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## **DEDICATION**

I dedicate this work to my brother Wanangwa and my sisters Rose and Nomsa for being my immediate inspiration. To my mother Mrs Leah Msuku Mlauzi and my father Mr Chiwoniso Mlauzi for your prayers, advice and being a support system. Thank you for showing me the value of education. To my friends and family for the encouragement.

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## **ABSTRACT**

The achievement of primary school learners in mathematics in Malawi is low. Many learners fail to reach the required proficiency levels as specified in the Malawi primary national curriculum. This is a major concern to education at large as failure to perform in mathematics at a lower level can bring about problems of learning in future. To improve learners' mathematical skills, the emphasis should be on successful mathematics teaching. Teachers are best positioned to understand the problems of teaching and learning hence challenging the views on teaching and learning can help solve the problem of poor performance in mathematics. This study is aimed at exploring how Lesson Study (LS) can challenge the views that teachers hold on teaching and learning the concepts of counting. The study was guided by the progressivism learning theory propounded by John Dewey as a theoretical framework. The theory states that progressive learning can be achieved by stimulating learners interest, promotion of critical thinking in learners, and learner participation. The study used a qualitative approach design. The participants were 57 teachers from 7 school of one region of Malawi. The participants were part of a professional development program (PD) that employed LS to improve the teaching and learning of mathematics. Data was collected through teachers' research lesson plans, notebook reflections, and comments from the knowledgeable others. Data was analysed using the discourse analysis approach. The findings of this study indicated that the views of teaching and learning the concepts of counting were challenged. The teachers discourse after the PD showed that being part of the LS gave teacher insights on how to create space to stimulate learners interest, promote critical thinking and learner participation.

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### **List of Acronyms and Abbreviations**

UNESCO	United Nations Education, Scientific, and Cultural Organization
MIE	Malawi Institute of Education
MoEST	Ministry of Education Science and Technology

# CHAPTER 1

## INTRODUCTION

### 1.0 Chapter Overview

This study aims at investigating how lesson study (LS) can challenge Malawi primary teachers' views on teaching and learning the concepts of counting. As an introduction to the study, the chapter presents the background of the study, the statement of the problem, the purpose of the study, the research questions, and the significance of the study. The section ends with a summary of the chapter.

### 1.1 Background

Mathematics is a catalyst for individual, social, economic, scientific, and technological development. Learning mathematics helps in developing innovative and logical thinking and equips students with analytical skills (Mamba, 2018). At the heart of mathematics is the development of the ability to solve problems (Mamba, 2018). In Malawi, the learning of mathematics begins as early as in primary school thus primary school mathematics is considered as a foundation for upper-level classes and in the future career of a child (Munthali, 2019). For a very long time, mathematics has been perceived as a difficult subject by both Malawian teachers and learners which makes some learners lose interest in mathematics in their early years of schooling (Phiri, 2011). The lack of interest, low-quality teaching, lack of teaching and learning resources, problems of learning mathematics in an unfamiliar language are among other reasons that make learners perform poorly in mathematics (Kazima, 2014; Brombacher, 2019).

In 2010, the Malawi Teacher Professional Development Support (MTPDS) conducted an assessment with the aim of investigating the level of mathematics skills of children in Malawi. It was discovered that students are performing at levels considerably below what the curriculum requires of them (MTPDS, 2010). Malawian learners are also not performing well on regional standardized tests administered by the Southern African Consortium for Monitoring Educational Quality in Mathematics (SACMEQ), according to their findings. Results from examinations administered to standard six learners 2004 by SACMEQ reveal that 98% of the students lacked advanced numeracy skills. Malawi scored third from the bottom in mathematics when compared to the performance of the other fourteen nations (UNESCO, 2010). Less than 8% of standard three students achieved the expected level of numeracy, according to the Primary Achievement Sample

Survey (PASS), which was carried out by the Ministry of Education Science and Technology (MoEST) to evaluate student achievement levels in English and mathematics in standards three, five, and seven. In standard five, no student received a math grade of more than 50%, while in standard seven, 99% of students received a math grade of less than 50% (MoEST, 2010). All of this demonstrates that primary school learners are struggling with mathematics, which, among other things, might be a sign that mathematics instruction is ineffective (Longwe, 2016).

Primary school education in Malawi comprises 8 classes, grades 1 through 8. Mathematics is a compulsory subject that is taught alongside Chichewa and English. In the first four years (grade 1 to 4), the teaching is in vernacular (Chichewa), while from grade 5 onwards teaching is in English. In 2001 there was a curriculum review that aimed at shifting the content-based curriculum to an outcome-based one. The outcome-based curriculum required a major shift from the use of traditional teacher-centered teaching to learner-centered teaching. This shift demanded the use of learner-centered approaches which include pedagogical practices that move the focus from the teacher to the learner and teaching (Schuh, 2004). In this way, learner-centered approaches focus on the role of the student as an active participant in the process of teaching and learning (Chiphiko & Shaba). The new curriculum was designed with a focus on what learners should be able to do at the end of a learning cycle. This new curriculum expects that learners should be able to count and perform basic mathematical operations by the time they reach grade 4 (Ministry of Education, 2014). However, the low performance of learners during the Primary School Leaving Certificate Examinations (PSLCE) revealed that a majority of learners fail to accomplish the rationale and success criteria of the primary school mathematics curriculum (Eliya, 2016).

Implementation of the outcome-based curriculum comes with its demands which force teachers to go back to the use of teacher-centered approaches (Chiphiko & Shawa, 2014). There seems to be hinderances in implementation of learner centered approaches. For example, Clements (2002) discovered that teachers find learner centered approaches time consuming to implement. Learner centered approaches call for maximum learner involvement, need thorough planning, and this process of preparation and the delivery of the learner activities during the lesson are thought of being time consuming. Teachers also focus on covering syllabus content within a specific time so teachers just resort to the use of teacher-centered approaches which they find easy and less time

consuming (Clements, 2002). Another study on the implementation of learner-centred approaches in Namibia showed non-implementation of the strategies citing challenges of teacher professional capacity, limited resources, cultural factors and learner background (O'Sullivan, 2004)

Dewey (1938) distinguished between traditional and progressive education where he pointed out that progressive education is far much better than traditional education. Traditional education views subject matter as a fixed body of knowledge and abilities and teaching as the process by which an accomplished teacher transfers knowledge and abilities to less accomplished students. The learner is supposed to “install” the assigned body of knowledge, with learning being considered as acquisition. The goal of progressive education, on the other hand, is to move away from the concepts of teaching as transmission and learning as acquisition and toward the idea of teaching as an interactive process in which the teacher supports the students to encourage learning via involvement and experience.

The knowledge and views about mathematics teaching and learning that teachers hold have an impact on the teaching and learning process as it determines how the curriculum is implemented (Lai et al., 2013). Agreeing with that, Grossman et al. (1989) stated that teachers' views about teaching and learning are important because their orientation toward the subject matter contributes to the ways in which teachers think about their teaching. Thus, the knowledge and views that teachers have about teaching and learning the concepts of counting can determine how the teacher selects activities and resources for a lesson on counting. Any attempt to improve the quality of mathematics teaching must thus begin with an understanding of the views of teaching and learning held by mathematics teachers (Thompson, 1984).

A thorough analysis and a major concern in mathematics underachievement in Malawi led to the inception of a number of interventions which targeted mathematics teachers while others targeted entire schools and communities in an attempt to promote progressive teaching and learning of mathematics. Some of the interventions include the numeracy boost, the unlocking talent program, improving the quality and capacity of mathematics teacher education in Malawi, Japan International Cooperation Agency (JICA) numeracy project, and strengthening numeracy in the

early years of primary education through professional development of teachers' project (Kazima et al., 2022).

The Strengthening numeracy in the early years of primary education through the professional development of Teachers project is an ongoing five-year collaborative project between the University of Malawi and the University of Stavanger in Norway running from 2017 to 2022. Among other things, the project employs LS to improve the teaching and learning of mathematics. This study is part of the stated project and more about this project has been discussed in Chapter 2. LS is a Japanese model of teacher-led activity in which a team of teachers work together to target an identified area of interest for development in their students' learning (Fujii, 2014) as elaborated in Chapter 2. LS has proven to be one of the ways of challenging teachers' views about teaching and learning and promoting deeper mathematical discussions (Fauskanger et al., 2021; Stafford, 2003).

In an aspiration to understand how LS contributes to challenging teachers' views of mathematics teaching and learning, Fauskanger et al. (2021) conducted a study that used LS as an approach to inductive qualitative research. In their study, primary school mathematics teachers were subjected to a PD program that involved the implementation of LS on counting. The teachers were taught about explorative ways of teaching counting during the PD and qualitative data was collected from teachers' notebook reflections and research lesson plans. The findings from this study revealed that the Malawi primary school teachers initially reported traditional views of mathematics teaching and learning but later, after having participated in a LS cycle, they reported on the need to work on progressive teaching of mathematics. This study only used data from 2019 from teachers' notebook reflections and research lesson plans so as a continuation of the research that was done previously, I will build my research on the study by Fauskanger et al. (2021) by incorporating data from the year 2021 to the year 2022 and on top of that discussing the teaching of the concepts of counting. The purpose of this study is to therefore understand how LS challenges teachers' views about teaching and learning the concepts of counting. The concepts of counting are elaborated in chapter 2.

## 1.2 Problem Statement

The achievement of primary school learners in mathematics is low and many learners fail to reach minimum levels of proficiency as specified in the Malawi primary national curriculum (Eliya, 2016). To improve learners' mathematical skills, the emphasis should be made on successful mathematics teaching. Teaching that focuses on learners is an attempt to move away from traditional education to more progressive approaches to teaching and learning (Mtika & Gates, 2010). "Improving teaching, which is complex and culturally embedded requires the efforts of all the players, including students, parents, and politicians. But teachers must be the primary driving force behind change. They are best positioned to understand the problems that students face and to generate possible solutions" (Stigler & Hiebert, 1999, p. 135). This means that challenging teachers' views on teaching and learning the concepts of counting is a leap of faith that can improve the quality of mathematics teaching and learning (Fauskanger et al., 2021). Overall, teachers' views on teaching and learning can have a significant impact on their instructional practices and student outcomes. Understanding these views can help inform professional development and curriculum development efforts to improve mathematics teaching and learning. Taking into account the importance of mathematics (Mamba, 2018) and also the learners' poor performance in Malawi (Brombacher, 2019), there is a need to find convenient ways of improving how mathematics is taught in primary schools of Malawi.

Some studies have been done to find out how teachers employ the learner centered approaches in their classrooms. For example, Chiphiko & Shawa (2014) conducted a study in Kasungu to find out how primary school teachers implement learner centred approaches in general. The study revealed that due to challenges such as inadequate teaching and learning resources, large class sizes and inadequate learning facilities, primary school teachers fail to plan for learner centered approaches at lesson planning level, fail to stimulate learners' interest during classroom instruction and fail to engage in critical thinking and problem solving activities with their learners in class. Mtika & Gates (2010) conducted a study to explore the capability of trainee teachers to implement learner-centred practice at one of the teacher education institutions in Malawi. The findings of this study showed that appropriating and application of learner-centered education is constrained by several factors. These factors include the education system, student teachers' personal disposition, the culture of the school and the national curriculum.

According to Prawat (1992), teachers are crucial contributors to any educational reform. They have the power to alter classrooms and schools in any way they see fit. Based on their approval of the reform, teachers may alter it, creating a gap between policy and practice. UNESCO (2004) also talks about the importance of the teacher in implementing education reforms by identifying that the classroom environment, including the influence of the teacher and teaching, is the key factor for enhancing learning outcomes. Any reform intended to increase the quality of teaching and learning must take teachers' views on teaching and learning seriously. Fauskanger et al. (2021) conducted a study whose aim was to better understand how LS contributes to challenging teachers' views of mathematics teaching and learning. This current study was therefore conducted to investigate whether LS as an approach to PD has the potential to challenge teachers' traditional views.

### 1.3 Purpose of the Study

To explore how LS challenges Malawi Primary school teachers' views about the teaching and learning of the concepts of counting.

### 1.4 Research Questions

The research questions have been developed from the research topic to facilitate the investigation on how LS challenges Malawi primary teachers' views on teaching and learning the concepts of counting.

#### 1.4.1 Main Research Question

How might lesson study contribute to challenging teachers' views about teaching and learning the concepts of counting?

#### 1.4.2 Specific Research Questions

- What activities and resources do teachers plan to use to introduce a lesson on counting?
- How do teachers plan to use activities and resources to teach the concept of counting?
- What are teachers' views about teaching and learning the concept of counting as visible in their notebook reflections before and after a LS cycle?

### 1.5 Significance of the study

The study attempted to highlight how LS might challenge teachers' views on teaching and learning the concepts of counting in Malawi primary schools. For teaching to be progressive in nature, it is important to take into consideration how teachers teach in the classroom and how teachers think about teaching and learning. The study therefore seeks to unearth how teachers' views on teaching and learning the concepts of counting can be challenged through participation in. This adds to the existing literature on primary school mathematics teaching. The study will also give insight to Malawi Institute of Education to employ LS as a form of professional development for all mathematics teachers in Malawi. To the teacher, the implementer of the policies that the government puts in place, the study will enlighten them on how they can adopt progressive teaching in their classrooms.

### 1.6. Chapter Summary

This chapter introduces the whole thesis. This section has introduced the thesis and discussed the background to the study in relation to LS and teachers' views on teaching and learning. The chapter has also presented the problem statement, the purpose of the study, research questions and the significance of the study.



## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter discusses literature related to counting, learning counting, teaching counting, teachers' views on teaching and learning counting, counting in the curriculum and textbooks in Malawi, LS, and LS pertaining to the PD project. Based on this, the chapter also presents the theoretical framework that was adopted to analyse the data material. The final section is a brief summary of the chapter.

#### **2.2 What is counting?**

Counting may look simple but it is complex as it involves a variety of skills and concepts. Gelman & Gallistel (1978) defined counting based on five principles of counting which are: one-to-one, stable order, cardinal, abstraction and order irrelevance principle. The first three principles deal with rules of procedure (how to count); the fourth deals with the definition of countables (what to count); and the final principle involves a composite of the other four principles (Gelman & Gallistel, 1978). The first is the one-to-one principle which involves the ticking off of the items in an array with tags in such a way that one and only one tick is used for each item in the array. To follow this principle, a learner has to coordinate two processes, partitioning and tagging. Partitioning involves the step by step maintenance of two categories of items- those that are to be counted and those that have already been counted (Gelman & Gallistel, 1978). Items must be transferred one at a time from the to be-tagged category to the already counted. Coordinated with this process is the process that involves summoning up, one at a time distinct tags. One strategy that can ensure coordination is to point at each item as it is being counted (Gelman & Gallistel, 1978).

Second is the stable order principle which involves the use of a stable list that is as long as the number of items to be counted (Gelman & Gallistel, 1978). When this principle is used, a learner that only knows the number names up to 'six' will not be able to count seven items and the extent to which young learners adhere to this principle is also related to set size. Third is the cardinal principle states that the last number in the counting sequence assigned to the collection represents the number of objects in the collection (Gelman & Gallistel, 1978). A learner that has grasped this principle needs to appreciate that the final number name is different from the earlier ones in that it

indicates the numerosity of the collection. If a learner recounts a collection when asked how many objects there are, then they have not yet grasped this principle (Gelman & Gallistel, 1978). Next is the abstraction principle which refers to the possibility that anything (not just physical objects) can be counted (Gelman & Gallistel, 1978). Finally, the order-irrelevance principle which refers to the understanding that the order in which the objects in a group are counted is not important. Objects can be counted in any order and the total will remain the same (Gelman & Gallistel, 1978). This refers to the understanding that the order in which the objects in a group are counted is not important. Objects can be counted in any order and the total will remain the same.

### 2.3 Learning Counting

The early years of a child have been found to be important for mathematics development. From the first years of life, children have the ability to learn mathematics and develop their interest in mathematics. What they know when they enter primary school predicts their mathematics achievement throughout their school career (Clements & Sarama, 2014). What children know in mathematics also predicts their reading achievement later and their early knowledge of literacy also predicts their reading ability. Duncan et al. (2007) conducted a study to find out the links between three key elements (school readiness, school entry, academic attention) and later reading and mathematics achievement. The findings showed that mathematics skills measured at kindergarten were strongly predictive of later academic success. Since mathematics predicts later mathematics and later reading, mathematics is a core component of cognition (Duncan & Magnuson, 2011).

Young learners come to school with knowledge of number concepts that are acquired by chance from informal experiences in their communities such as home, grocery, playground, store, games and shopping malls. Reuben (2009) found that learners' understanding of number concepts and operations such as addition and subtraction evolves from their early counting experiences. These number concepts include counting, addition, subtraction, multiplication and division. Learners' progress with the construction of number knowledge using their existing knowledge that later becomes an essential basis for understanding school-taught mathematics. In formal schooling, learners develop number concepts and operations through modelling using sets of objects, role-playing and through games.

Young learners are constantly counting as they make sense of their world (Hintz & Latimer, 2018). They also come to school with preconceived counting skills which they acquire by participating in daily activities before starting school (Kilpatrick et al., 2001). Counting has been a part of children's preschool experiences and it is one of the best ways of helping young children develop number sense and other important mathematical ideas. Mastering the concept of counting supports the development of a deep understanding of numbers which provides the fundamental skills for understanding place value, how numbers are composed and decomposed, and how they are related to one another (Franke et al., 2018). Given a counting task, a child can count and recount the same object in a collection because they find it very hard to keep track of the counting process. Adults that are proficient in counting usually forget that learning to count is a complex process that requires the integration of much knowledge and skill acquired over time (Franke et al., 2018). Therefore, preschoolers need time and varied opportunities across a range of settings to develop their understanding of counting. Learning the counting sequence is one important piece of learning to count. It is more than learning to memorize the number names but involves bringing out a structure that underlines the sequence to help the children see the patterns and understand how those patterns enable them to efficiently use the number system (Franke et al., 2018).

#### 2.4 Teaching Counting

To effectively teach young learners mathematics, a teacher must understand that learners are thinkers that have emerging theories about the world. The teachers must therefore refrain from teaching procedures and algorithms, instead, they must behave in an interactive way with the students, encouraging them to invent their own methodologies for mathematical operations (Marmasse, n.d.). Counting collections and choral counting are activities that a teacher can use to foster the development of an understanding of a wide range of early ideas about numbers (Hintz & Latimer, 2018). These two activities were the focus of the PD and hence will be highlighted here. In choral counting, a teacher supports learners in counting aloud together following a particular number sequence (Hintz & Latimer, 2018). Choral counting gives students an opportunity to examine number relationships that enable them to identify, discuss, and use patterns and the structure of the number system (Hintz & Latimer, 2018). Counting collections and choral counting activities develop students' understanding of counting and open doors for collaboration

and support teachers to listen and learn more about learners' mathematical thinking (Hintz & Latimer, 2018).

Counting collections involves the counting of a collection of objects and as learners count the objects, they enrich their understanding of counting through their varied ways of grouping and sorting the objects (Hintz & Latimer, 2018). A teacher may introduce a counting collections lesson by inviting students to think through their own decisions about how to organize their items and how to keep track. When the activity is left open for young mathematicians to reason on their own, they are able to problem-solve and build on their own ideas and those of their classmates. The learners are also given the opportunity to make mathematical decisions that can be highlighted for the rest of the class (Hintz & Latimer, 2018). For example, a learner may be given a task to find patterns

In counting collections, a teacher may support students learning by partnering students in small groups so that they have the opportunity to learn with and from one another (Hintz & Latimer, 2018). Small group discussions are richer than large group discussions as the teacher is able to pay much attention to the conversations the students are making. Through these partnerships, learners can benefit from hearing the ideas of others and working with a peer who can support their thinking and learning and they can also appreciate that there are many different ways of solving a particular problem.

## 2.5 Teachers' Views on Teaching and learning.

Different constructs such as views, beliefs, conceptions and discourses are used in literature to describe how individuals perceive and discuss the concept of good mathematics teaching (Hemmi & Ryve, 2015). I will begin this section by presenting the concept of beliefs and later on discuss the concept of views as the term that has been adopted in this study. Beliefs held by teachers are essential to understanding teachers thinking process and the nature of the practices that they put into use inside their classrooms (Aljaberi, 2018). Different types of beliefs are discussed in the literature, for example, Ernest (1989a) recognize that mathematics teachers' beliefs in relation to the nature of mathematics, mathematics teaching and mathematics learning to be relevant to teachers' practice. Ernest (1989b) described three categories of teacher beliefs about the nature of

mathematics as instrumentalist, Platonist and problem-solving. The instrumentalist belief sees mathematics as a collection of facts, skills and rules to be used in the pursuance of some external end. According to this belief of mathematics, the different topics that comprise the discipline are seen as disconnected. The Platonist belief sees mathematics as a static body of unified, pre-existing knowledge awaiting discovery. Here, the structure of mathematical knowledge and the interconnections between various topics are of fundamental importance. The final category is the problem-solving view in which mathematics is regarded as a dynamic and creative human invention; a process, rather than a product (Ernest, 1989).

The research on teachers' beliefs began many decades ago and runs a range of research methodologies, theoretical perspectives, and identification of specific beliefs about any number of topics (Oliver, 1953). The initial goal of the research on teachers' beliefs was to establish a clear construct that could serve as an explanatory and predictive mechanism for explaining differences in teachers' practices (Abrami et al., 2004), outcomes with students (Muijs & Reynolds, 2002), and experiences (McAlpine et al., 1996). However, the manifestation of beliefs in teachers' practice is tricky, and the understanding of what is meant by teachers' beliefs in the research literature remains questionable. The study of teachers' beliefs has evolved gradually over the last 60 years (Ashton, 2015). According to the narrative that Thompson (1992) gives, in 1920 there was considerable interest among social psychologists in the study of the nature of beliefs and their influence on teachers' actions. In the years that followed, that interest faded and nearly disappeared as a topic in psychological literature, due in part to the difficulty in accessing these beliefs for study. In the 1960s, interest in the study of beliefs was renewed but was varied among psychologists. Later in the 1980s, there was a comeback of interest in beliefs and belief systems among scholars from disciplines as diverse as psychology, political science, anthropology and education. Since 1990, many studies in mathematics education have focused on teachers' beliefs about mathematics and mathematics teaching and learning (e.g., Beswick, 2005). These researchers have mostly worked from the premise that "To understand teaching from the teachers' perspective we have to understand the beliefs with which they define their work" (Nespor, 1987, p. 323). Pajares (1992) also stated that an individual's behaviour follows from his/ her own beliefs. The concept of beliefs is not easily defined. Beliefs can be conceptualized as one's judgement of the truth or falsity of a proposition or as a set of connected notions, or as a set of conceptual

representations which store general knowledge of objects, people events and their characteristic relationships (Hermans et al., 2001). Beliefs can also be defined as anything that an individual regards as true (Ajzen & Fisbein, 1980). Fives & Buehl (2012) noted that when it comes to the study of beliefs, the challenge is not in defining beliefs but in finding consistency across the various definitions so that one can come to a meaningful, pragmatic, and warranted conceptualization of the research. Khader (2012) defined teachers' beliefs as a set of ideas rooted in the psychological and mental content of the teacher that plays a role in his/her teaching behaviour. Rokeach (1969) defined beliefs as "any simple proposition inferred from what a person says or does, capable of being preceded by the phrase 'I believe that...'" (p.113). Other scholars also working on teachers' beliefs also engage in lengthy discussions about the concept and try to unpack it from related constructs such as knowledge, conceptions, values, goals, and emotions (Nespor, 1987; Philipp, 2007).

Since no agreement has been reached about the definition, other scholars define beliefs implicitly and in use, indicating that in spite of the lack of an agreed-upon definition, there is sufficient consensus about the core of the concept for continued research to sense. There seem to be four key aspects to such a core which are that: (a) Beliefs are generally used to describe individual mental constructs, which are subjectively true for the person in question; (b) there are cognitive as well as affective aspects to beliefs, or at least beliefs and affective issues are viewed as inextricably linked, even if considered distinct; (c) beliefs are generally considered temporally and contextually stable reifications that are likely to change only as a result of substantial engagement in relevant social practices; (d) beliefs are expected to significantly influence the ways in which teachers interpret and engage with the problems in practice (Skott, 2015). Despite the shared core and characteristics of the concept of beliefs, it is still underspecified and there is little consensus on how to distinguish it from attitudes, values, and world views. This study adopted the term "views" in order to get meaning from teachers' notebook reflections and lesson plans.

Teachers' views have long been regarded as critical to the reform of mathematics education (Battista, 1994). Despite the acknowledged link between teachers' views and their classroom practices, its nature remains controversial, with some writers reporting consistency between teachers' views and practice (Thompson, 1984) and others reporting inconsistency (e.g., Shield,

1999). The direction of the views-practice connection has been questioned by Guskey (1986, cited in Cobb et al, 1990) who argued that rather than views determining behaviour, change in teachers' views is a consequence of change in their behaviour. On the other hand, Cobb et al. (1990) concluded that the relationship between views and practice is not linearly causal in either direction but rather views and practice develop together and are dialectically related. Contextual constraints have been recognized as exerting significant influence on enactment of views (Sullivan & Mousley, 2001). The context in which a teacher is teaching can determine how their views on teaching and learning are manifested. Green (1971) also asserted the relevance of context, suggesting that the relative strength with which various views are held depends on context.

Fives & Buehl (2012) argued that views about teaching and learning may be at the forefront of teachers' work and as such serve as filters, frames, and guides for teaching practice including: engagement in professional learning experiences, instructional planning, and classroom interactions. In a quest to study various views some scholars hold, researchers and teacher educators focus on content-specific views and others refer to teachers' views about teaching and learning without respect to the content area (Fives et al., 2015). Investigations of content-general views about teaching and learning potentially allow for comparisons of teachers' views across teaching content areas and experience levels.

Studies in the area of the teachers' views of teaching and learning revealed that their perceptions views are put into two groups based on the approach of teaching-learning thus traditional and constructivist (Sapkova, 2014). Teachers that hold the traditional view consider their role as limited to passing on knowledge to the students in a clear, organized, and systematic way. This approach guarantees that the learners follow the sequence of steps when learning and paying attention in the classroom. On the other hand, teachers that hold the constructivist view put the learners and their needs in the first place, and they teach using techniques that focus on the learner; and makes the learner the center of the learning and teaching process (Sapkova, 2014). Rayyan (1997) suggested that it is essential to constitute sequences of changes and corrections to the systems of teaching and learning mathematics. This includes developing strategies and methods of teaching and learning mathematics. Traditional techniques cannot create the desired change and

they may suppress the learner's thinking, which would hinder a learners' perception of the logical construct of mathematics.

Sapkova (2014) attempted to reveal possible correlations between traditional views that teachers hold, their teaching practices, and their students' achievement. There was data analysis from numerous research projects with a sample of 190 mathematics teachers and 2828 of their students enrolled in the ninth grade in different regions of Latvia. The results of the Study revealed that traditional views which are held by teachers are connected to low academic achievement for students in mathematical examination. A study by Staub & Stern (2002) employed a sample of 496 elementary students whose performance and skills in mathematical problem-solving were measured. Their teachers' views toward the cognitive and pedagogical mathematical content were measured as well, concluding that they possessed a set of constructivist views which were strongly correlated with their students' abilities in solving mathematical problem.

In studying the source of teachers' views about mathematics teaching and learning, it has been noted that most views that mathematics teachers hold are formed during the teachers' schooling years and are shaped by their own experience as students of mathematics (Owens, 1987). The task of modifying long-held and deeply rooted views of mathematics teaching and learning in the short period of a course in methods of teaching remains a major problem in mathematics and teacher education (Thompson, 1992). Much of the current education reform, teacher education, and professional development rest on particular views of teaching and learning that serve as the basis for guiding instructional practices. In this study teachers' views about teaching and learning were studied by exploring the teachers' notebook reflections and research lesson plans.

## 2.6 Counting in the Curriculum and Textbooks in Malawi

Tanner and Tanner (1995) defined the curriculum as, "the planned and guided learning experiences and intended outcomes formulated through systematic reconstruction of knowledge and experiences under the auspices of the school, for learners' continuous and willful growth in personal social competence" (p.158). A curriculum is a resource that sequences learners' learning over a long period. In Malawi, the curriculum materials are made up of syllabi, teacher's guides and learners' books. The content and the structure of the syllabus, teachers' guides and learners'



books in primary schools are determined by the content and focus of the curriculum, therefore, the core role of a textbook is determined by the degree to which it contributes to learners' achievement of the learning outcomes (Chang & Salalai, 2017). The curriculum focuses on prescribing the objectives while the syllabus describes the means to achieve the stated objectives.

The Malawi outcome-based (OB) education curriculum focuses on the achievement of learners through active participation in classroom and outdoor activities that promote independent learning and critical thinking (MIE, 2008). The rationale for primary school numeracy and mathematics is to develop learners' critical awareness of how mathematical relationships are used in social, environmental, cultural and economic contexts (MOEST, 2005). At an early stage, learners are expected to develop the ability to count and carry out basic mathematical calculations; at a later stage, the learners are expected to make inferences using manipulated data and to apply that knowledge of mathematics to solving practical problems in daily life (MOEST, 2005). The role of the learners' book is to highlight and achieve the goals of the curriculum thereby mediating between the intended and implemented curriculum (Schmidt et al., 2001). That is, learners' books tie the intended curriculum and the implemented curriculum together.

The numeracy and mathematics syllabus for primary school has aspects that give teachers an opportunity to plan for students to learn about counting and writing numbers. The syllabus has suggested teaching and learning activities that facilitate pronouncing numbers correctly, counting objects, modelling numbers, ordering numbers, tracing and writing numbers (MOEST, 2005). Number and operations are key elements in mathematics because they define numeracy and they are prerequisites for learning mathematics beyond the literacy level (Kasoka et al., 2017).

Concepts in mathematics are arranged in such a way that a former idea is contained in the latter that follows it (MOEST, 2004). In Malawian primary textbooks, number, operations and relationships follow the sequencing from the counting of concrete objects, counting using a number line, ordering, order of operations, fractions and many more (MOEST, 2005). The first core element in primary mathematics is number where, among others, learners learn about counting. In the curriculum, a core element is a component that is maintained without alteration in order to ensure program effectiveness. A core element has a learning outcome that describes

important learning that learners are expected to achieve and demonstrate at the end of a unit/ lesson or concept. The learning outcomes for number, operations and relationships for primary schools in mathematics focus on seeing the learner develop the ability to use numbers and their relationships to solve practical problems.

## 2.7 Lesson Study (LS)

LS is a professional development model originating in Japan which involves teachers collaborating to target an identified area for development in their students learning (Yarema, 2010). The 2007 Trends in International Mathematics and Science Study (TIMSS) developed and implemented by the International Association for the Evaluation of Educational Achievement found that while students from the United States had higher average mathematics and science scores than the TIMSS average across thirty-six countries, the United States students were still falling behind students of several Asian countries (Gonzales et al., 2008). “The Teaching Gap” (Stigler & Hiebert, 1999) written in response to the TIMSS 1999 video study described a key difference between the countries compared in the study, in the way they support the continuing development of teachers. In this report, LS is given as an exemplar of supporting ongoing teacher improvement focused on student learning. The process of developing teaching practice within the context of a LS requires teachers to come together to plan a lesson, observe the teaching and learning process in a classroom, evaluate the content of the lesson and mode of delivery, and use suggestions from the evaluation to prepare better lessons (Ogegbo et al., 2019; Watanabe, 2008).

Educators in different countries have come a long way in developing their own understanding of how LS can be implemented to improve teaching and learning in schools. For Japanese teachers, LS is like air, so natural, that it is difficult for the educators to identify its critical and important features. LS typically follows the steps outlined in Figure 1, with a research lesson as the centerpiece of the study process (Lewis, 2002). After identifying a research goal, teachers plan a lesson. The goals can be general at first and are increasingly refined and focused throughout the LS process to become specific research questions at the end. Teachers then choose a teaching approach to make student learning visible, keeping their lesson goal in mind. As they plan, they anticipate students’ possible responses and craft the details of the lesson. Teachers come to know the key aspects of the lesson, to anticipate how students may respond to these aspects, and to

explore different thinking and reasoning that may lie behind the possible responses (Murata, 2011). During planning, teachers also have an opportunity to study curricular materials, which can help teachers' content knowledge development. During the research lesson, teachers attend to student thinking and take notes on different student approaches. In the debriefing after the lesson, teachers discuss student learning based on the data they have collected during the observation (Murata, 2011).

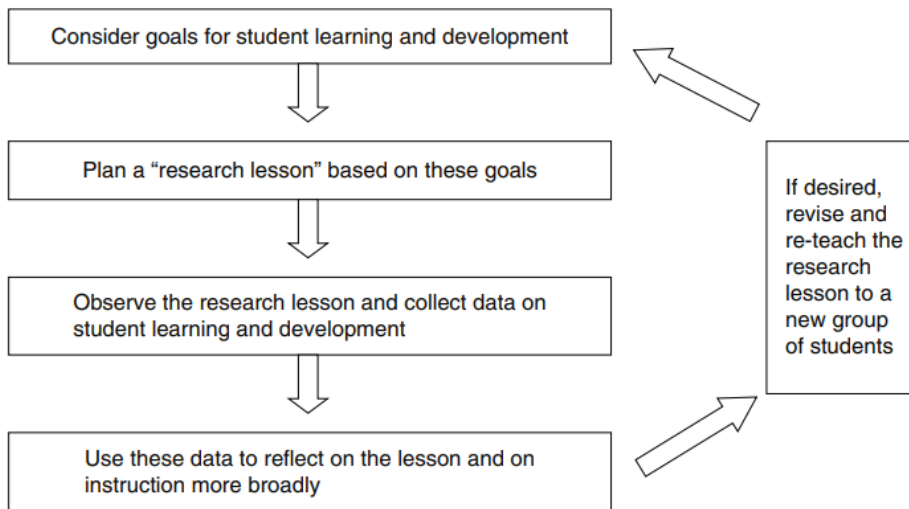


Figure 1: Lesson study cycle (Murata, 2011, p. 2)

Despite the fact that LS is a teacher-driven and teacher-centered professional development activity, non-classroom teachers are crucial to the process (Watanabe, 2010). These people are known as knowledgeable others or instructors and their role is to serve as facilitators of the individual LS groups, moderators of post-lesson discussion, or final commentators (Watanabe, 2010). In this thesis, the term instructor is used instead of knowledgeable other (see Chapter 3). Takahashi (2014) conducted a study in Japan to find out more about the nature of the final comments and how instructors prepare about them. The author examined the final comments of three instructors and conducted interviews with them to have a glimpse of the structure of effective final comments, how they plan for the comments, the skills and expertise that the role of being an instructor knowledgeable other requires. The findings showed that the structure of the comments had a part that discussed issues regarding lesson execution and a part that discussed content of the lesson in terms of the curriculum and lesson plan. The findings also revealed that the knowledgeable other in a LS is responsible for bringing new knowledge from the research and the curriculum, showing

a connection between theory and practice, and helping others learn how to reflect on teaching and learning (Takahashi, 2014). In the study presented in this thesis, the instructors were both from Malawi (n=1) and Norway (n=3).

The Mathematics Education Department of Tokyo Gakugei University with support from the Japanese International Cooperation Agency (JICA) has been conducting an intensive three-week seminar for mathematics educators since 2008 (Fujii, 2014). The participants of the seminar are from Ethiopia, Ghana, Kenya, Malawi, Nigeria, Sierra Leone, Tanzania, Uganda, and Zambia. Initially, one individual was invited from each of these countries to be part of the seminar but since 2010 two people are invited. The essence of the seminar is to help the participants learn about the Japanese model of LS, deepen and formulate viewpoints necessary for mathematics lesson evaluation, and contribute to lesson improvement in their countries. The participants have a chance to observe several mathematics research lessons in elementary secondary schools and discuss student-centered lessons through research of teaching materials and post-lesson discussions. Upon returning to their home countries, the participants are expected to become pioneers of LS in their respective schools.

Gok (2016) conducted a study in Turkey with an aim of finding out how LS was integrated and what the initial reactions of the teachers were to this form of continued professional development. For teachers, the findings showed that the LS process: 1) shifts their focus from teaching to learning, 2) helps them observe and better understand student learning, 3) shows them ways of improving learning in their classrooms, 4) improves their own learning by developing teaching skills, and 5) gives them confidence and opportunities to try new ideas out and see the immediate results (Gok, 2016). From the teachers' comments (Gok, 2016) understood that creating opportunities for them to share their experiences with a wider audience contributed so much to their PD and its continuity.

Mon et al. (2016) conducted a study to find out the school based factors that support or hinder implementation of LS in the Malaysian education context where LS is a new culture. The findings revealed that various constrains and challenges were encountered in implementation of LS. On a micro-level, these constraints were time, perception of teaching observation and teachers'

workload. On macro-level, the challenges outlined were lack of teachers' awareness of PD and examination- oriented culture rooted in the education system.

## 2.8 Lesson Study in the PD

Strengthening numeracy in the early years of primary through professional development is a project whose purpose is to improve the quality of mathematics teaching in Malawi (Fauskanger et al, 2021). The project is a collaboration between the University of Malawi and the University of Stavanger in Norway. The project invites primary school teachers in Malawi to participate in a PD in which the LS is used as a PD model for improving the teaching and learning of mathematics. In the first year of the PD, 41 primary school teachers teaching grade 1 and grade 2 in four schools in one region of Malawi were invited to join the PD program focusing on explorative approaches of teaching counting (Fauskanger et al, 2021). The program included a seven-month long process starting and ending with a three-day workshop. In between the two workshops, the teachers at each school collaborated in a LS cycle. Each group chose a LS topic related to counting (e.g. one-to-one correspondence, cardinality, base-ten structure) and a chosen activity (choral counting or counting collections; see Franke et al, 2018). At the PD, three views of teaching were discussed thus teaching as transmission, transaction and transformation (Miller, 1996). Two different views for learning were also presented and discussed thus learning as acquisition and learning as participation. Teachers collaborated in their respective schools to conduct the LS. Each group wrote a draft of their research lesson plan and submitted to the PD instructors, who gave written feedback on each lesson plan. Two of the instructors visited each school to discuss the feedback. The teachers had time to revise the plan, and each school had a meeting with one instructor supporting the work of adjusting the plan before conducting the lesson. The participants also wrote some notebook reflections relating to teaching and learning and LS. Reflections on the research lesson were shared and discussed, and perspectives such as talk moves (Kazemi & Hintz, 2014) were highlighted at the second PD.

Alongside the project, Fauskanger et al., (2021) conducted a study that was aimed at understanding how LS contributed to challenging teachers' views of mathematics teaching and learning by analyzing the Malawian teachers' views about teaching and learning with a focus on how their views are constructed in their written discourse (reflections and lesson plans). In this study, they

analysed teachers' research lesson plans and notebook reflections that the teachers wrote during the workshop. The findings revealed that before the LS they had traditional views of mathematics teaching and learning and after participating in the LS they reported on the need to work on how to provide opportunities for their learners to interact in the classroom. The findings also showed that their participation in the LS process challenged their views on teaching and learning. This study will therefore build on the study by Fauskanger et al, (2021) by looking at teachers' views of teaching and learning the concepts of counting.

## 2.9 Theoretical Framework

### 2.9.1 Progressivism Learning Theory

A framework is a lens for looking and making sense of the findings from a research (Creswell, 2012). This study is guided by the Progressivism Learning theory as propounded by the American Philosopher John Dewey (1859-1992). The theory was chosen because it gives guidance on moving away from traditional approaches to teaching to approaches that are interactive and help learners to actively and critically create meaning (Progressive approaches). It was also chosen because it gives teachers guidance on what principles they must follow to make mathematics teaching and learning learner-centered. Dewey's books and seminal papers broadly summarize the progressivism learning theory (Chiphiko & Shaba, 2014). The next paragraphs describe three of the tenets of the progressivism learning theory from Dewey's writings.

The first tenet is the need for learner participation in the learning process. Education is considered as both a psychological and a sociological endeavor, and as such, a teacher must be aware of a learner's history in order to help them integrate into society (Dewey, 1929). Because the primary responsibility of the teacher to the learner is in the sociological dimension, learning should aim to involve learners (Dewey, 1929). The second tenet is the need for stimulation of learners interests. Dewey (1985) posits that to facilitate learning, the forms of skills to be acquired and the subject matter to be learnt must generate interest in learners while at the same time giving attention to learners' specific capabilities, needs, and preferences. This is because learners come to school with their interests and it is the job of the teacher to use these interests to organize activities towards valuable results (Westbrook, 1999). As such, the progressivism learning theory puts an emphasis on the importance of learners' background experience as a prerequisite to learning (Berding, 1997).

The final tenet is the need for the promotion of critical thinking and problem solving learning (Dewey, 1929).

Dewey (1938) distinguished between traditional and progressive education. In traditional education, subject matter is considered to be affixed set of knowledge and skills, and teaching is seen as a process where an experienced teacher transmits knowledge and skills to learners. Learning is viewed as acquisition where the learner is expected to install the designated body of knowledge. On the other hand, progressive education aims at moving beyond teaching as transmission and learning as acquisition, toward teaching understood as a process of interaction where the teacher guides the learners to facilitate learning from experience and participation. In the process of education reform, one has to consider how teachers do teaching in the classroom and how teachers view teaching and learning. Progressive mathematics instruction, also known as ambitious mathematics instruction (e.g., MacDonald et al., 2013), strives to improve all learners' conceptual understanding, procedural knowledge, adaptive reasoning, and involvement in mathematical problem-solving.

Some researchers claim that it is impossible to know teachers views by reading texts only. However, a discourse approach can be taken as an analytical approach to encompass assumptions of what is possible to capture using oral or written data (Ryve, 2011). Hemmi and Ryve (2015) used this approach to analyse focus group interviews with lecturers, interviews with mentoring teachers supervising prospective teachers to study how good mathematics teaching is constructed. Their data was conceptualised in terms of discourses about good teaching in Finland and Sweden I chose to use the discourse analytical approach because: 1) I assume that the data from notebook reflections and research lesson plans cannot be seen as a mirror and means for capturing the teachers' cognitive views of teaching and learning, and 2) I conceptualise teachers' cognition and written text as part of culturally established ways of discourse and thinking (Hemmi & Ryve, 2015). The next sections discuss the three views of teaching and two metaphors of learning.

### 2.9.2 Views of Teaching

The three views of teaching as stated by Miller (1996) teaching as transmission, transaction and transformation. Teaching as transmission is understood as transmitting knowledge from the

instructor's head to the learners' head. This view of teaching is a traditional teacher-centred approach where the teacher is the dispenser of knowledge and the final evaluator of learning. Teaching as transaction is strongly related to constructivism, which sees teaching as the process of setting up circumstances in which students can engage with the subject matter being learnt in order to construct knowledge. Information is not passively taken in but actively created by the students. Teaching is viewed as helping students build their knowledge by providing contexts in which students' prior knowledge can interact with new information to produce meaningful learning. Holistic education as a philosophy of education is aligned with teaching as transformation. According to this perspective, teaching involves setting up circumstances that have the potential to transform the learner on a variety of levels, and transformational teaching encourages both students and teachers to realize their full potential as educators, contributors to society, and individuals. Dewey's idea of progressive education from 1938 is related to both teaching as transaction and teaching as transformation.

### 2.9.3 Metaphors of Learning

Sfard (1998, p. 5) asserts that "we live by the metaphors we use," and that various metaphors may inspire various modes of thought and endeavors. Sfard (1988) does not make a case for either side. As opposed to that, she contends that "it is essential that we try to live with both" (Sfard, 1988, p. 10). According to Sfard (1988), our conception of learning mathematics is based on the idea that learning has always been thought of as an acquisition of something. The concept of learning as acquisition prompts us to consider the human mind as a vessel to hold particular contents, with the learner emerging as the owner of these materials. The teacher may deliver, convey, facilitate and mediate to assist the learner in acquiring mathematical knowledge. Sfard (1988) continues to contend that a wide range of theories, including moderate to radical constructivism, interactionism, and sociocultural theories, have maintained the idea of learning as acquisition. However, there appears to be an underlying consensus that the learning process may be conceived in terms of the acquisition metaphor, even among these various concepts. Sfard also makes it clear that the environment in which learning activities are conducted is crucial and this includes the situatedness, contextuality, cultural embeddedness, and social mediation (Sfard, 1998) makes this clear. According to this perspective, learning mathematics is more about joining a certain community, being able to speak in its language, and acting in accordance with its standards. Sfard (1998)



continues by stating that the participation metaphor may result in a new, more democratic method of teaching and learning. This study will largely be based on whether teachers' participation in the LS PD challenges their views of teaching and learning the concepts of counting are progressive or traditional as visible in their lesson plans and notebook reflections.

#### 2.10 Theoretical framework as applied in the study

To explore teachers' views, this paper utilizes three principles of the progressivism learning theory broadly understood from Dewey's writings: a) a need for learner participation in the learning process, b) a need for the stimulation of learners' interest and curiosity to learn and c) a need for the promotion of critical thinking and problem-solving in learning (Dewey, 1929). Learner participation can be achieved by involving learners in different activities such as group work, collaborative and cooperative learning projects, pair work and discussions. Teachers thus ought to prepare and plan lessons that involve learners in different activities to improve their participation in the learning process. In this way, teachers could stimulate learners' interest and curiosity to learn and provide them with opportunities to develop critical thinking and problem-solving skills. Dewey's progressivism learning theory is deemed appropriate in this study as it links well with the demands of the learner-centred approaches. Using the progressive learning theory as a framework, I was guided in the formulation of research questions, data collection, and data analysis. In data collection, the framework particularly helped me in collecting data from notebook reflections and research lesson plans by looking for what is possible to capture in relation to traditional or progressive views of teaching and learning the concepts of counting. The framework was also used to analyse if the teachers' views were challenged as visible in their written notebook reflections and lesson plans. This was done by using the discourse analysis of what was captured from the lesson plans and notebook reflections.

#### 2.11 Chapter Summary

This chapter has reviewed the literature on counting, teaching and learning counting. It has also reviewed the literature on teachers' views of teaching and learning, counting in the curriculum and textbooks in Malawi, lesson study and lesson study in the PD. The last part of this chapter has described the theoretical framework that has been adopted for this study.

## **CHAPTER 3 METHODOLOGY**

### **3.0. Chapter Overview**

The purpose of this study is to explore how LS challenges Malawi primary teachers' views on the teaching and learning of the concepts of counting. In this chapter, I describe the research design, data collection instruments. Furthermore, this chapter introduces the intended analysis of this study. Finally, the ethical considerations pertaining to data generation relevant to this research are discussed.

### **3.3 Research Designs**

Research designs are plans and procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis (Creswell, 2012). The plans and actions for research include detailed methods of data collection and data analysis. The research design is guided by the nature of the research problems, personal experiences of a researcher, audience the researcher is writing for, and the research sample (Creswell, 2012). The research designs are important because they help guide the methods and decisions that researchers must make during their studies and provide the analytical framework at the end of the study (Creswell, 2012). This study adopted a qualitative methods approach to conducting research in order to answer the research questions (Chapter 1), collect, analyse and interpret data. A qualitative research design was suited for this study because I needed to have an in-depth understanding of the views that teachers have regards teaching and learning the concepts of counting as visible in their notebook reflections and lesson plans. Thus, the qualitative research approach helped me to regard the teachers as social beings whose behaviour is deeply rooted in context. Qualitative data for this study was collected by analyzing teachers' draft lesson plans and written notebook reflections to focus on how teachers' views were constructed. Revised lesson plans and comments from instructors were also analysed.

### 3.4 Data collection instruments

This study aimed at answering the following research questions:

- What activities and resources do teachers plan to use to introduce a lesson on counting?
- How do teachers plan to use activities and resources to teach the concept of counting?
- What are teachers' views about teaching and learning the concept of counting as visible in their notebook reflections before and after a LS cycle?

#### 3.5.1 Research lesson plans

Documents represent a good source for text (word) data for a qualitative study. As stated by Creswell (2012), the advantage of using documents is that they are in the language and words of the participants who have given a thoughtful attention to them. They are also ready for analysis without the necessary transcription that is required with other kinds of data such as observation or interviews. The study used teachers' draft research lesson plans and revised research lesson plans that teachers were introduced to at the PD. These are different from the ordinary lesson plans in such a way that they have a research question, predictions on what learners will respond to tasks and what teachers will observe. Figure 2 and Figure 4 show an example of a draft research lesson plan and revised research lesson plan respectively. The research lesson plans provided meaningful insight into the preparation that teachers put into their lessons. Instructors gave comments that guided teachers when coming up with the revised research lesson plan. Figure 3 shows a representative of comments from instructors and figure 4 shows a representative of a revised

research lesson plan.

TEACHING LEARNING AND ASSESSMENT RESOURCES			
bottle tops			
Teachers activities	Learners activities	Prediction of learners activities	Observation of learners activity
<b>Introduction</b>			
<ul style="list-style-type: none"> <li>Introducing numbers by singing a song (two were nge marambala)</li> </ul>	<ul style="list-style-type: none"> <li>Singing number song</li> </ul>	<ul style="list-style-type: none"> <li>Counting numbers correctly</li> </ul>	<ul style="list-style-type: none"> <li>learners are singing number song</li> </ul>
<b>Developmental steps</b>			
<b>Step 1</b>			
<ul style="list-style-type: none"> <li>make sure that all learners are in groups</li> <li>distribute materials to the groups</li> </ul>	<ul style="list-style-type: none"> <li>being in groups</li> <li>receiving materials</li> </ul>	<ul style="list-style-type: none"> <li>others are not in their groups</li> <li>learners have received enough resources</li> </ul>	<ul style="list-style-type: none"> <li>being in groups</li> <li>some learners are using resources without</li> </ul>

**Figure 2: Example of part of a research lesson plan**

In the plan you present 4 developmental steps. We think this is a very useful way to plan a lesson, but the plan for the research lesson will be easier to follow if more details are filled in on tasks, predictions and observations in the 4 different steps. Some questions underneath might support you in filling out more details in the different steps of the lesson plan.

Step 1: Make sure that all learners are in groups and distribute materials.

How many learners will be in each of the groups? What instructions will be given before the activity?

Step 2: Introducing counting collection

How will you introduce the activity counting collections?

Step 3: Practice with learners

Again, how will you practice with learners? What instructions will be given before the activity? Will the teacher show learners what to do, or will the learners be asked to find out for themselves? What predictions do you have, how do you think the learners will handle this activity? How, and what learners are you planning to observe?

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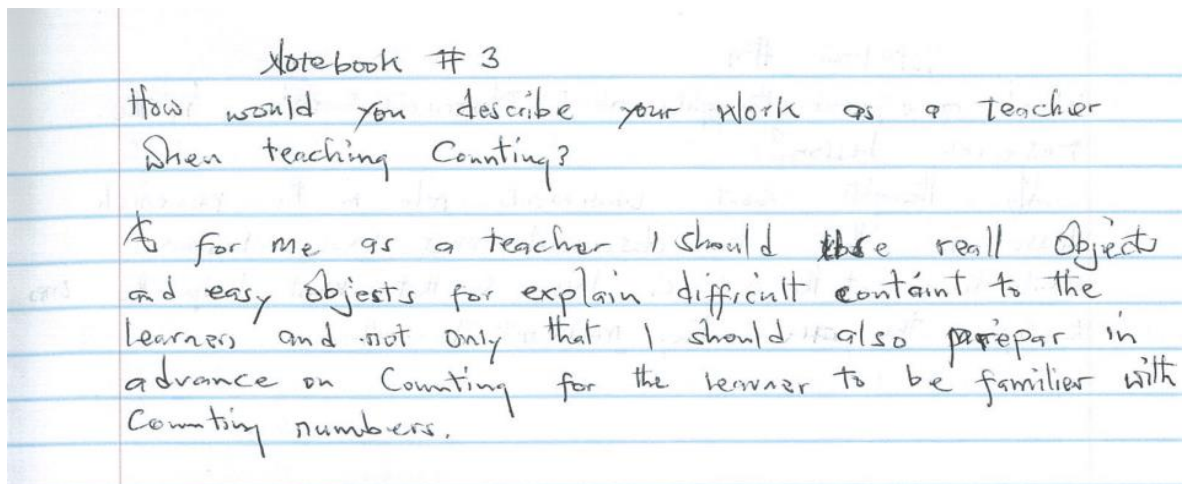
**Figure 3: example of comments from the instructor**

TEACHING LEARNING AND ASSESSMENT RESOURCES				
Bottle tops, sticks				
TEACHER'S	ACTIVITIES	LEARNERS ACTIVITIES	PREDICTION OF LEARNER'S ACTIVITIES	OBSERVATION OF LEARNERS ACTIVITIES
INTRODUCTION (2mins)				
	Introducing numbers by singing a song (Masamu masamu)	• Singing number song	• Counting numbers correctly	• All learners are singing number song.
DEVELOPMENTAL STEPS				
STEP 1 (3mins)				
	Make sure that all learners are in groups of 10s	• being in groups	• others are playing • others going not in their groups	• All learners are in their groups

**Figure 4: Example of a revised research lesson plan**

### 3.5.2 Notebook reflections

Notebook reflections are similar to interview guides in that a researcher uses to ask questions to research participants. These can be helpful when conducting semi-structured in-depth qualitative questioning of participants (Knight, 2012). In this study, teachers were given questions that required them to reflect on their teaching of the concepts of counting. The questions helped to gather data on views that teachers have on teaching and learning the concepts of counting and other aspects of their teaching of counting. The notebook reflections had questions whose answers gave a picture of how teachers views have been constructed. Figure 5 shows an extract that represents an example of a question for notebook reflections.



**Figure 5: Example of teachers’ notebook reflection**

Table 4 gives a summary of each of the research questions and source of information and instruments which I used to collect the data.

**Table 4: Data Collection Instruments**

Research Question	Source of information	Instrument
What activities and resources do teachers plan to use to introduce a lesson on counting?	Teachers	-Notebook reflections -Lesson plans
How do teachers plan to use activities and resources to teach the concept of counting?	Teachers	-Notebook reflections -Lesson plans
What are teachers’ views about teaching and learning the concept of counting as visible in their notebook reflections?	Teachers	-Notebook reflections

### 3.4 Study Sample

The research sample size for this study was made up of 57 primary school mathematics teachers teaching grade 1 and 2 in seven schools from one region of Malawi. The study targeted grade 1 and grade 2 mathematics teachers that were part of the LS PD program in the years 2021 and 2022. These teachers were purposefully sampled to ensure that the research participants had the capacity to give required information to the researcher. This is according to Creswell (2012) who stated that in purposive sampling, the researcher intentionally selects individuals and sites in order to learn or understand the main phenomenon. The standard used in choosing participants and sites is whether they are information rich.

The PD program that is presented in this study began in 2021 with 19 participating teachers from one school in Zomba. Only one school participated because at this time all schools were closed by the Ministry of Education as a COVID-19 prevention measure. The PD program focused on explorative approaches to teaching counting. To develop the participants' classroom practices, LS was used.

The PD program included a seven-month-long process starting and ending with a three-day workshop. In between the 2 workshops, the teachers collaborated in a LS cycle. The participating teachers worked in four groups to come up with draft research lesson plans as shown in Table 1 (each group was assigned a number from 1-8). Each group chose a LS study topic related to counting (e.g., one-to-one correspondence, cardinality, base-ten structure) and a chosen activity (choral counting or counting collections; see Franke et al., 2018). The draft plans were submitted to PD instructors, who gave written feedback on each lesson plan. The instructors also visited the teachers in their respective schools to discuss the feedback on each lesson plan. Before conducting the research lesson, the teachers collaborated in two groups (see Table 1) to come up with a revised lesson plan that used the comments from the instructors as a guide.

**Table 1: Number of Research Lesson Plans**

<b>SCHOOL GROUP</b>	<b>YEAR</b>	<b>NUMBER OF DRAFT LESSON PLANS</b>	<b>NUMBER OF REVISED LESSON PLANS</b>
<b>1</b>	<b>2021</b>	<b>2</b>	<b>1</b>
<b>2</b>	2021	2	1
<b>3</b>	2022	4	1
<b>4</b>	2022	1	1
<b>5</b>	2022	2	2
<b>6</b>	2022	4	4
<b>7</b>	2022	1	2
<b>8</b>	2022	2	2
<b>TOTAL</b>		<b>18</b>	<b>14</b>

During each three-day workshop, the teachers came up with 19 notebook reflections that had questions related to the teaching and learning of counting. The first notebook reflections were written before the three views of teaching (see Chapter 2) were discussed in the first workshop (see Chapter 2). Several questions were asked (see Appendix 1) but only few questions were analysed for this study (see Table 3).

Reflections on the research lesson were shared and discussed, and perspectives such as talk moves (Kazemi & Hints, 2014) were highlighted at the second workshop. At the second workshop, the teachers also wrote notebook reflections related to questions as shown on Table 3. The number of notebook reflections are as shown in Table 2.

**Table 2: Number of Notebook Reflections**

	<b>2021</b>	<b>2022</b>	<b>Total</b>
<b>May</b>	15	42	57
<b>November</b>	15	42	57



In 2022, the PD began with 42 participating teachers from six schools in Zomba. The PD's focus was the same as that of 2021. The teachers collaborated in a LS by forming fourteen groups to come up with draft research lesson plans (see Table 1). The instructors gave their comments which were used as a guide for revising the draft lesson plans. During the revision of lesson plans, the teachers collaborated in twelve groups to come up with the final lesson plans (see Table 1). The participating teachers also wrote notebook reflections during the three- day workshops both at the beginning and at the end of the workshop just like in 2021. The questions that were asked are shown in Table 3.

**Table 3: Summary of Questions for PD Notebook Reflections**

<b>Year</b>	<b>Questions for First PD</b>	<b>Questions for Second PD</b>
2021	What is teaching? What is learning? How would you describe your work as a teacher when teaching counting?	Do you find these talk moves relevant in a Malawian context?
2022	What is teaching? What is learning? How would you describe your work as a teacher when teaching counting?	Based on what you have learnt from the PD, describe your teaching approach in future lessons on any aspect related to counting. How is it different from your previous teaching approach of the concepts of counting? How do you compare your view of teaching counting before and after the PD?

To achieve this, a variety of instruments were used to collect data in order to ensure that there is ensure reliability (Fraenkel et al., 2012). Therefore, to answer the research question for this study data was collected through notebook reflections, lesson plans and comments from the instructors. These data collection techniques were chosen because they complement each other. Fraenkel et al. (2012), stated that validity is enhanced when conclusion is supported by data that has been collected from different instruments. Therefore, these data collection techniques were used independently in order to get valid results. This combination of several data collection methods,

also known as triangulation, is helpful in supporting and shedding light on the different themes or issues that emerge from the study thus minimizing bias. The data collection instruments used are discussed in the section that follows.

### 3.6 Data Analysis

The purpose of data analysis was to make sense out of data that was collected and to answer the research questions (Creswell, 2012). In this study, data analysis was done qualitatively for the reason that this study adopted a qualitative approach. Firstly, the raw data from notebook reflections were scanned so that they should be kept in an electronic format. The questions from notebook reflections and their responses were typed in an excel sheet. The data was coded accordingly as shown in table 4

**Table 4: Codes for Analyzing Data**

	<b>Code</b>	<b>Definition</b>	<b>Example from Data</b>
<b>Views of Teaching</b>			
Teaching as Transmission	Transmission	Involves transmission of knowledge from teachers' head to students' head	Teaching is a process where a teacher imparts knowledge to learners. Something that a teacher does
Teaching as transaction	Transaction	Involves creating situations whereby learners can interact with the material to be learned to construct knowledge	Teaching is a process of sharing ideas from known to unknown. Delivering knowledge
Teaching as transformation	Transformation	Involves creating conditions that have the potential to transform a learner	Teaching is the process of understanding concepts taught and making differences

<b>Views of Learning</b>				
Learning as Acquisition	Acquisition	Involves receiving knowledge from a teacher	Learning is a process of getting knowledge and skills from a teacher	
Learning as Participation	Participation	Learning involves interaction and experience	Learning is a process that involves sharing of ideas in a classroom	

The draft research lesson plans and revised research lesson plans were analysed using theory driven analysis. This was done to identify the teachers' views of mathematics teaching and learning as visible in their written notebook reflections and research lesson plans. To achieve this, all teachers written data were read several times and then used the systematic approach to classify the data and identify themes and patterns following what Hsieh and Shannon (2005) regarded as a flexible way of analyzing texture data. I identified teachers' views using the theory of teaching and theory of learning such that whenever the teachers wrote about teaching, I coded their text as teaching as transmission or teaching as transformation (Miller, 1996). When learning was the focus of attention in the teachers' writings, I coded the text as learning as acquisition or learning as participation (Sfard, 1998). Thereafter open coding was done without predetermined codes to identify other issues. All codes were categorized into themes and interpreted in relation to the research questions.

### 3.7 Ethical Considerations

Conducting research is a moral and ethical enterprise and it should therefore aim at ensuring privacy and confidentiality of research participants to avoid exposing the research participants to potential danger related to their participation in the research (Creswell, 2012). With this in mind, ethical issues were considered for this study to ensure that no stress or harm is brought to the participants. Permission was sought from the head teachers of the chosen schools (see Appendix 2) and informed consent from the teachers themselves before the beginning of the study and (see Appendix 3) After understanding the purpose of the study, informed consent enables participants to decide whether to participate in the study or not (Cohen et al., 2007). Participants were briefed

in detail on what the study was all about, and they were told that they had the freedom to withdraw from the study at any point if they wished to do so. Issues of confidentiality were also considered at all levels of the study (e.g., The school names of the schools were given codes from 1-8). Every step of the project followed the standards set by the Norwegian Centre for Research Data (NSD). The researcher requested permission from NSD to carry out the research project. Permission to carry out the research project was given (see appendix 4). Processing of personal data was done in accordance with the principles under the General Data Protection Regulation of the NSD. No information that can be used to identify participants has been revealed. Personal names and school names have been replaced by codes or pseudonyms.

### 3.8 Chapter Summary

This chapter has described the research design, study sample, data collection instruments, data analysis and ethical considerations pertaining to data generation.

## CHAPTER 4 RESULTS AND DISCUSSION OF FINDINGS

### 4.1 Introduction

In this chapter, the results of the study are presented and discussed. The chapter starts with a presentation of findings that follow the instruments that have been discussed in the previous chapter. This is followed by a discussion of the findings. The discussion of findings has been presented following research questions. The specific research questions of the study are:

- What activities and resources do teachers plan to use to introduce a lesson on counting?
- How do teachers plan to use activities and resources to teach the concept of counting?
- What are teachers' views about teaching and learning the concepts of counting as visible in their notebook reflections before and after a LS cycle?

### 4.2 Notebook Reflections

#### 4.2.1 Notebook Reflections During the First Workshop

This section presents the findings from analyses that were done on fifty-seven teacher's notebook reflections that teachers wrote in the first workshop. Several questions were asked during the first workshop and only two questions related to teaching and learning and one related to the work involved when teaching counting were analysed: 1) What is teaching and 2) What is learning? 3) How would you describe your work as a teacher when teaching counting?

#### **What is teaching?**

From the responses given by the teachers to the question what is teaching, there are several themes that emerge as regards the question 'What is teaching?' The teachers wrote that the process of teaching can take various forms like delivering information, putting knowledge in someone's brain or facilitating the learning process. The analyses of the reflections show that forty of the fifty-seven participating teachers describe teaching as a process of imparting knowledge to learners (e.g., "Teaching is a process of imparting or giving knowledge to learners by using different teaching methods"). Three of teachers add that teaching involves imparting knowledge or skills to a learner (e.g., "Teaching is a process of imparting knowledge or skills from a teacher to a learner). Four teachers touch on the idea that teaching can involve imparting values alongside knowledge and skills (e.g., "Teaching is a process of imparting knowledge, skills and values to learners").

Two teachers' responses focus on the idea that teaching involves bringing change to the learner (e.g., "A continuous process where a teacher inputs knowledge to a learner in order to bring change to learners"). One teacher's response emphasizes the importance of the teacher in the teaching process (e.g., "Teaching is what a teacher does to learners in order to achieve the goals"). One teacher describes teaching as a process that involves making learners' work easier (e.g., "Teaching is a process of instilling concepts, knowledge, values, and skills to learners through facilitation and mentoring"). Six responses highlighted the idea that teaching involves sharing of ideas from known to unknown (e.g., "Teaching is a process of sharing ideas from known to unknown"). One teacher highlights the importance of understanding or comprehending the information that is being taught (e.g., "Teaching is the process of making learners understand concepts taught and making a difference"). Overall, the analysis of notebook reflections suggest that teaching involves the process of imparting knowledge, sharing ideas, and delivering content to learners through various teaching methods. It emphasizes the importance of both the teacher and learner in the teaching process and highlights the goal of bringing about change or progress in the learner.

### **What is learning?**

The common theme in the responses to the question about what is learning for the participating teachers is the idea of acquiring knowledge, skills or gaining new ideas from someone else, specifically a teacher. The analysis of fifty-seven notebook reflections show that thirty-seven teachers describe learning as the process of receiving information from the teacher (e.g., "Learning is the process of receiving knowledge and information that a teacher planned for a particular time"). Ten teachers added the concept of the acquisition of skills and values from a teacher or someone else (e.g., "Learning is a process of receiving the required knowledge, concepts, ideas, skills or content from a teacher for further use by the learner"). One response focus on the idea that learning involves the development of the mind (e.g., "Learning is a process of grasping the presented information in developing mind through practical work). One teacher described learning as a process that involves self-discovery, behaviour and attitude change (e.g., "Learning is a process of acquiring new information through self-discovery and change of attitudes"). Four teachers described learning as a process that involves sharing of ideas (e.g., "Learning is a process of sharing ideas"). Three teachers described learning in terms of the role of the learner (e.g., "Learning is what a learner does when the teacher is teaching").

Overall, the analysis suggests that learning involves the process of acquiring knowledge or gaining new ideas from a teacher and highlights the importance of the learner in the learning process.

### **How would you describe your work as a teacher when teaching counting?**

The work of teaching counting can also be analysed as to how teachers prepare to teach and what teachers do when teaching the concepts of counting. The analysis of teachers' notebook reflections related to how they write about their work on teaching counting reveal that teachers prepare in advance before they teach counting. Three teachers wrote that the preparation includes planning lessons, gathering appropriate teaching materials, and ensuring that they are familiar with the concepts of counting (e.g., "My work as a teacher would be planning thoroughly with a lot of teaching materials and teaching activities. I do this so that my learners will be able to participate and acquire knowledge and skills on counting"). Eight teachers describe their work to involve demonstration, modeling, and providing clear instructions: The teachers use demonstration and modelling techniques to clarify counting concepts. Additionally, clear instructions are given to guide learners' understanding and application of counting principles (e.g., "Firstly, I greet my learners and introduce the lesson by demonstrating how to count numbers. I let the Learners practice counting numbers in groups and then let them count as individuals").

Six teachers describe their work to involve providing counters or number cards and ensuring that learners know how to count using them. Teachers ensure that each learner in the class has counters and the teacher is responsible for teaching learners how to effectively use the counters for counting (e.g., "As a teacher, I make sure that each and every learner Has counters or number cards. At the end of the lesson I make sure each and every learner knows how to count numbers using counters"). One teacher describes the work to involve the use of real objects and easy objects to explain difficult content to the learners. This includes the use of tangible and familiar objects that help learners know complex counting concepts ("As for me, I use real objects and easy objects to explain difficult content to the learners. I also prepare in advance on counting for my learners to be familiar with counting numbers"). Two teachers describe the work to involve the use of various methods and strategies to arouse learners' interests.

Teachers use different teaching methodologies like games, songs, and other activities to engage learners and to keep them interested in learning counting. One teacher wrote the following:

“As a teacher I use various methods when teaching to arouse learners interest, for example, I sometimes use games, songs, and different activities in the lesson which can motivate Learners. In doing so, the learners are playing and also learning is taking place at the same time which makes them to enjoy the lesson”.

The excerpt shows that the teachers use a variety of teaching strategies when teaching the concepts of counting. Different activities are also used to motivate learners. When this is done, the learners are playing and learning at the same time.

Two teachers describe the work of teaching counting to involve observation and being part of the counting activity. According to the teachers, being part of the lesson involves working together with the learners. The teachers engage in the counting activity together with the learners. In doing this, the teacher is able to monitor learner progress and offer support to struggling learners. The following was written by one of the teachers and represents what the teachers wrote concerning being part of the lesson:

“As a teacher, when teaching counting my work is to observe, instruct, be part and parcel of the counting activity. If I am counting together with the learners, they are strengthened and motivated to keep on counting. I also assist slow learners and fast earners, as well, to avoid disorganization”

From the excerpt above, it shows that the teachers’ task is to watch the learners do some counting activities give instructions on how to go about the activity and assist the learners according to their different abilities.

Seven teachers explain their work by highlighting the different ways of counting objects and numbers. Teachers wrote that they use various teaching approaches to demonstrate different ways of counting. This gives learners an opportunity to develop an understanding of counting principles and strategies (e.g., “Teaching counting as a teacher, can be described as an easy teaching method by Choral counting and counting collections, by one-to-one correspondence, cardinality, counting names, simple relation, ordering and sequencing”). Overall, the analysis suggests that the teachers employ a variety of teaching strategies, such as using real objects, planning in advance, actively



participating in counting activities, providing resources, and catering to individual learner needs, to create an interactive and effective learning environment for teaching counting.

### 1.2.2 Notebook Reflections During the Second Workshop

This section presents the findings from analyses that were done on fifty-seven teacher's notebook reflections that teachers wrote in the second workshop. Several questions were asked during the second workshop and only four questions related to teaching and learning the concepts of counting were analysed.

#### **Do you find talk moves relevant in a Malawian context? Why or why not?**

Analysis of the notebook reflections related to the relevance of talk moves in a Malawian context show that there are mixed views on whether the talk moves are relevant in a Malawian context. Among those that pointed out the relevance of talk moves stated that the talk moves can help Malawian learners to have an interest in mathematics and deepen their thinking capacity (e.g., "...These talk moves can help Malawian learners to have interest in mathematics and acquire other skills in mathematics. This can help in deepening their thinking capacity").

One teacher stated that the talk moves are relevant because they provide an opportunity for improved teacher-learner interaction. This is expressed in the following quotation:

"The talk moves are relevant to the Malawi context because they will provide an opportunity for improved teacher-learner interaction, allow learners to understand their activities and tasks well, and even allow teachers to probe more on learners' ideas and perhaps make teaching and learning live and enjoyable."

As can be seen from this extract, the teacher finds talk moves to be relevant to the Malawian context because they help create a classroom environment where the teacher and learners are able to freely interact. The classroom interactions allow learners to understand the given tasks easily. When teachers use talk moves, they have an opportunity to probe more on learners' ideas.

Additionally, some teachers pointed out that talk moves are more relevant in a Malawian context because they help to know other learners' views and strategies for coming up with a solution, and they make learning easier by allowing learners to learn through their colleagues.

On this, one teacher wrote the following: “Yes. I find talk moves relevant because it makes learning easier. Learners can learn through their fellow learners as well. It also makes learners have the ideal mind of their response without a second thought.”

The excerpt shows that the teacher finds talk moves relevant because they make the learning process easy. The talk moves provide an opportunity for learners to learn different strategies of solving a particular problem from their fellow learners without involving the teacher.

One teacher pointed out that talk moves take into consideration all learners despite their different abilities. The teacher wrote the following:

“...These talk moves are very relevant in a Malawian context because the learners we have in our large classes have individual learning abilities. Others learn fast, and others learn slowly. For the slow learners, they need to master the skill and practice before moving to another activity so that they are not left behind.”

This excerpt shows that the teachers teach in large classrooms that have a combination of both fast and slow learners. The slow learners are usually left behind when talk moves are not used as they need more time to master one skill before moving on to the next. Therefore, the use of talk moves overcomes the barrier of difference in learning abilities.

Three teachers pointed out that talk moves are not relevant in a Malawian context. One teacher stated that the syllabus does not support the use of talk moves (e.g., “Talk moves are not relevant to the Malawian syllabus”). One teacher pointed out that time limits the use of talk moves (“Talk moves are not relevant in the Malawian context because when teaching the concepts of counting we use different methods when teaching so we do not have enough time to incorporate talk moves in our lessons”). Another teacher wrote that spoon-feeding learners hinders the use of talk moves. This was written as follows:

“Talk moves are not relevant in a Malawian context because we do not let learners explore solutions on their own. We mostly guide them on how to get the expected answers to the given mathematical tasks. If we start using these talk moves in our classrooms, they may become relevant in our context.”

As can be seen from the excerpt, the teacher found the talk moves irrelevant because of the teaching strategies that they use in their classroom. The teacher pointed out that when teaching, learners are not allowed to discover their own strategies of finding solutions. The learners are simply given steps to follow to get the desired answer. However, the teacher admitted that if the teachers start using the talk moves now and again, they may be relevant. Overall, the analysis shows that the teachers' views on the relevance of talk moves in a Malawian context is subject to various factors such as teaching methods, time, and individual learning abilities of the learners.

**Describe your teaching approach in a future lesson on any aspect related to counting.**

From the responses provided to the question about the teachers' approach in a future lesson on any aspect of counting, nineteen teachers wrote that talk moves will play a significant role in their teaching approach related to counting in future (e.g., "In future, I will use some talk moves in my lesson since my class is large"). Seven teachers emphasized the importance of learner participation and involvement in the learning process (e.g., "I will ensure that my class activities encourage learner involvement"). One teacher highlighted the use of various teaching methods and materials to help learners develop critical thinking skills and self-discovery ("In future, I will give learners time to think so that I help the learners develop critical thinking skills"). On top of that, three teachers mentioned the use of cultural activities and songs to make the lesson more engaging and meaningful for the learners (e.g., "I will use different cultural activities related to counting"). Finally, four teachers mentioned the importance of giving learners adequate thinking time and providing opportunities for them to interact with the materials learnt (e.g., "I will give my learners adequate thinking time and a chance to participate"). Overall, the analyses of the teachers' responses indicate that their views on their future teaching approach will focus on creating a learner-centred environment that promotes active participation and critical thinking. The use of talk moves is an essential component of their approach, as it helps to facilitate learners' engagement and understanding of the concepts of counting.

### **How is your future teaching approach different from your previous approach in teaching any aspect of counting?**

Analyses of the written notebook reflections on the teachers' future teaching approach on teaching the concepts of counting indicate that the teachers have changed their previous teaching methods to implement new ones learnt in the PD programme. The teachers indicated that previously, they were teaching using techniques that expect learners to repeat what the teacher had demonstrated (e.g., "previously learners were given examples on how to solve a problem..."). The teachers also wrote that in their future lessons, they will use teaching strategies that will encourage learners to find their own solutions to problems using their own strategies (e.g., "...In future lessons, learners will be encouraged to use their own strategies of finding the solution). Some teachers pointed out that the main goals of the new teaching methods adopted will promote critical thinking (e.g., "...Now, learning will be practical to help learners think critically") and learner participation (e.g., "...In future, I will use activities which will help learners thinking and encourage their participation and I will involve learners through repetition"). Seven teachers stated that talk moves will be employed in future lessons to encourage learners to explain their understanding and connect ideas (e.g., "Before the PD, I was asking learners to count numbers as a class in a chorus manner but now I will use talk moves"). The teachers stated that they will no longer spoon-feed the learners but will create opportunities for them to discover mathematical concepts on their own (e.g., "The teachers are using new strategies like goal setting, counting collections, and giving more examples to help the learners understand concepts of counting. The learners are now given more time to think and interact with the content"). It is clear from the analysis that there is a change in the teachers' approach to teaching counting when compared to their previous approach. The PD program has thus played a crucial role in helping the teachers acquire new teaching strategies. The teachers view learner involvement and the use of talk moves as a tool for supporting classroom discussions. In a nutshell, the analysis suggests that the new teaching strategies are more effective in promoting critical thinking and learner participation and are therefore likely to lead to better learning outcomes for the learners.

### **How do you compare your view of teaching counting before and after the PD?**

The analysis of the teachers' written reflections on their view of teaching before and after the PD indicates that the PD had a significant impact on the teachers' teaching of counting.

Before the PD, the teachers primarily relied on teacher-centred instruction that limited the opportunities for teacher-learner participation (e.g., “In the past our lessons were teacher centred, now learner participation will be encouraged”, They also used a few talk moves and provided learners with few examples (e.g., “Before, learners were given few examples...”). The teachers also stated that after the PD they now incorporate talk moves and various teaching strategies to promote learner participation (e.g., “...talk moves that I will use will help me to foster learner participation in my classroom). They also now provide more examples and use counting activities to engage learners. On this, one teacher wrote the following: “Before, I was not incorporating more talk moves to help learners understand concepts on counting better. Now, I will use concepts from the mathematical teaching framework. I will also use many examples for the learners to practice on”. In addition, the teachers have realized the importance of allowing learners to think for themselves and are now using teaching as transformation and transaction instead of transmission (e.g., “Before learners were spoon-fed but now they will be given many opportunities to think themselves. That is using teaching as transformation and transaction and not transmission”). They also now use skip counting and explore more methods to teach counting (e.g., “Before, I did not use skip counting because I thought that my learners will have difficulties applying the concept. But now it is easy to use skip counting in my classroom. My learners can now count more objects than before. Now my learners can count up to 200 without assistance”). Overall, the analysis suggests that the PD has helped to shift teachers’ views on how they teach the concepts of counting by helping them consider various teaching strategies and talk moves to foster learner participation and classroom engagement.

#### 4.3 Results from lesson study research lesson Plans

This section presents the analyses of draft research lesson plans and revised lesson plans. The revised draft research lesson plans were written after the instructors gave their comments on the draft research lesson plans.

In analyzing the first draft lesson plans, the counting activity is introduced in various ways. Eleven of the eighteen lesson plans introduced the lesson by singing a counting song (e.g., “Sing a song with learners”). In one lesson plan, the counting of the song was coupled with number cards (“Ask learners to sing a number song with cards”). In another lesson plan the counting was done using jumping as an activity (“Count numbers together with learners while jumping”).

One lesson plan was done in reference to a number chart (“Ask learners to count numbers on a chart”). Five lesson plans began with asking learners to count numbers on a chart in ascending or descending order (e.g., “Ask learners to count numbers 70-99 in descending order”). One lesson plan began with asking questions from the previous lesson (“Ask learners questions from the previous lesson”).

In the phase following the counting song, seven of the eighteen lesson plans had distribution of counters to learners as the next activity (e.g., “Let learners be in groups and distribute counters to them”). Five lesson plans had letting learners count numbers as their next step (e.g., “Ask learners to choral count from 1 to 50 by 2s. The teacher should record the numbers on a chart”). Three lesson plans used a chart after the introduction (e.g., “Paste a chart showing numbers from 99-70”). Two lesson plans began by asking learners to identify number patterns (e.g., “Ask learners to identify number patterns from a chart”). This step was followed by demonstration on how to count where five lesson plans had demonstration as the next phase after distribution of counters (e.g., “Display a number chart on the board and demonstrate how learners are going to count numbers in a sequence”). In some cases, this step was followed by asking learners to explain how they are counting (e.g., “Let learners explain how they are counting”). The learners were in turn asked to count the collections. Overall, out of the eighteen draft research plans, nine were teacher led. Here the teacher was at the forefront of the classroom activity. For the revised research lesson plans, out of the 14 plans, only four were teacher led thus the activities presented in the plan had their focus on the teacher. This is summarized in table 4 below. The analysis of the research lesson plans indicates that the counting of collections would be done in several ways. In the process of counting, the teachers planned to supervise the learners and asking the learners to explain how they are coming up with the responses (e.g., “Monitor the learners and ask the learners to explain how they counted their collections”). The lessons were summarized by singing a counting song, identifying number patterns, naming numbers on a chart, group and individual presentations. The analysis reveals a similar pattern from the draft research lesson plans which is presentation-monitoring, demonstration-observation or analysis- consolidation or evaluating-pattern.

Table 4: Summary of Transition of Draft and Revised Research lesson Plan

	Teacher-Centered	Learner- Centered
Draft Plan	9	8
Revised Plan	4	10

Based on the draft research plans and the teacher led approach visible in some of the plans (Table 4, first column), the instructors gave comments that challenged this approach. As representative examples, the following are some of the lesson plans that were changed from teacher- centered to learner centered and the comments from instructors.

### **Research lesson plan 3**

The lesson began by asking learners to count numbers 1-99. This was followed by the teacher demonstrating how to count numbers in ones and in groups. The instructors commented as follows:

“In the introduction you ask learners to count numbers 1 up to 99. How will they count, i.e., will they all count in a choir, by themselves, is the teacher silent or will the teacher lead the counting? The activity says “ask learners to count” so it seems the learners are doing the counting and not the teacher, which is good as it can show if they are ready to explore further on different counting activities (with counters). Also, your research question asks about counting up to 50, but the first introduction counts up to 99?”

The excerpt above shows that the instructors asked the teachers whether the learners will count in a choir or by themselves. They also asked if the teacher will be silent or will lead the counting. This comment challenged the teachers to revise the plan toward one which is more learner-centered. In their revised plan, the teachers used chose to use choral counting as a counting activity. The revised lesson plan was modified and the plan began with asking learners to choral count from 1-50. This was followed by the teacher distributing counters to learners and asking learners to practice counting in their groups in groups of ones, twos, threes, fours and more

### **Research lesson plan 6**

Lesson plan 6 began by asking learners to count numbers 1-3. The learners were then asked to count numbers from 2-20 together with the teacher as he records and pause. The teacher would then ask the learners to mention the next number.

The instructors commented that:

“Will the learners count individually or in groups? How many learners will be in each of the groups? What instructions will be given before the activity? Or, is this a choral count where the learners count together with the teacher? Why? And why count in twos? In the second part of this first step, learners will “count the numbers”. We do not understand this activity. Will they count counters, or just say the numbers while looking at a number chart? Please provide more information about the activity as well as what instructions will be provided by the teacher and why. Please also provide more information about who will be observed and why. How will you know if learners are “counting in 2s?”

In the comment above, the instructors asked the teachers whether the learners will count individually or in groups. They also asked if the teacher will give instructions before the activity. On top of that, the instructors recommended to the teachers that they should provide more information about the activity and the instructions that they will give to the students. In the revised lesson plan, the teachers followed the comments from the instructors that they asked the learners to be in groups of 5 and distributed counters to each group. The teacher then asked the learners to count the counters on their own following the instructions given.

### **Research lesson plan 11**

The plan began by asking learners to count numbers 70-79 in descending order. Then a chart would be pasted showing numbers 99-70. The teacher would then model counting numbers in descending order from 99-70. Learners would be asked to count numbers in descending order individually, in pairs or as a class. The instructors commented as follows:

“The third question you ask is “How learners are counting numbers in descending order correctly?” Is there more than one way to count the numbers correctly in descending order? Which ways? What if some learners do not count correctly? How would you as teachers help them?”

The comment above shows that the instructor challenged teachers by asking whether there were more than one ways to count numbers correctly in descending order. The instructors also asked how the teacher would assist learners that do not count correctly.

Based on the comment concerning how the teacher would assist learners that do not count correctly, the revised plan was changed. In the revised research lesson plan, the teachers asked



learners to count numbers in ascending order from 70-99 using a number chart pasted on the blackboard. Learners would then be asked to count the same numbers backwards from 99-70 using the same chart in groups and individually.

### **Research lesson plan 16**

The research question for this plan was “How are learners identifying patterns from a given chart?” The plan began by a song which was followed by putting learners in groups. The teachers then planned to display a number chart on the board and demonstrate how learners are going to count numbers in a sequence. This was followed by letting learners count numbers in a sequence from using number chart in groups. This was followed by asking learners to complete the given numbers in a sequence. The instructors commented as follows:

“What instructions will be given before the activity that requires learners to count numbers in a sequence form using the number chart in groups? How do you intend or plan to guide the learners to understand different ways of sequencing (patterns)? In this step you predict that some will be struggling with finding patterns, but perhaps you can also expect that some learners will find patterns? If so, what patterns do you think they will find? For the observation you say that “finding the missing numbers in a number sequence”. We are not sure what you exactly mean by this – do you mean to observe if they are able to find the missing number in a number sequence? We did not find any chart attached to the plan so we are not sure what is meant by “missing numbers”. As for Step 2, we think you should also have a better plan that will be observed, who will observe, and which learners will be observed”.

The comment shows that the instructors challenged teachers how they plan to guide the learners understand different ways of sequencing patterns. The teachers predicted that some learners will struggle to find the patterns so the instructor challenged the teachers to show what patterns students that are able to find patterns will find. Based on this comment from the instructors, the revised plan had major changes. Firstly, the plan began with a song. This was followed by the teacher displaying a chart and demonstrating how learners are going to count numbers in a sequence. After demonstration of the chart, the teachers would ask the learners to count numbers from the chart.

This would be followed by asking learners to find number patterns using the number chart in groups (e.g., +1, +2, +3). This was followed by asking learners to complete the missing numbers from the chart in groups as shown in figure 6.

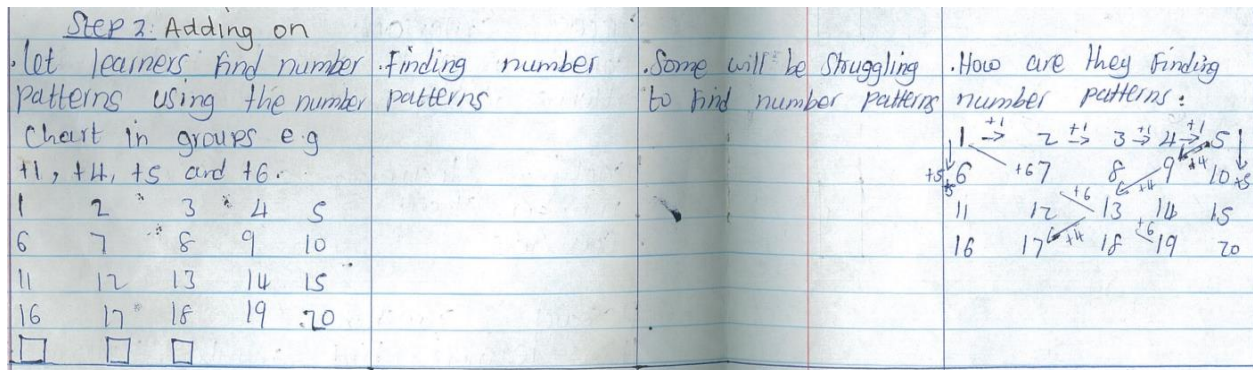


Figure 6: An extraction from a revised lesson plan showing an activity to be used for identifying patterns.

Figure 6 above shows an extraction from a revised research lesson plan that teachers planned to use to help learners find patterns on a given chart. From this extraction, it is evident that the comments from the instructors challenged them to pick a choral counting activity as part of an activity.

#### 4.4 Discussion of Findings

This section discusses the findings of the study .

The findings of this study from notebook reflections revealed that the work of teachers when teaching the concepts of counting involves preparing in advance before teaching. To do this, firstly, the teachers come up with a plan for their lesson on counting. The lesson plan serves as a guide that the teacher uses to deliver a lesson on counting. Secondly, they gather appropriate teaching materials that will be used by learners in the classrooms. They also ensure that they are familiar with all the counting concepts that they plan to teach. The use of demonstration and modelling has been revealed as the ways in which they plan to use activities and resources to teach the concepts of counting. In demonstration, the teacher simply shows the learners how to go about a particular task by doing. This is done by using the blackboard, counting charts, counting songs, number cards and counting collections. The reflections also show that the teachers give clear instructions on how learners should go about a task. Various strategies and methods are used to arouse learners interest. These activities include the use of counting songs, games and other activities.

The analysis of notebook reflections indicates that the discussions in the PD workshop challenged teachers' views on teaching and learning the concepts of counting. The discussions contributed to a shift in teachers' views from traditional to progressive. Similar to findings from Fauskanger et al. (2021), the analyses from written notebook reflections revealed that the teachers initially held the traditional view of teaching and learning. The most prominent view of teaching was called teaching as transmission and the most prominent view of learning was learning as acquisition of knowledge. This is not surprising because in most classes of Malawi schools the teacher-learner ratio is usually very high and teachers view teaching as a process that involves giving out knowledge to learners and the process of learning as receiving information from the teacher (reference supporting this claim). Few teachers' initial view of teaching and learning was progressive. They thus viewed teaching as what Miller calls teaching as transaction which involves the teacher and the learner sharing ideas through classroom interaction. On top of that they viewed learning as participation.

Through the LS experience and teachers' notebook reflections, the majority of the teachers wrote that before the LS cycle, they were employing teacher-centered approaches to teaching the concepts of counting. They also stated that participating in the PD workshop and LS cycle helped them consider how they can teach the concepts of counting using approaches that promote active participation and critical thinking. In this study, majority of teachers emphasized that the PD has helped them to improve their teaching of the concepts of counting by enlightening them on how to use various teaching strategies and talk moves to foster learner participation and engagement. These results are similar to the results that Gok (2016) found out that the LS process shifts teachers focus from teaching to learner learning and shows teachers ways of improving learner learning in their classrooms.

One thing that stood out in the analysis of notebook reflections was that the teachers views on the use of talk moves was challenged. Before the PD, the teachers were aware of the talk moves but they found them irrelevant because the syllabus does not support the use of talk moves. Secondly, the teachers wrote that to use talk moves with learners, a lot of time is required. Since limited time is allocated to the mathematics lessons, it becomes very difficult for the teachers to use talk moves. Finally, the teaching strategies that the teachers use do not allow learners to explore their own

solutions. The teachers simply guide learners on how to get the expected answers to the given counting tasks. These findings are similar to what O'Sullivan (2004) found.

This view on talk moves was challenged after participating in the PD. The analyses of notebook reflections, the teachers found out that the use of talk moves helps learners have an interest in mathematics and deepen their thinking capacity. The talk moves provide an opportunity for teacher- learner interaction. The teachers also became aware that the use of talk moves makes learning easier as learners can learn through their colleagues by listening to how others are coming up with solutions. Lastly, the use of talk moves gives teachers an opportunity to be inclusive. The teachers pointed out that their classrooms have students with different learning abilities so the use of talk moves ensures that no learner is left behind.

The analysis of research lesson plans and instructors' comments also showed that the input from the instructors played a role in shifting the teachers' views from teacher centered to a progressive view of teaching and learning the concepts of counting. This is similar to findings of Moss et al. (2015). The comments that instructors give in a lesson study have parts that discuss issues regarding lesson execution and a part that discuss the content of the lesson in terms of the curriculum and lesson plan. The analyses make it clear that the comments from the instructors challenged the teachers to modify their draft research lesson plan from a teacher-centered plan to a learner-centred plan. Following the comments from the instructors, teachers were challenged in different ways. Firstly, the teachers were challenged to choose a choral counting activity for their lesson. In their draft research plan, the teachers did not specify whether the learners would count as a group or individually which was later changed in the revised plan as they decided to use a choral counting activity. Using choral counting as a counting activity enhances active learner participation, stimulates learners interest and promotes critical thinking (Franke et al. 2018).

Secondly, the teachers were challenged to help learners work in groups. In one of the research lesson plans, the teachers wrote that they will count numbers with the learners. The comment that the instructors gave challenged this approach. In the revised research lesson plan, the teachers then planned to help learners do the counting while in groups of five. The use of group work in a lesson on counting fosters learner participation which is a progressive approach to teaching and learning.

Finally, the teachers were challenged to find ways of assisting learners that struggle to complete a given task. One of the plans predicted that some learners will find it hard to count in descending order. The comments that the instructor gave challenged the teachers and in their revised plan, they instead planned to ask the learners to count in descending order using a chart on the board. Taking into consideration the different learning abilities that learners have fosters stimulation of learners' interest in learning which is a progressive approach to learning. Despite the evidence that the revised research lesson plans encouraged the creation of space for learner involvement in a lesson on counting, there were some research lesson plans did not change even after the instructors gave their comments. This could be because of they did not meet as a group to revise the draft research lesson plan. This is similar to findings by Mon et al. (2016) whose findings revealed time constraint and teachers' workload makes it hard for teachers to come together so that they can revise a research lesson.

### **CONCLUSION**

The findings from this study indicate that the teachers' views on teaching and learning the concepts of counting had been challenged having gone through the LS process. This was evident in their willingness to use stimulating activities in their revised research lesson plans. Previously, the teachers planned their activities in such a way that they did not give learners enough time to think but now they have shown interest in including activities like choral counting and counting collections. Being part of the lesson study has also helped teachers find out more ways of helping learners of different capabilities. This is evident in their notebook reflections when they stated that they will use talk moves.

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# APPENDICES

## Appendix 1: Permission From NSD

5/30/23, 3:00 AM

Notification form for the processing of personal data



[Notification form](#) / [Lesson Study: Challenging Malawi Primary Teachers' Views on tea...](#) / Assessment

### Assessment of processing of personal data

**Reference number**  
438309

**Assessment type**  
Standard

**Date**  
10/11/2022

**Project title**

Lesson Study: Challenging Malawi Primary Teachers' Views on teaching and Learning the concepts of counting.

**Data controller (institution responsible for the project)**

University of Stavanger / Faculty of Education and Humanities / Department of Primary School Teacher Education, Sports and Special Education

**Project leader**

Janne Fauskanger

**Student**

Anita Eves Mlauzi

**Project period**

01/08/2022 - 31/08/2023

**Categories of personal data**

General

**Legal basis**

Consent (General Data Protection Regulation art. 6 no. 1 a)

The processing of personal data is lawful, as long as it is carried out as stated in the notification form. The legal basis is valid until 31.08.2023.

[Notification Form](#)

**Comment**

**ABOUT OUR ASSESSMENT**

Data Protection Services has an agreement with the institution where you are carrying out research or studying. As part of this agreement, we provide guidance so that the processing of personal data in your project is lawful and complies with data protection legislation.

We have now assessed the planned processing of personal data. Our assessment is that the processing is lawful, as long as it is carried out as described in the Notification Form with dialogue and attachments.

**TYPE OF DATA AND DURATION**

The project will be processing general categories of personal data until the date documented in the Notification form.

**LEGAL BASIS**

The project will gain consent from data subjects to process their personal data. We find that consent will meet the necessary requirements under art. 4 (11) and 7, in that it will be a freely given, specific, informed and unambiguous statement or action, which will be documented and can be withdrawn.

The legal basis for processing general categories of personal data is therefore consent given by the data subject, cf. the General Data Protection Regulation art. 6.1 a).

**PRINCIPLES RELATING TO PROCESSING PERSONAL DATA**

We find that the planned processing of personal data will be in accordance with the principles under the General Data Protection Regulation regarding:

- lawfulness, fairness and transparency (art. 5.1 a), in that data subjects will receive sufficient information about the processing and will give their consent
- purpose limitation (art. 5.1 b), in that personal data will be collected for specified, explicit and legitimate purposes, and will not be processed for new, incompatible purposes

<https://meldeskjema.sikt.no/631115f2-2c8e-4c62-893b-6c83e9fd961/vurdering>

1/2



[Notification form](#) / [Lesson Study: Challenging Malawi Primary Teachers' Views on tea...](#) / Assessment

## Assessment of processing of personal data

<b>Reference number</b>	<b>Assessment type</b>	<b>Date</b>
438309	Standard	10/11/2022

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Lesson Study: Challenging Malawi Primary Teachers' Views on teaching and Learning the concepts of counting.

### Data controller (institution responsible for the project)

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### Project leader

Janne Fauskanger

### Student

Anita Eves Mlauzi

### Project period

01/08/2022 - 31/08/2023

### Categories of personal data

General

### Legal basis

Consent (General Data Protection Regulation art. 6 no. 1 a)

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[Notification Form](#)

### Comment

#### ABOUT OUR ASSESSMENT

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## **Appendix 2: Questions for Notebook Reflections**

### **Questions for May 2021 PD**

1. a. What is teaching?  
b. What is learning?
2. What are the skills and concepts involved in counting?
3. How would you describe your work as a teacher when teaching counting?
4. What are your thoughts on the observers' role in the research lesson?
5. a. What mathematical content was highlighted for you as we worked on counting in this session?  
b. What ideas about teaching and learning were highlighted for you as we worked on choral counting in this session?
6. What challenges do you think you would be faced with if you were implementing these activities with your own learners?

### **Questions for November 2021 PD**

1. Describe one issue you found particularly interesting in the work you have been doing together with your colleagues since May. Describe what you found most challenging in this work?
2. Highlight issues that you found particularly interesting from listening to the presentation of the other groups.
3. a. Do you find these talk moves relevant in a Malawi context? Why or why not?  
b. Would you like to add any talk moves to the list?
4. Highlight issues that you found particularly interesting from listening to the presentation of the other groups.
5. a. Is there something you do in planning and teaching your mathematics lesson that is not mentioned in the mathematical teaching framework?  
b. Is there something mentioned in the mathematics teaching framework that you don't do?
6. a. What have you found useful for you as a teacher?  
b. Do you think that the PD will have any impact on your future teaching? And in what ways?

### **Questions for May 2022 PD**

1. What is teaching?
2. What is learning?
3. What are the skills and Concepts involved in counting?
4. What are the activities you normally use when counting is the focus of attention?
5. How would you describe your work as a teacher, when teaching counting?
6. What are your thoughts about observers' role in the research lesson?
7. What ideas about teaching and learning were highlighted for you as we worked on choral counting in this session?
8. What questions do you still have?

### **Questions for November 2022 PD**

1. Describe one issue you found particularly interesting. In the work you have been doing together with your colleagues since May?
2. Describe what you found most challenging in this work?
3. Highlight two issues that you found particularly interesting from listening to the presentation of other groups.
4. Do you find these talk moves relevant in Malawi and context? Why or why not?      b.  
Would you like to add any talk moves to the list?
5. Highlight one or two issues that you found particularly interesting from listening to the presentation of other groups?
6. Based on what you have learned from the PD, describe your teaching approach in future lessons on any aspect related to concept of counting?
7. How is it different from your previous teaching approach of the concepts of counting?
8. How would you compare your view of teaching counting before and after the PD?

### Appendix 3: Consent Form for Teachers

## **Are you interested in taking part in the research project?** ***Lesson Study: Challenging Malawi Primary Teachers' Views of Teaching and Learning the Concepts of Counting.***

### **Information to teachers**

This is an inquiry about the participation of mathematics teachers that are part of a lesson study to participate in a research project. The main purpose is to investigate the views of mathematics primary teachers on teaching the concept of counting. In this letter, I will give you information about the purpose of the project and what your participation will involve.

#### **Purpose of the project**

This project is part of my master's studies at the University of Stavanger (Norway), where I will be writing my master's thesis in Mathematics Education. The purpose of my master thesis project is to explore how lesson study challenges teachers' views about teaching and learning the concepts of counting. The study is guided by the following research questions:

- What activities and resources do teachers plan to use to introduce a lesson on counting?
- How do teachers plan to use activities and resources to teach the concept of counting?
- What are teachers' views about teaching and learning the concept of counting as visible in their notebook reflections before and after a LS cycle?

In particular, I am interested in studying:

- a) The draft lesson plans that teachers prepared for the ongoing lesson study.
- b) The revised lesson plans that teachers prepared for the ongoing lesson study.
- c) The resources and activities used during the lesson study.
- d) Teachers' reflections

#### **Who is responsible for the research project?**

The master thesis is written under the supervision of Professor Janne Fauskanger, Department of Education and Sports Science, at the University of Stavanger, Norway, who is responsible for the project. Any questions can be addressed to her on the email: [janne.fauskanger@uis.no](mailto:janne.fauskanger@uis.no), or by phone: +4795240504.

#### **Why are you being asked to participate?**

You are part of the 6 schools have been selected in Zomba district in Malawi. The schools have been selected because they are all part of the lesson study professional development program. I have first contacted head teacher at your school and have been granted permission to go ahead.

### **What does participation involve for you?**

You will be required to submit a draft research lesson plan, a revised research lesson plan, and your notebook reflections.

### **Participation is voluntary**

Participation in the project is voluntary. If you chose to participate, you can withdraw consent at any time without giving a reason. All information gathered will be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw.

### **Your personal privacy – how we will store and use your personal data**

I am only interested in documents that you will submit, guided by the research questions above, and no information that can be used to identify you as a teacher, or your school will be revealed – as personal names and school names will be replaced by codes/pseudonyms. Any personal data that will be collected will be processed confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

- In addition to me as a researcher, only Professor Janne Fauskanger at the University of Stavanger will have access to the data.
- Your documents will be encrypted separate hard disk that is locked away when not used, until is deleted at the end of the project. The list of names, contact details and respective codes used in the transcript will be stored separately from the collected data.

### **What will happen to your personal data at the end of the research project?**

The project is scheduled to end 1.8.2023. All documents will be deleted latest at this date, and only anonymized text will be kept after that.

### **Your rights**

So long as you can be identified in the collected data, you have the right to:

- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified
- receive a copy of your personal data (data portability), and
- send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

### **What gives us the right to process your personal data?**

We will process your personal data based on your consent.

Based on an agreement with University of Stavanger, NSD – The Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with data protection legislation.

### **Where can I find out more?**

If you have questions about the project, or want to exercise your rights, contact:

- University of Stavanger, Norway, via Professor Arne Jakobsen.

- NSD – The Norwegian Centre for Research Data AS, by email: ([personverntjenester@nsd.no](mailto:personverntjenester@nsd.no)) or by telephone: +47 55 58 21 17.

Yours sincerely,

Project  
Leader

Janne Fauskanger  
Professor

Student  
Anita E Mlauzi

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## Consent form

I have received and understood information about the project *Lesson Study: Challenging Malawi Primary Teachers' Views of Teaching and Learning the Concepts of Counting* and have been given the opportunity to ask questions. I give consent:

- to be observed during my teaching the of research lesson
- for my research lesson plan for the teaching analysed.

I give consent for my personal data to be processed until the end date of the project, approx. 1.8.2023

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(Signed by participant, date)

### Appendix 3: Consent form for Head teacher

## **Are you interested in taking part in the research project?** ***Lesson Study: Challenging Malawi Primary Teachers' Views of Teaching and Learning the Concepts of Counting***

### **Information to the Head teacher**

This is an inquiry about the participation of mathematics teachers that are part of a lesson study to participate in a research project. The main purpose is to investigate the views of mathematics primary teachers on teaching the concept of counting. In this letter, I will give you information about the purpose of the project and why I am asking you for permission to approach the mathematics teachers teaching standard 1 & 2 (grade 1 & 2).

#### **Purpose of the project**

This project is part of my master's studies at the University of Stavanger (Norway), where I will be writing my master's thesis in Mathematics Education. The purpose of my master thesis project is to explore how lesson study challenges teachers' views about teaching and learning the concepts of counting. The study is guided by the following research questions:

- What activities and resources do teachers plan to use to introduce a lesson on counting?
- How do teachers plan to use activities and resources to teach the concept of counting?
- What are teachers' views about teaching and learning the concept of counting as visible in their notebook reflections before and after a LS cycle?

In particular, I am interested in studying:

- e) The draft lesson plans that teachers prepared for the ongoing lesson study.
- f) The revised lesson plans that teachers prepared for the ongoing lesson study.
- g) The resources and activities used during the lesson study.
- h) Teachers' notebook reflections.

#### **Who is responsible for the research project?**

The master thesis is written under the supervision of Professor Janne Fauskanger, Department of Education and Sports Science, at the University of Stavanger, Norway. Any questions can be addressed to her on the email: [janne.fauskanger@uis.no](mailto:janne.fauskanger@uis.no), or by phone: +47-95240504.

#### **Why am I asking for permission to collect data at your school?**

I have selected a sample of 6 schools in Zomba district in Malawi. This district has been selected because they are all part of the lesson study professional development program. I would like to seek permission from you as the head teacher to carry out research at your school. I would like

you to work with grade 1 & 2 teachers that were part of the lesson study professional development in May 2022.

### **What does participation involve for your school?**

Teachers at your school will be required to submit the research lesson plans that they prepared for the research lesson and notebook reflections.

### **Participation is voluntary**

Participation in the project is voluntary. If you allow me to involve teachers at your school, all information gathered about them will be made anonymous. There will be no negative consequences for them or your school, and they can withdraw at any time from the project.

### **Personal privacy of participating teachers– how we will store and use their personal data**

I am only interested in the research lesson plans and notebook reflections guided by the research question above, and no information that can be used to identify teachers or your school will be revealed as personal names and school names will be replaced by codes/pseudonyms. I will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

- In addition to me as a researcher, only Professor Janne Fauskanger at the University of Stavanger will have access to the data.

### **What will happen to your personal data at the end of the research project?**

The project is scheduled to end 1.8.2023. All documents will be deleted latest at this date, and only anonymized text will be kept after that.

### **What gives us the right to process teachers' and children's personal data?**

We will process teachers' data based on their consent.

Based on an agreement with University of Stavanger, NSD – The Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with data protection legislation.

### **Where can I find out more?**

If you have questions about the project, contact:

- University of Stavanger, Norway, via Professor Arne Jakobsen.
- NSD – The Norwegian Centre for Research Data AS, by email: ([personverntjenester@nsd.no](mailto:personverntjenester@nsd.no)) or by telephone: +47 55 58 21 17.

Yours sincerely,

Project Leader

Student

Janne Fauskanger  
Professor

Anita Evess Mlauzi

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## Consent form

I have received and understood information about the Project *Lesson Study: Challenging Malawi Primary Teachers' Views of Teaching and Learning the Concepts of Counting school* and have been given the opportunity to ask questions. I give consent:

- to the researchers to contact mathematics teachers at my school and ask for volunteers to conduct research as outline above.

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(Signed by participant, date)