 42007
Fax : (053) 42289
E-mail: ccelgeyomarakwet@yahoo.com
ccelgeyomarakwet@gmail.com
When replying please quote

COUNTY COMMISSIONER'S OFFICE,
ELGEYO-MARAKWET COUNTY,
P.O. BOX 200-30700
ITEN

Ref. PUB. CC. 24/2 VOL.II/181

Date 3rd December, 2019

All Deputy County Commissioners
**Elgeyo Marakwet County**

**RE: RESEARCH AUTHORIZATION**

**GIDEON MAROKO REG NO. EDU/Dphil/PGC/1002/13**

This is to confirm that the above named has been authorized to carry out a research in Elgeyo Marakwet County on ***"The use of Dialogue Approaches towards Minimization of Learner Errors in Mathematics classes. A case of Teacher Trainees in Public Primary Training Teachers' Colleges in North Rift, Kenya."***

Please accord him necessary assistance.

Julius K. Maiyo, HSC
For: County Commissioner
**ELGEYO MARAKWET**

COUNTY COMMISSIONER
ELGEYO MARAKWET COUNTY

JKM/njk

# APPENDIX IX: RESEARCH LICENSE

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **155819**

Date of Issue: **20/November/2019**

## RESEARCH LICENSE

**This is to Certify that Mr.. GIDEION SHEM of University of Eldoret, has been licensed to conduct research in Elgeyo-Marakwet on the topic: THE USE OF DIALOGIC APPROACHES TOWARDS MINIMIZATION OF LEARNER ERRORS IN MATHEMATICS CLASSROOMS: A CASE OF TEACHER TRAINEES IN PUBLIC PRIMARY TEACHER EDUCATION IN KENYA for the period ending : 20/November/2020.**

License No: **NACOSTI/P/19/2834**

**155819**

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

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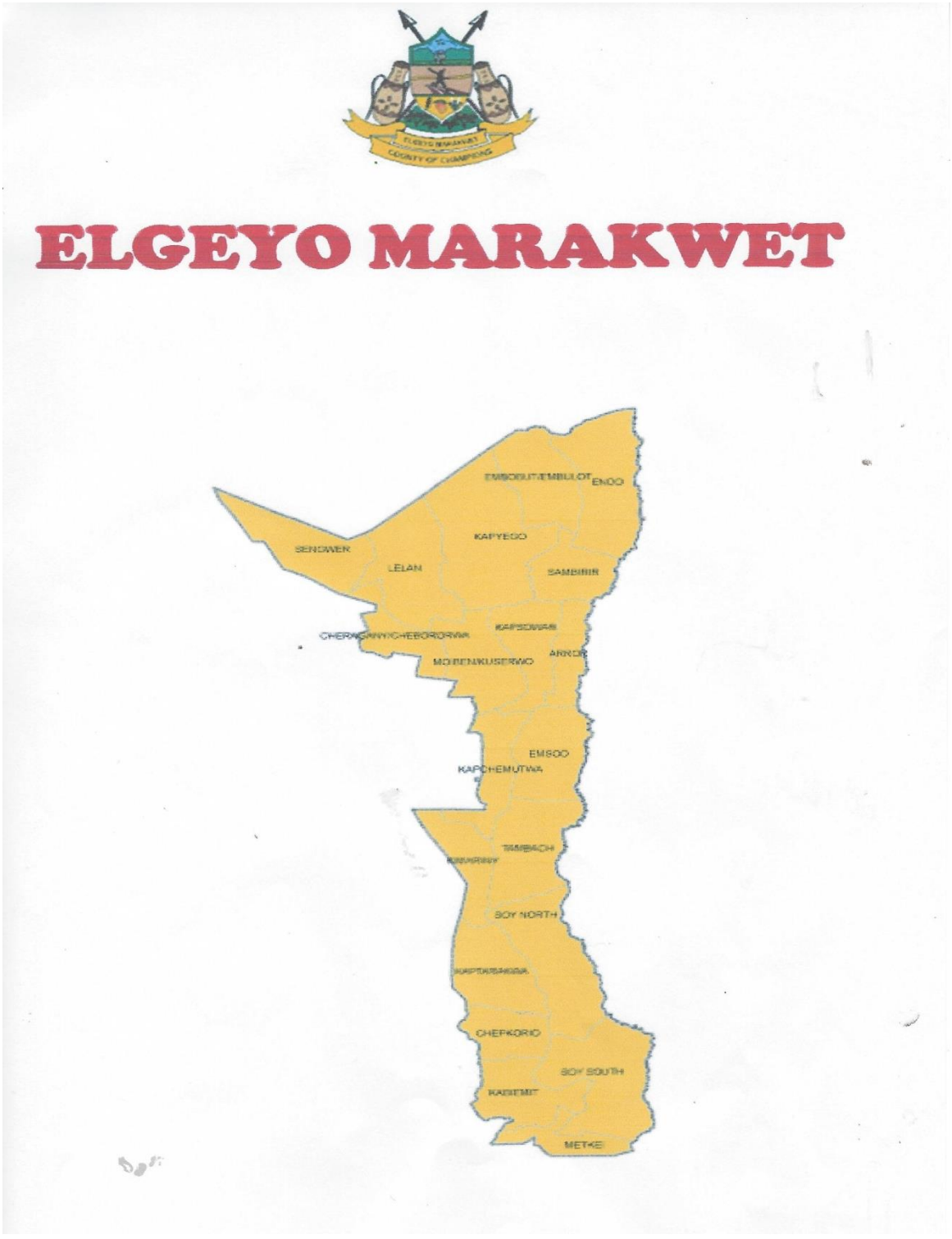
# APPENDIX X: MAPS OF THE STUDY AREA

## ELGEYO MARAKWET COUNTY



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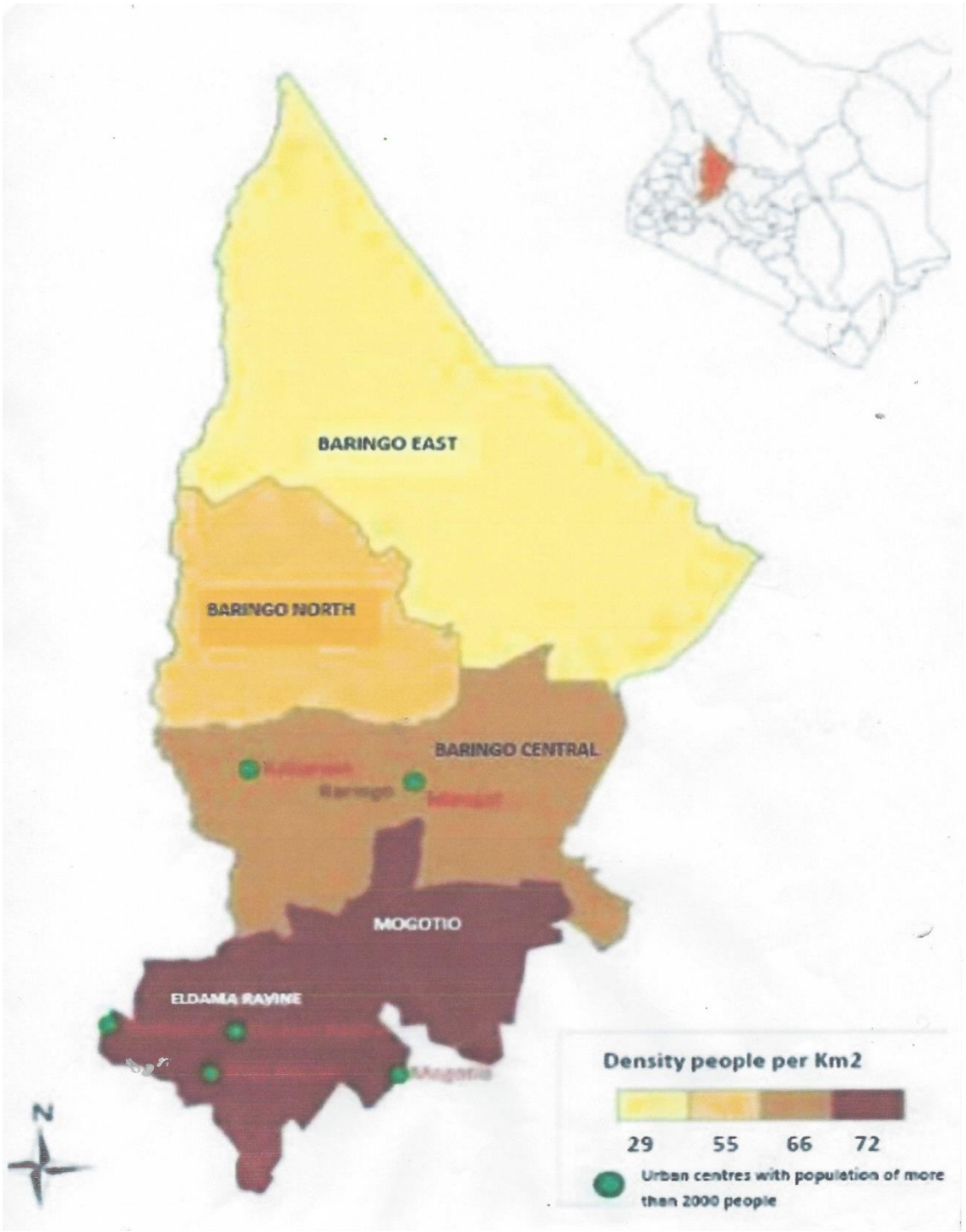
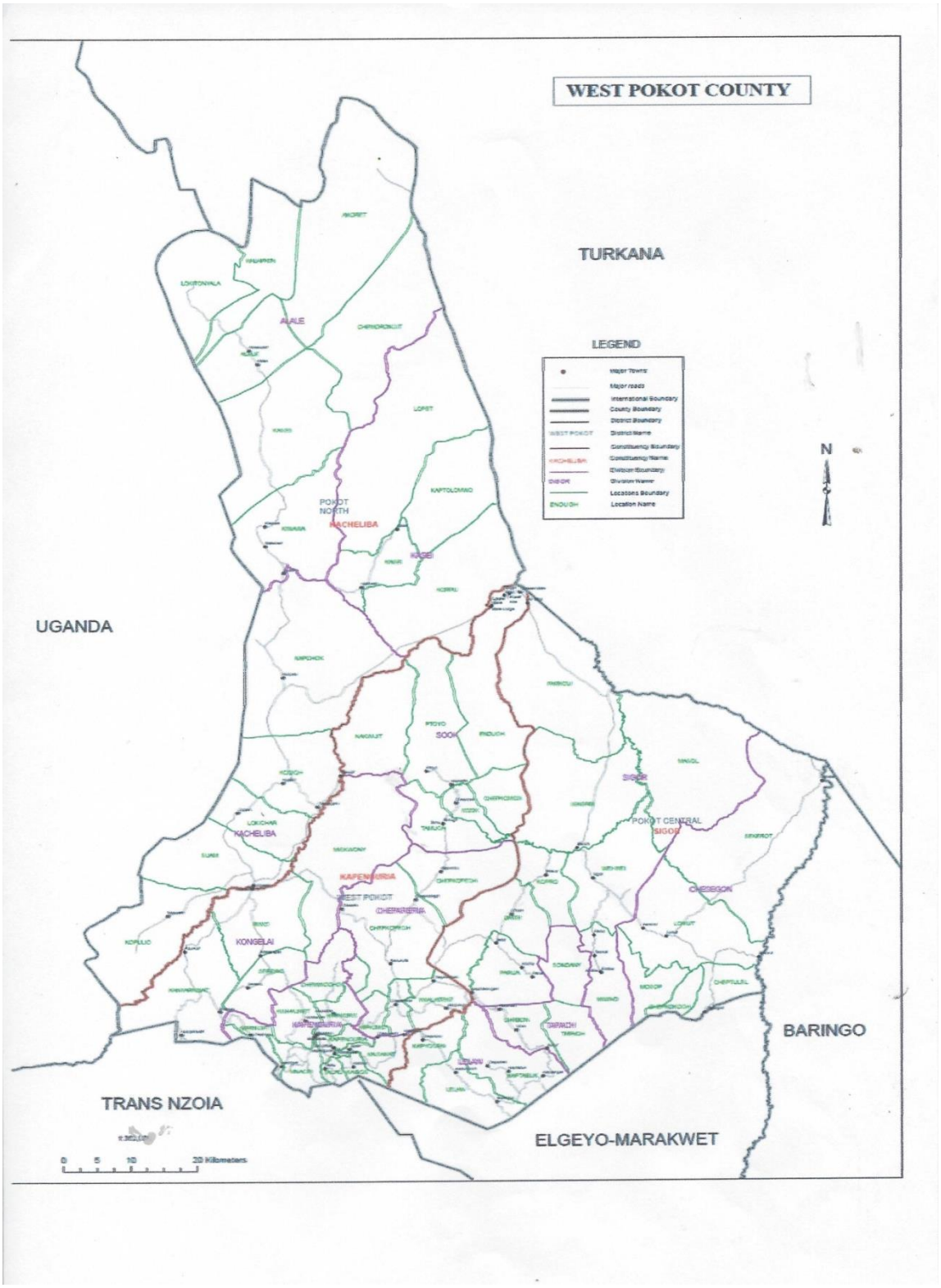
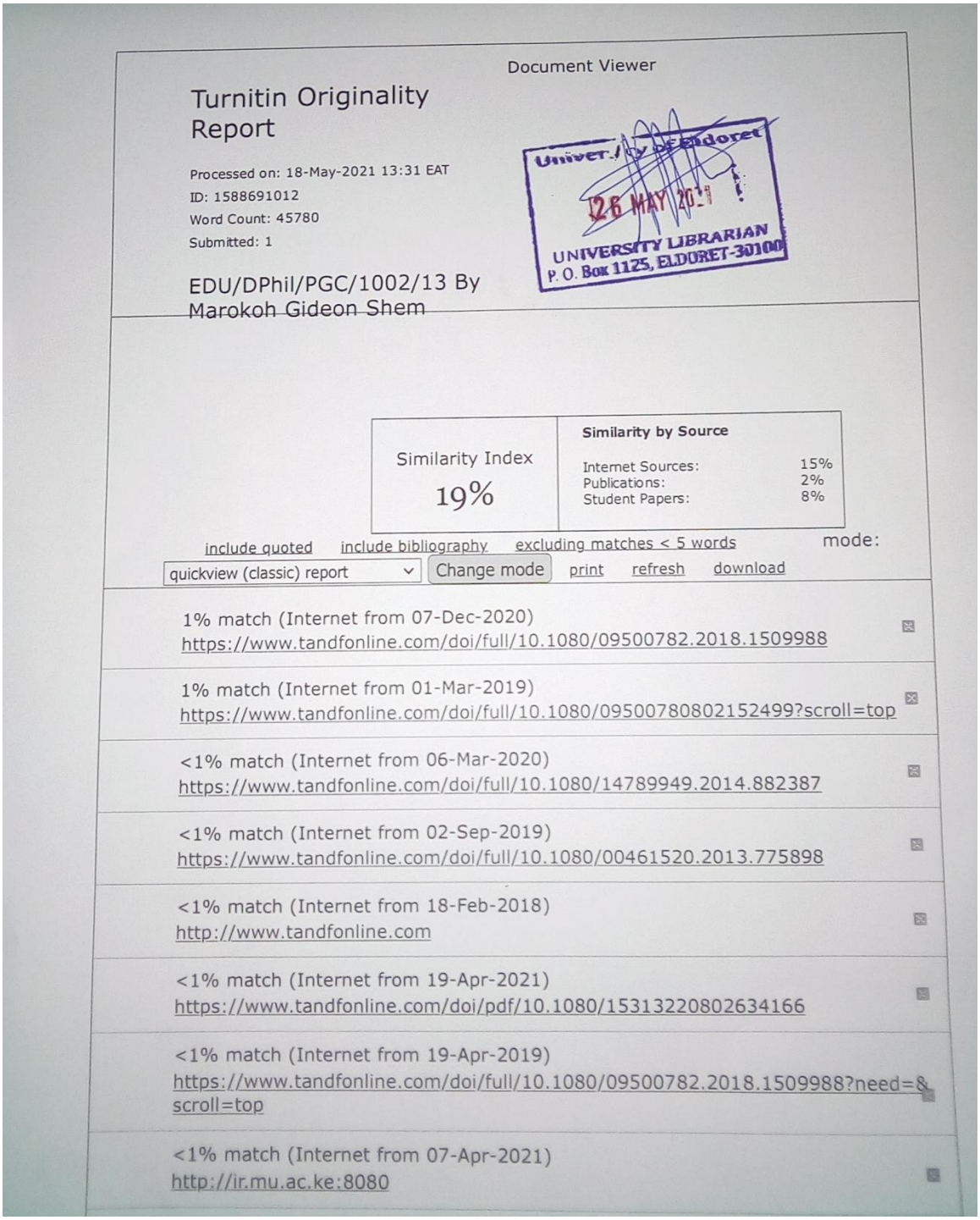
**BARINGO COUNTY**



**WEST POKOT COUNTY**



# APPENDIX XI: SIMILARITY REPORT



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