COMPARATIVE STUDY OF TEACHERS' EXPECTATIONS, INSTRUCTIONAL PRACTICES AND LEARNERS' COMPETENCE IN MATHEMATICS IN UGANDA

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Declaration

I, Kisa Sarah, declare that this dissertation titled "Comparative Study of Teachers' Expectations, Instructional Practices and Learners' Competence in Mathematics in Uganda" is my original work which has never been submitted to any institution for any award. I am now submitting it Kyambogo University Graduate School with the approval of my supervisors.

Signature: ………………….. Date: ……………………..

Student

Approval

This dissertation titled “Comparative Study of Teachers’ Expectations, Instructional Practices and Learners’ Competence in Mathematics in Uganda” by Kisa Sarah has been developed with our guidance. We as supervisors confirm the work done by the candidate under our supervision.

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Dedication

Dedicated to my children Felicitas, Dorcas, Deborah and Albert

Acknowledgement

I wish to thank all the people who have helped me during the preparation of this dissertation. Very special thanks to my supervisors, Associate Professor Godfrey Ejuu and Associate Professor Joyce Ayikoru Asiimwe who always found time to read through my work and offer very prompt and valuable feedback. Your invaluable professional support has enabled me to advance my research experience. Many thanks to my classmates Carol Kavuma, Deborah Kyazze and Matha Apolot with whom we have always worked extremely well as a team throughout our PhD endeavour. Finally, I say thank you to my family who have allowed me time to pull everything together. It has been a great blessing working with you all.

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Abbreviations and Acronyms

AAMT	-	Australian Association of Mathematics Teachers
DEO	-	District Education Officer
MoES	-	Ministry of Education and Sports
NAPE	-	National Assessment of Performance in Education
NCDC	-	National Curriculum Development Centre
NRC	-	National Research Council
P.1	-	Primary One
P.2	-	Primary Two
P.3	-	Primary Three
P.7	-	Primary Seven
PLE	-	Primary Leaving Examination
SACMEQ	-	Southern and Eastern Africa Consortium for Monitoring Education Quality
SRS	-	Simple Random Sampling
SST	-	Social Studies
UNCST	-	Uganda National Council for Science and Technology
ZPD	-	Zone of Proximal Development

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Operational Definition of Terms

Expectations:	The perceptions, ideas and beliefs teachers have about the current and future mathematics ability of the learners.
Instructional practices:	What the teacher does or says deliberately and consistently during the lesson in a one-to-one interaction with the learners in order to support and guide the learners and make the learning process individualised for the benefit of the learners.

Abstract

The study explored Primary One teachers' expectations of their learners' competence in mathematics and the instructional practices teachers could adopt to enhance the competence. The focus was on establishing how teachers' expectations influence learners' competence; determining the most mastered mathematics competences by the learners; and examining instructional practices teachers should use to help learners attain competence. A mixed methods survey was used among 74 purposively selected P.1 teachers and 296 randomly selected learners from 37 schools in each of Busiro North and Luuka North County. Data collection tools included a questionnaire, lesson observation schedule, oral interview guide, learners' mathematics test and artefacts of learners' work. The t-test for independent groups was used to compare learners' test scores, while Pearson's correlation coefficient established the relationship between teachers' expectations and learners' competence. Learners were most competent in working with numbers 0 to 9, with over 80% able to score at least 7 out of ten. However, at least 3 % of the learners could neither count nor write any number. Learners from Busiro performed better overall (M = 25.24, SD= 6.22) compared to those from Luuka (M = 20.35, SD= 9.66). Statistically significant relationships were found between teachers' expectations and learners' competence for Busiro and Luuka (r = 0.711, r = 0.596, p = 0.01) respectively. Teachers considered learner's age; language for instruction; and nursery school attendance important background factors for enhancing P.1 learners' competence in mathematics. Teachers used various instructional practices to enhance the learners' mathematics competence. These included use of songs, rhymes and games with mathematical concepts. However, not more than 10% of the teachers from either study area used practices which are promotive of the learners' competence in mathematics such as pair work, visual prompts, and learner explanation of ideas. A few teachers used practices that demote competence in mathematics like ignoring learners when they laugh at a classmate who makes a mistake while attempting a task at the chalkboard, and calling on the next learner to attempt a task when the first learner has failed and has not been given any feedback or support to correct a misconception. The findings indicate a need for teacher education courses in Uganda to inform pre-service teachers about teacher expectations and their influence on learners' competence. Teachers in Busiro and Luuka North Counties are encouraged to consistently use practices like learners' justifications of their ideas in all mathematics lessons and ensure that no learner begins a new lesson when they still have misconceptions from the previous lesson.

Chapter One

Background to the Study

Introduction

Contemporary research in mathematics education has focused on the teacher's role in improving the learners' mathematics achievement. Researchers have studied teachers' expectations and how they influence learners' achievement with emphasis on racial minority students. The current study extended this body of research through a comparative analysis of Primary One teachers and learners from Busiro North and Luuka North Counties in Uganda. This chapter highlights the historical, conceptual and contextual background aspects of the problem that was investigated. This is followed by the problem statement, purpose, objectives, scope and significance of the study. The chapter ends with a discussion of the theoretical underpinnings of the research and an illustration of the conceptual framework for the study.

Background to the Study

Mathematics is indispensable as a tool for transformation in both developing and industrialised societies, as it accelerates technical capabilities and advancements in science, technology and engineering (Ogan, 2015). Products of mathematical research are widespread and benefit global social progress. Examples of such products include: multifunctional computers that enable the use of satellite and fibre-optic networks for information and communication technology via mobile telephones and internet communications; weather forecasting and prediction; fast , comfortable movement resulting from designs of fuel efficient vehicles and aeroplanes; traffic control; efficient and effective transactions between bankers and customers; high-tech security gadgets; and state of the art medical imaging and diagnostics (Dambatta, 2013 as cited in Ogan, 2015; Fatima, 2015). Indeed, modern technology would be unimaginable without mathematics (Hansson, 2019).

Mathematics is not only a very important and globally compulsory school subject but it also plays a fundamental role in an individual's daily life activities. It is useful at work for planning and managing job schedules; at home for planning and preparing meals; in commerce while selling or buying goods and in health to manage medicine dosages; and in each and every other human daily life activity as we navigate through this complex, computerised and technologically fast developing world (Iyanda, 2017; Ogan, 2015; Uwadiae, 2017). A good knowledge and understanding of mathematical concepts at the onset of education evidently facilitates children's learning of other school subjects like science, music and fine art (Frye et al., 2013). Notably, industrialised countries like Germany and the United Kingdom have been able to develop because of the technical capabilities built over time through advancements in science driven by mathematics (Fatima, 2015). Thus, early development of mathematics skills in children like addition, subtraction and multiplication of numbers becomes an issue of paramount importance if least developed countries have to make it to the level of the developed world (Clements, Sarama, Spitler, Lange & Wolfe, 2011; Shanley, Clarke, Doabler, Kurtz-Nelson & Fien, 2017). To realise this cause, the teachers' role is crucial in providing the necessary motivation and experiences for the learners to master the mathematical skills and augment competence (Cairns, 2015)

Elementary mathematics, which embeds competence in basic number operations; nonstandard measures of time and distance; and drawing of basic shapes is indeed a very important building block for lifelong learning (Crouch & Montoya, 2017; Mallows & Litster, 2016; Windisch, 2015). But there are studies that testify that physical infrastructure, scholastic materials, qualified teachers and children's innate academic ability may not, on their own necessarily translate into educational success (Vermeulen, 2013; Wamala, Omala & Jjemba, 2013; Wei & Dzeng, 2014; Yan, 2009).

One intriguing factor often under looked in the learners' mathematics achievement is the teachers' expectations of the learners' competence (Rubie-Davies, 2007). Teachers' expectations and the associated instructional practices play a primary role in fostering among the learners the foundational competences in mathematics (Domitrovich et al., 2009; Perkins, 2015).This makes access to the best mathematics education attained through the most appropriate instructional practices every child's right. In the early years' mathematics lessons, teachers ought to exhibit very high expectations of all learners' competence, and employ intentional, very well executed and effective instructional practices that lead children to mastery of mathematical skills and augmented mathematics competence (Alber, 2014; Cairns, 2015).

High expectation teachers have been reported to ask learners higher order questions, use more complimentary language when interacting with them and generally help learners succeed (Kaplan & Owings, 2013; Rubie-Davies, 2010). On the contrary, teachers with low expectations assign blame for failure on learner characteristics, respond angrily, and belittle the learners' efforts to attain competence (Ramirez, Hooper, Kersting, Ferguson & Yeager, 2018; Tunner, Rubie-Davies & Webber, 2015). Ideally, all teachers should exhibit high expectations for all learners and help them to reason mathematically and use the mathematics concepts learnt to solve their daily life problems and avoid drilling them on mathematical facts and formulae (Altinyelken, 2010; Reed & Andrews, 2016). Teachers can achieve this by employing specific strategies like cooperative learning, structured group work, frequent assessment, intervening immediately, involving parents and guardians to break cycles of low aspiration, and learning to learn (Sharples, Slavin, Chambers & Sharp, 2011).

This approach has been exemplified in Singapore where 15-year olds rank among the best mathematics students internationally and with schools and parents having pride in high but achievable expectations for all learners; specialised elementary mathematics teachers; individualised learning; few topics covered in greater depth compared to other countries; and "mathematizing children's thinking" (Vasagar, 2016; Wei & Dzeng, 2014). In China, a learner's homework is marked when they are present then the learner does corrections in person to strengthen their competence (National Research Council [NRC], 2010).This study will make a contribution to the growing body of research in improving young children's mathematics competences.

For Uganda, a citizenry competent in mathematics is important for scientific, industrial, technological and social progress. Unfortunately, in the case of Uganda, the country has continued to experience declining performance in mathematics right from P.1. Regionally, the Southern and Eastern Africa Consortium for Monitoring Education Quality (SACMEQ) 2010 project ranked Uganda eleventh out of 15 countries on the numeracy proficiency of primary six learners (Ministry of Education and Sports [MoES], 2014). In addition, SACMEQ found that nearly 39 % of the Ugandan test takers performed below the lowest performance benchmark in mathematics as compared to an average 32% for other countries that took the same assessment (Education Policy and Data Centre [EPDC], 2014).

Apparently, despite the unprecedented usefulness of mathematics, the learning of the subject remains a challenge in the Uganda education system. This is also indicated by the subject's ranking in performance at the national Primary Leaving Examinations (PLE) done at the end of the seven years primary school cycle. A comparative performance in the four subjects of Mathematics, English Language, Science and Social Studies (SST) shows that between the years 2009 and 2017, mathematics has never been ranked as the best done subject but has taken either the third or fourth position in six years, coming second only twice in 2009 and 2014 (Ahimbisibwe, 2012; Ahimbisibwe, 2017; Musoke, 2015; Mwesigye, 2009; Ssenkabirwa, 2013).

At the local level, learner competence in mathematics varies from one district to another. In the study area of Busiro North County, Wakiso District for example, primary schools rank among the best performing in Primary Leaving Examinations (PLE), with some schools having up to 99 per cent of pupils passing in grade one in the years 2010 – 2019 (Ampurire, 2017; Businge, 2010; Mayanja, 2018; Ssebwami, 2020). On the other hand, in the same period of 2010 – 2019, the study locality of Luuka North County in Luuka District was listed among the ten worst performing districts in the country (Yolisigira, 2014). On average only 2.2 per cent of learners have been passing at the first grade level (Kimbowa, 2015; Mubiru, 2020) and in 2011 the district had 32.9 % of PLE candidates failing (Makuma & Mukama, 2012). This created a need to explore the levels of the P.1 teachers' expectations of their learners' competence in mathematics. This was done alongside an analysis of the instructional practices to identify what these teachers in Busiro and Luuka North Counties who set the foundation in the cognitive and affective domains (Leader in Me, 2018) of the learners' mathematics competence do differently to warrant the remarkable difference in performance.

In addition, whereas Uwezo (2016) ranked Wakiso district second with 54.3 per cent of P.3 to P.7 learners assessed able to perform P.2 division, Luuka was ranked 84th, with only 22.2 per cent of P.3 to P.7 learners assessed able to perform P.2 division. A similar inter-district comparison found 97 per cent of P.3 learners in Wakiso district with the desired numeracy competency level; the corresponding figure for Luuka district was 71 per cent (National Assessment of Performance in Education [NAPE], 2015). There are such wide variations in the mathematics competence of P.3 – P.7 learners in the two districts, while the mathematics competence of P.1 learners needs an independent investigation. There are also no reports of comparative studies on the mathematics competence of P.1 learners done between any of the best and worst performing districts in PLE in Uganda. This creates a need to explore what the Primary one mathematics teachers in Busiro and Luuka North

Counties who set the foundation in the cognitive and affective domains (Leader in Me, 2018) for the learners' mathematics competence do differently to warrant the remarkable difference in performance.

The P.1 learners in Uganda are expected to attain competence in basic numeracy including 2-digit number operations (NCDC, 2006). This basic numeracy is fundamental for their optimal mathematics competence in higher classes. However, Bold et al., (2017) found 50 % of Uganda's P.3 learners unable to compare and arrange numbers from 0 up to 999. Similarly, NAPE (2015) reported that only 29.1% of pupils in P.3 were able to apply addition, and 26.7% were able to apply subtraction in novel situations; while only 21% of the pupils could multiply using tables. This means that the learners' mathematics competence decreased with increasing task level. Likewise, observing no competence improvements since 2010, Uwezo (2016) found only 30 % of P.3 learners in Uganda proficient in P.2 numeracy. This implies that children were being promoted from P.1 to other class levels and more so in public primary schools without attaining the basic mathematics competences (Uwezo, 2015).

In the event when learners do not attain the desired mathematics competence, they are faced with a hindrance in their further development of mathematical skills (Baroody, 2010; Kenny, 2014). The unsatisfactory P.3 – P.7 learners' performance implies that mathematics education in the primary schools is not helping the majority of children prepare for the real life mathematical challenges faced after PLE. The highest levels of numeracy assessed for these P3 – P.7 learners correspond to the educational targets of

P.2 with the assumption that in an effective education system, almost all P3 – P.7 learners would be able to successfully do all the P.2 numerical tasks (Uwezo, 2016).

Nevertheless, evidence from research shows that P.1 learners possess mathematics abilities from their daily life and academic experiences and are capable of attaining high competence levels in the classroom when their teachers hold high expectations of them (Gee, 2012; Hailikari, Katajavuori & Lindblom-Y, 2008, Cairn, 2015). Teachers' expectations are regarded as the ideas that the teachers hold about the potential academic attainment of their learners (Rubie-Davies, 2007). The teachers' expectations are important since they determine the level and types of instruction teachers plan for the students and can result in substantial impact on the learners' performance. In the seminal experimental study in the field of teacher expectations (Rosenthal & Jacobson, 1968), which was based on purported test scores, teachers were made to believe that some learners in each class in one school would suddenly blossom that year. Indeed, significant increases were shown for the 'bloomers'. The researchers argued that the teachers must have interacted differently with the bloomers and that these differential behaviours led to enhanced performance (Rubie-Davies, 2006). However, teacher behaviours were not measured in that seminal study.

Considering some aspects of the teachers' classroom behaviour that might create different learning environments during P.1 mathematics lessons and perhaps lead to gaps in knowledge acquisition, Shindler (2008) asserts that whatever a teacher does or says, including the body language, pattern of actions and voice tone, all send a message to the learners about the teacher's expectations of their performance. Noting that learners invariably interpret the message, Shindler (2008) adds that over time, learners make judgements of whether their teacher has high or low expectations of them, irrespective of whether these teacher expectations are unconscious, explicit but not written or written classroom rules. But arguing that teacher expectations have powerful effects on learner performance, Wentzel, (2006) cited in Shindler (2008) urges teachers not to communicate their biases since they affect what they say and do but instead struggle to promote positive, functional and healthy explicit expectations so that learners know what the teacher expects of them, have a clear sense of what it takes to perform a task and understand the learning tasks better.

More recent research has produced evidence that learners with high expectation teachers improve achievement by more than one standard deviation in one year when they are compared with learners of low expectation teachers who make very few if any academic gains (Rubie-Davies, 2010). Such variations in the learners' academic attainment may be attributed to pronounced differences in the instructional practices of high and low expectation teachers (Rubie-Davies & Rosenthal, 2016). This suggests that if teachers could be taught specific practices of high expectation teachers, learners' attainment could increase substantially. These studies from the developed world may not reflect the teachers' expectations and learners' mathematics competence situation in Busiro North and Luuka North Counties. This is why the current study sought to describe the relationship between teachers' expectations and their learners' competence in mathematics at the very beginning of formal education.

In the current study, teachers' expectations are on one hand explored basing on learners' background, the curriculum content and the teachers' instructional practices as depicted by both teacher and learners' routine classroom procedures. On the other hand, instructional practices are conceptualised by ten major components. These are: building on the learners' existing knowledge connected to their daily life activities; modelling tasks for the learners (showing and telling or using verbal and visual cues); presenting learners with opportunities to explain their ideas; giving learners sufficient time at task to carry out classroom mathematics activities whether oral, written or practical; offering learners timely and supportive feedback; drilling learners (using the traditional teacher-centred mode); using assessment for grading learners; using mathematical songs, rhymes, drama and games; using pair work during problem solving; and the use of appropriate wall charts for numbers. Other components of teacher instructional practices are explored in combination as "other common teachers' instructional practices".

Besides having high and achievable expectations of their learners, effective P.1 teachers ought to behave in interactive ways with the learners, encouraging them to apply their own numerical problem solving strategies and procedures, and to explain these strategies and procedures to their peers (Dooley, 2011; Dunphy, 2011). Additionally, other studies suggest that learners benefit from teachers' instructional practices like using learners' prior knowledge; debating mathematical ideas; and supportive feedback (Gordon, 2006; McCombs et al., 2011; NicMhuiri, 2011). With these practices, the teachers help the learners to develop better number sense, master the basic number operations facts, and build a strong basis for further mathematics success. The Uganda primary school curriculum stipulates that a child attains competence in the addition and subtraction of 2 –digit numbers; in the multiplication of 2-digit numbers by 2, 3 and 10; and in telling the time of the day as morning or night, the days of the week, and the months of the year. Other competences to be attained by the end of P.1 include measuring lengths and capacity with nonstandard units; recognising money up to 1, 000 shillings; and drawing basic shapes (NCDC, 2006).

Undoubtedly, teachers' instructional practices are critical in uplifting learners' mathematical proficiency. Crawford, Saul, Mathews and Makinster (2005) believe the best instructional practices promote active learning; critical thinking; enable children to learn fully; apply what is learnt in real situations; and debate ideas constructively. Using such instructional practices, teachers offer guidance through questions that enable learners solve problems using their own strategies; direct learning without telling; and ensure mistakes are inspected (Office of Superintendent of Public Instruction [OSPI], 2018). If teachers in Busiro North County and Luuka North County ignore these instructional practices, their learners' mathematics success will remain unachievable even as they complete the primary school cycle (Makuma & Mukama, 2012; Mubiru, 2020). However, there is evidence that learners get to P.3 when they lack the basic numeracy skills intended for P.2 (Uwezo, 2016). Even as they progress to higher class levels, it is not until P.5 that at least 50 % of the learners attain full P.2 basic numeracy (Atuhurra & Alinda, 2018;

Uwezo, 2016). This means that for the majority of the learners in the mathematics classroom, little attainment of competence occurs as they move from one class level to another. These learners lag far below their class level (Gilligan, Karachiwalla, Kasirye, Lucas & Neal, 2018).

Failure to master such basic mathematics at the very start of formal schooling definitely leads to difficulties in learning more advanced mathematics (Baroody, 2010; Clements & Sarama, 2005). This research attempts to explore and provide new ideas on how P.1 teachers could use various instructional practices to develop their learners' mathematics competence. This section has detailed the conceptual and contextual aspects of the problem studied. The section that follows is a formal statement of the problem for this study.

Statement of the Problem

When elementary grade teachers have high expectations of all learners and anticipate excellent competence development from them in any subject, the learners perform better (Rubie-Davies, Peterson, Irving, Widdowson & Dixon, 2010; Turner, Rubie-Davies & Webber, 2015).

There are reports of significantly different levels of primary school learners' competence in mathematics for Busiro North and Luuka North Counties. Busiro has repeatedly recorded more than 48% of its P.3 –P.7 learners attaining P.2 numeracy competence, whereas Luuka has reported only 22 % (NAPE, 2015; NAPE 2018; Uwezo, 2016; Uwezo, 2019). Failure by large proportions of the P.3 –P.7 learners to demonstrate competence in P.2

mathematics could be an indicator that teachers do not interact with them in ways that promote attainment of the set mathematics learning outcomes. This in turn implies that the majority of learners are being promoted from P.1 to other class levels without attaining the required competence in mathematics (Uwezo, 2015).

Several studies have associated teachers' expectations with their learners' mathematics achievement (Peterson, Rubie-Davies, Osborne & Sibley, 2016; Riegle – Crumb & Humphries, 2012; Rubie-Davies, Hattie & Hamilton, 2006; Rubie-Davies & Rosenthal, 2016). However, the majority considered teacher expectations of individual learners and in the perspectives of ethnic minority or a disadvantaged social -economic background. These learners' demographics on which the studies focused are not applicable in Busiro and Luuka North Counties. In addition, studies do not compare teachers or learners across geographical locations (Chang & Demyan, 2007; Dee, 2005; Diamond & Randolph, 2004; Trang & Hansen, 2020). Furthermore, few researchers like Rubie-Davies and Rosenthal (2016) delved into how teachers' expectations could be moderated by instructional practices yet both factors are in tandem. They, however, considered secondary school level and the findings may not address practices for lower primary school teachers.

It is from the foregoing evidence that this study focused on teachers' expectations of the P.1 learners' competence in mathematics at the class level, irrespective of the learners' ethnicity and social economic status (SES). If teacher expectations are not addressed alongside teacher practices that enhance learners' competence in mathematics, learners with low expectation teachers will continue lagging behind those with high expectation teachers (Wang, Rubie-Davies & Meissel, 2019). Basing on the findings of this study, an understanding of how high teacher expectations impact P.1 learners' mathematics competence development will improve both teacher practice and learners' capabilities.

Purpose of the Study

The purpose of this study was to explore teacher expectations and the instructional practices that Primary One mathematics teachers in Busiro North County and Luuka North County can adopt in order to enhance their learners' competence in mathematics.

Objectives of the Study

1. To establish teachers' expectations of the Primary One learners' competence in mathematics in the two study areas

2. To compare the Primary One learners' competence in mathematics in the two study areas

3. To examine the instructional practices Primary One mathematics teachers in the two study areas use in order to enhance their learners' competence in mathematics

4. To determine the relationship between teachers' expectations and their learners' competence in mathematics

Research Question for Objective 1

Which are the prevalent teachers' expectations of the P.1 learners' competence in mathematics?

Research Question for Objective 3

What instructional practices do P.1 mathematics teachers in the two study areas use in order to enhance their learners' competence?

Research Hypothesis for Objective 2

H_1: There is a statistically significant difference between the mathematics competence of P.1 learners in Busiro North County and those in Luuka North County.

Research Hypothesis for Objective 4

H_1: There is a statistically significant relationship between teachers' expectations and their learners' competence in mathematics

Significance of the Study

The outcomes of the study will in general contribute to the growing body of research on how to enhance the mathematics competence of young children. Specific stakeholders outlined below will also benefit from the results of this study.

This study established the teachers' expectations of the P.1 learners' competence in mathematics. It is hoped that the teachers will base on the findings to hold high expectations for all learners, and expect all their learners to attain optimal competence in mathematics by encouraging them, giving them tasks that can be solved in several different ways so that each learner can demonstrate their ability, and giving them positive feedback irrespective of their gender, initial ability or any other background factors. Teacher Training Institutions will also use the findings to prepare pre-service teachers to develop high, achievable expectations of the learners' mathematics competence through having the tutors exhibit and model positive attitudes towards mathematics, and eliminate maths anxiety from the teacher trainees.

Primary school administrators and teachers may find the results useful for sensitizing parents on the importance of having very high expectations of their children's mathematics competence so that parents provide mathematically stimulating environments at home for the children, use mathematical language with the children, and encourage children to think mathematically and apply mathematics in their everyday life activities.

The study also identified instructional practices that teachers can adopt in order to enhance the mathematics competence of P.1 learners. The teachers are urged to use these instructional practices to uplift the learners' mathematics competence by promoting active learning, offering learners guidance through questions that enable learners to solve mathematical problems using their own strategies and applying what is learnt to their life experiences. School administrators and District Inspectors of Schools ought to organise continuous professional development workshops to ensure that P.1 mathematics teachers are updated on, and employ the instructional practices identified in this study to help their learners' attain the desired mathematics competence. Teachers should also be made aware of the influence of their expectations on the learners' mathematics achievement.

The Primary Teacher Education Training Institutions could incorporate the instructional practices identified in this study to enrich their teacher training programs so that the teacher trainees are well equipped to promote the learners' mathematics competence. The Ministry of Education and Sports could design a policy that makes it incumbent for Primary one mathematics teachers to use the instructional practices identified in this study to promote the learners' competence in mathematics.

Scope of the Study

Geographical Scope

The study was limited to two areas in Uganda: Busiro North County in Wakiso District, Central Uganda and Luuka North County in Luuka District, Eastern Uganda. Details about the two study areas are presented in Chapter Three under Location of the Study (p. 77 - 78). The two counties were selected because of the similarities between them: they are both rural, with 82% of their 6 – 12 year olds attending primary school and 62 % of the homes depending on radio as major source of information (UBOS, 2017a; UBOS, 2017b). Furthermore, the two areas were convenient in terms of cost and time expended for data collection.

In addition, the two study areas were chosen to enable the researcher explore the instructional practices particularly used by the high expectation teachers that P.1 mathematics teachers in Busiro North County and Luuka

North County can learn from each other and adopt them in order to enhance their learners' mathematics competence.

Conceptual Scope

The study focused on establishing the most prevalent P.1 teachers' expectations of their learners' competence in mathematics, comparing the learners' competence in mathematics, determining the relationship between the teachers' expectations and the learners' competence in mathematics and examining the instructional practices teachers in the two study areas use to enhance the learners' competence in mathematics. The comparison of two study areas helped to ascertain that the difference in learners' competence existed in P.1, the first class of formal schooling in Uganda. The difference in the learners' competence corresponded accordingly with the difference in the teachers' expectations reported by the study.

Time Scope

The study's time scope was limited to the period 2016 – 2019 during which the study was initiated. Teachers and learners who participated in the study were recruited between April and November, 2019. Data was collected from the teachers of P.1 and the learners' who were in P.1 in 2019.

Limitations and Delimitations

Limitations

The lesson observations were carried out once for each teacher. However, 74 different teachers were observed, 37 from Busiro North and 37 from Luuka North counties on different days. It is hoped that the teachers observed taught typical lessons as they normally do. The outcomes of the 74 lesson observations have been compiled to get a general representation of the teachers' use of the instructional practices that are of interest for this study. Therefore, a note of caution needs to be taken when inferring the study's findings to other counties in Uganda.

On the other hand, the learners' mathematics competence was evaluated at different times of the school year. Variations in content coverage by the different learners and hence in what ought to be included in the test items may have their own limitations in judging the learners' competence. Simple random sampling of the learners whose competence was evaluated for this study evened out any biases or errors in the test item variations.

Lack of a standard tool for measuring teachers' expectations, made the researcher rely on the teachers' own judgement of their expectations as indicated by the questionnaire responses (self-reported data). Using the sequential data collection approach rather than the concurrent one, would have started with collecting quantitative data. Doing preliminary analysis of the quantitative data and then collecting qualitative data on teachers' instructional practices after establishing their expectations of the learners' competence in mathematics could have improved on the self-reported teachers' expectations. Consequently, the researcher would have been able to better establish teachers' expectations first then observe teachers with either high or low expectations in order to distinguish clearly their instructional practices since promotive instructional practices were used by small proportions of the teachers in both study areas.

Delimitation

The findings of this study will apply to only the P.1 learners and teachers in Busiro and Luuka North Counties, at the time of data collection. They will not be generalised to represent the instructional practices that support the mathematics competence of other P.1 learners in other areas of Uganda or in other countries.

Theoretical and Conceptual Framework

This section of the background to the study discusses the theoretical framework and presents the conceptual framework of the study. The theoretical framework details three theories that relate to the study: The Pygmalion effect, the Zone of Proximal Development (ZPD) and the Social Interdependence Theory (SIT). A detailed theoretical review of other theories that relate to the learning of mathematics as advanced by Piaget, Bruner, Dienes, and Skemp is done in Chapter Two. The conceptual framework on the other hand gives a visual explanation of the key concepts and variables of the study with an indication of how they relate to each other.

Theoretical framework

A teacher's mind set about a learner can lead the learner to either succeed or fail in mathematics because often when a teacher sees a learner as an achiever they are likely to interact more with that learner and offer more positive feedback which helps the learner to flourish (Mazarin, 2018). This idea is in agreement with the "Pygmalion effect (Rosenthal effect)" from Rosenthal and Jacobson's (1968) study which hypothesizes that "If teachers are led to expect enhanced performance from children, then the children's performance was enhanced.” The implication is that higher expectations lead to an increase in performance. This study aligned with the Rosenthal effect by initially establishing the teachers’ expectations of their learners’ competence in mathematics in the first objective; followed by comparing the learners’ competence in the second objective; and then finally determined the relationship between teachers’ expectations and learners’ competence in mathematics in the fourth objective.

On the other hand, as learners advance in acquiring mastery of new mathematical knowledge and skills, they perform certain tasks and solve problems without requiring guidance. However, there will be activities in which a learner is not yet at the stage of perfect proficiency and requires assistance from the teacher or a more capable classmate (Siyepu, 2013). This proposition stems from Vygotsky’s (1978) Zone of Proximal Development (ZPD) Theory which supposes that a learner’s problem solving ability has a ZPD composed of all of the knowledge and skills that a learner cannot yet understand or perform on their own (Figure 1.1), but is capable of attaining with the benefit of support from a More Knowledgeable Other (MKO), through shared discourse during the task (Denhere, Chinyoka & Mambeu, 2013). The fourth objective of the study sought to identify any instructional practices that offer learners the support of a MKO.

Within the ZPD Theory, a teacher or more knowledgeable classmate provides the learner with supportive verbal and practical interventions to improve the learner’s evolving mathematics problem solving skills. The support is later stopped as the learner eventually masters new skills. Thus, the teachers' instructional practices that were examined in this study's third objective ought to have been tailored to learner responses and encouraged learners to conjecture, analyse, interpret, explain, and predict information. Learners should also have worked collaboratively in groups as they solved real life mathematical problems (The Practice of Learning Theories, 2009). The instructional practices considered by this research are options for the teachers to adopt as supportive interventions for enhancing the learners' competence in mathematics which was evaluated in the second objective of the study.

Thus, in this study, the ZPD was considered as one fundamental aspect of Vygotsky's Social Constructivist Theory which assumes that knowledge is co-constructed as classmates learn from each other. Teachers' instructional practices should then aim at supporting learning to occur with the participation, assistance and cooperation of all classmates in order to reach each learner's ZPD as demonstrated in Figure 1.1. The theory obliges teachers to ensure that all learners are actively engaged in the learning process and share and strengthen their mathematical knowledge as they interact with their classmates.

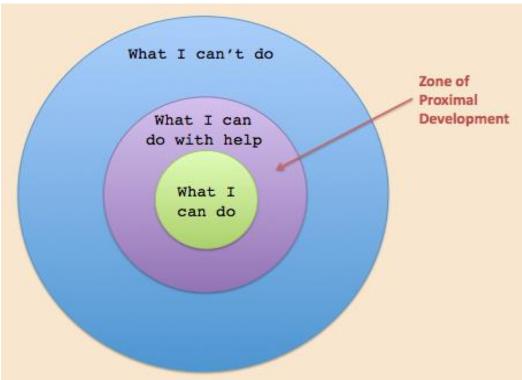


Figure 1.1: Illustration of Vygotsky's Zone of Proximal Development (ZPD)

Source:http://www.instructionaldesign.org/theories/social-development.html

Vygotsky’s ZPD theory was used jointly with Johnson, D.W and Johnson, R. T’s (2005) Social Interdependence Theory (Figure 1.2) applied to education. It states that “Positive interdependence in the classroom results in promotive interaction as classmates encourage and facilitate each other’s attempts to reach the lesson’s goal, such as maximizing each person’s learning” (Johnson, D. W. & Johnson, R. T, 2005; Wickham & Knee, 2012). In this study, it was envisaged in objective 3 that some of the teachers’ instructional practices would create a learning environment in which there is social interdependence among learners, the learners would aim at common learning outcomes, and each learner’s attainment of competence would be affected by the actions of their classmates. Objective 3 of the study sought lesson episodes when teachers applied the Social Interdependence Theory particularly during whole class teaching and cooperative small group work.

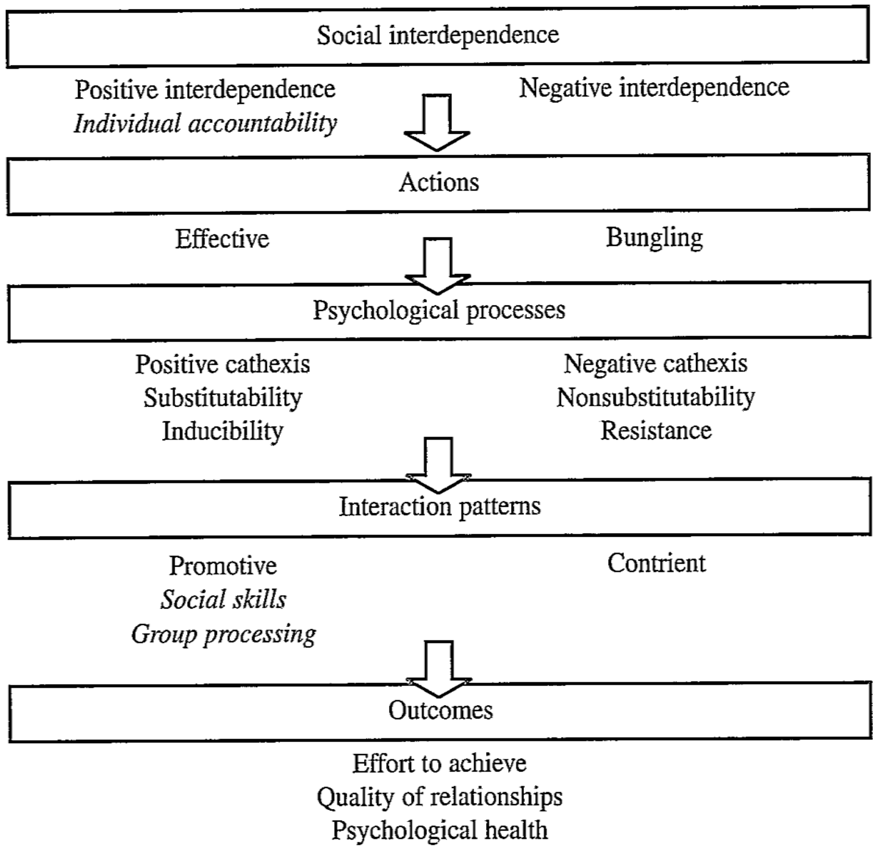


Figure 1.2: Overview of the Social Interdependence Theory (SIT)

Source: Wickham & Knee, 2012.

Figure 1.3 is a diagrammatic illustration of how the learners' competence in mathematics is at the centre of the Pygmalion effect, the ZPD and the Social Interdependence theory. Figure 1.3 demonstrates that teachers' expectations are an overarching factor, manifested through the teachers' instructional practices that aim to support a learner at an individual basis as advanced by the ZPD. However, when the teacher's practices attend to learners in groups of three or more, and even during whole class teaching the social interdependence theory (SIT) has a central role. This happens as the teacher facilitates learners to communicate and cooperate with each other in order to achieve each one's optimal mathematics competence.

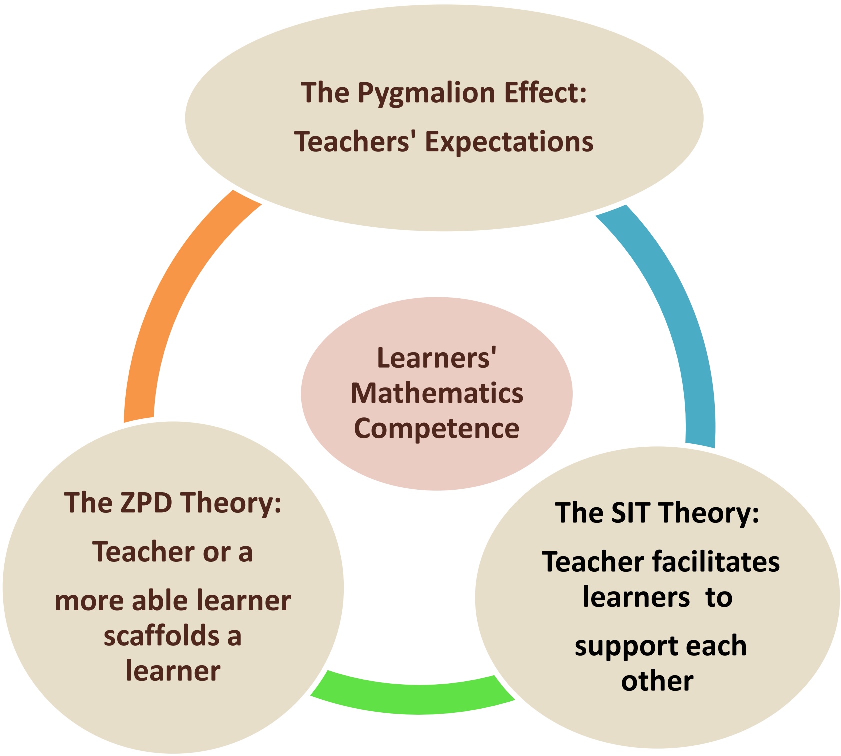


Figure 1.3: Relating the Theories to Learners' Competence

The Conceptual Framework

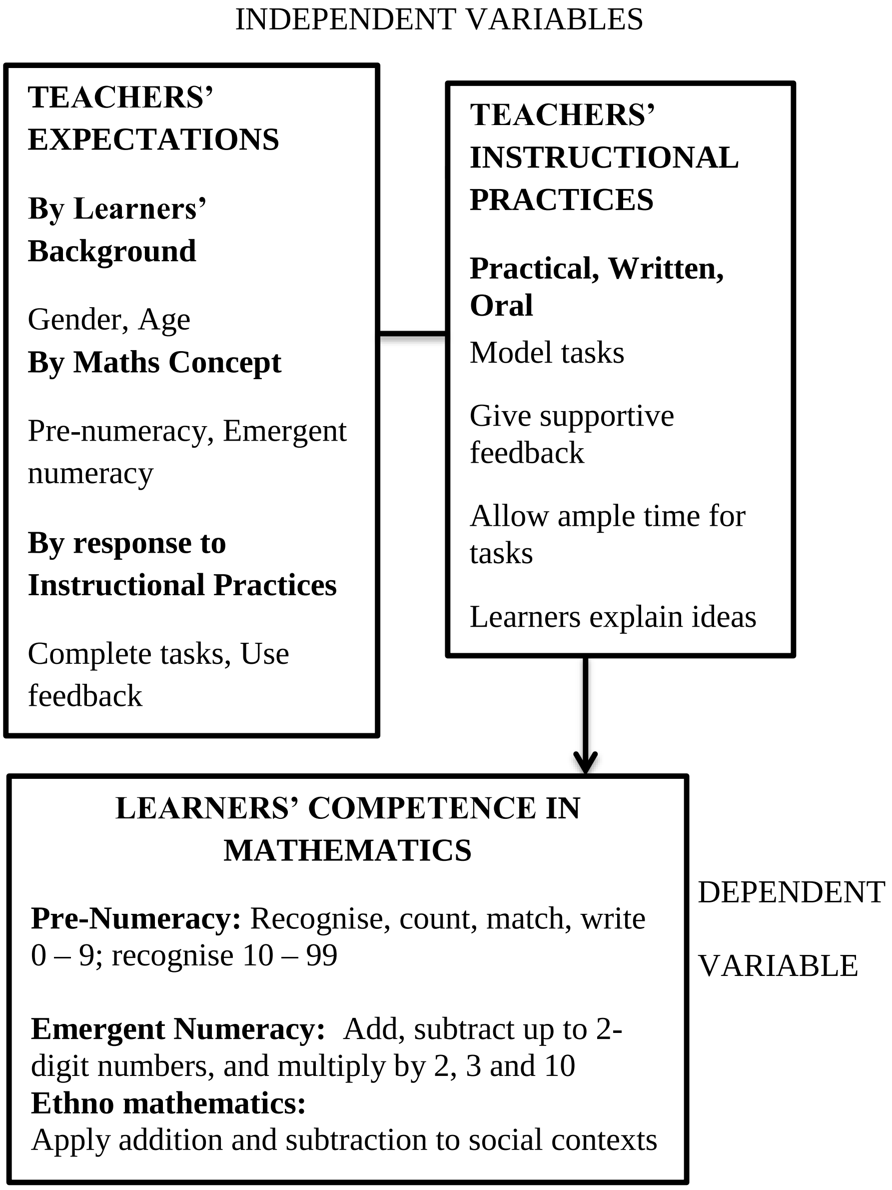


Figure 1.4: The Conceptual Framework

Sources: Domitrovich et al., 2009; Gee, 2012; Hailikari et al., 2008; Perkins, 2015; Rubie-Davies, 2007.

Conceptualization of the Study Variables

Teachers' expectations are the primary independent variable (Figure 1.4). Teachers' expectations are the perceptions, beliefs or ideas that the teachers hold of their learners' mathematics ability. Research shows that teachers form expectations of their learners' abilities basing on the learners' performance records, learners' personal characteristics, identifiable stereotypes, race, social economic status (SES) and staffroom discussions (de Boer, Timmermans & van der Werf, 2018; Trang & Hansen, 2020). For example, teachers in the United States (US) have been reported to hold lower expectations for low-income and African American students' academic ability than for middle and upper income white students (Chang & Demyan, 2007; Dee, 2005). There is evidence to show that teachers adjust their instructional practices to align with their expectations and treat learners differently: exhibiting lower quality interactions for the low-expectancy learners (Rubie-Davies, 2006; Turner, Rubie-Davies & Webber, 2015). For this very reason, this study considered two independent variables.

The teachers' instructional practices are the secondary independent variable (Figure 1.4) of this study. Instructional practices in this study refer to the teachers' verbal and nonverbal instructional (interaction) behaviour through which the teacher facilitates learning to ensure that each learner attain optimal knowledge and skills of a mathematics concept. This includes behaviours aimed at organising the learners, giving directions, presenting ideas and giving feedback. Svanes and Klette (2018) refer to instructional practices as the activities and approaches teachers use as they interact with individual learners including the academic, social –emotional and practical support the teacher gives to individual learners. Consequently, instructional practices in this study are a secondary independent variable which explains and strengthens the relationship between teachers' expectations and the learners' competence in mathematics.

Rationale for the two Independent variables: There is evidence of discriminatory practices or behaviours teachers employ when interacting with learners for whom they hold either high or low expectations for academic achievement (Johnston, Wildy & Shand, 2019; Jussim & Harber, 2005; Rubie-Davies, 2010;), which behaviours are mechanisms for indicating the teachers' expectations (Sæbø & Midtsundstad, 2018). For instance, teachers require high achievement levels from learners for whom they have high expectations and frequently praise these learners (Riegle-Crumb & Humphries, 2012) while the contrary is true for low expectancy learners. This evidence affirms that teachers' expectations and teachers' instructional practices are in tandem, occurring concurrently with each other in a classroom situation. This warranted that this study considers the two as the independent variables to be investigated in the context of the Ugandan primary schools.

The learners' competence in mathematics is the dependent variable (Figure 1.4) of the study. Competence refers to a learner's observable or demonstrable mathematics ability as specified in the Uganda P.1 curriculum. A competence is a mathematical skill a learner acquires over a shorter period than a learning outcome. NCDC (2006) further highlights in the Primary one curriculum that competences emphasize the transfer of learning and they are the genuine abilities of a learner to demonstrate that they have understood the concepts and have also acquired clearly measurable skills. This implies that when a child is competent in mathematics, the child has mastered how to do the mathematics, knows why they are doing the mathematics and when to use that mathematics. Competences provide a basis for assessment in forms of written exercises, tests or examinations (Atuhurra & Alinda, 2018).

Mathematics as a learning area for P.1: According to the National primary school curriculum for Uganda: Teacher's guide primary one (NCDC, 2006), the mathematics strand is composed of numeracy and other conceptual topics in mathematics including: shapes, size, measurements, probability and data handling. The guide emphasizes the need for teachers to develop these concepts from P.1 and for this reason, refers to the learning area as mathematics rather than numeracy. The extraneous variables were controlled through randomisation in the selection of the learners who took part in the study. These were the learners' cognitive and language development, and attendance of pre-school.

Extraneous variables that impact the teachers in the two study areas were identified as: teachers' pedagogical content knowledge (ability to teach and mastery of subject matter); high learner: teacher ratio; ability to meet children's emotional or psychosocial needs (pay attention to and address the whole learner); and the teachers' self-efficacy. Other extraneous variables were school culture; the teachers' mathematics learning and teaching experiences; and the teachers' attitude to teaching and learning mathematics. All these were controlled by initially sampling schools randomly from lists of all the primary schools in a county as provided by the office of the DEO. The teachers were then selected purposively from the selected schools.

Chapter one has laid down the background for this study. The chapter has discussed the importance of mathematics in the development of society; mathematics as a backbone for advancements in science, technology and engineering; and its crucial role in the everyday life of all individuals. Also discussed in the chapter is the situation of mathematics performance in Uganda, particularly in the areas of the study location of Busiro North County in Wakiso district and Luuka North County in Luuka district. The influence of the teachers' expectations and the teachers' instructional practices on the learners' mathematics competence has been emphasized. The theories underpinning the study, the conceptual framework of the study, statement of the problem; purpose; objectives; and research questions were also presented. The next chapter will give arguments from previous research that are related to the different aspects of the current study.

Chapter Two

Literature Review

Introduction

This chapter is a review of literature from previous research on the four objectives of the current study. The review provides a theoretical background to the study while establishing links between aspects of the current study and previous research. In this way, gaps in the existing body of knowledge that form the focus of this study have been identified. The foremost section is a review of the theories that relate to the teaching and learning of mathematics. Next is a discussion of related literature on the first and fourth objectives on teachers' expectations of the learners' competence in mathematics, how the expectations are conveyed to the learners through the teachers' classroom behaviours and instructional practices, and how the learners' competence development is influenced by their teachers' expectations. The third section of this chapter is about previous research findings on the second objective related to the development of the mathematics competence of young children from their preschool years' experiences to the time when they are in P.1. The fourth and final section presents literature on the third objective about the various practical, oral and written instructional practices commonly used by teachers as they endeavour to develop their learners' competence in mathematics. Through this literature review, the gaps that have been filled by the current study are highlighted.

Theoretical Literature Review

The quest for understanding how children learn mathematics has been a perennial challenge for more than five decades (Chahine, 2013). Both philosophers and education theorists have historically sought for the optimal conditions under which elementary school mathematics learning occurs (Zhou & Brown, 2017). Contemporary research has focused on improving the teaching and learning of mathematics through emphasizing the development of the learners' problem –solving capability, their reasoning ability and promotion of learner-to-learner and learner-to-teacher classroom dialogue (Goos, 2004).

One theoretical perspective of individualism is that the development of mathematical knowledge is a process of active individual construction and it owes much to Jean Piaget's 1968 theory of cognitive development (Ojose, 2008). Piaget advanced that since children acquire number concepts by construction from the inside, every child is capable of excellent mathematical reasoning if attention and care are directed to specific activities that are of interest to a child (Alenezi, 2008). In a classroom environment, the teacher's role would involve doing away with any emotional impediments that might give learners feelings of mathematical inability (Goos, 2004). However, Piaget advanced that interaction with adults can hinder a learner's mathematics competence development, advising that what teachers, caregivers or parents can do is to ensure a rich, stimulating mathematical environment in which a learner can experience success (Zhou & Brown, 2017).

Piaget particularly postulated four different stages of cognitive development through which children advance from birth and adolescence. Each stage is marked by the emergence of new intellectual abilities which enable children to understand the world in increasingly complex ways. He claimed that all children pass through these stages of development in a specific order and no child can miss a stage, although some could advance to the next stage at differing paces (Dooley, 2011). Alenezi (2008) outlined these cognitive stages as: Sensorimotor stage (birth - 2 years old) when a child, through physical interaction with the environment, builds a set of concepts about reality and how it works; there is formation of the concept of object permanence and gradual progression from reflexive behaviour to goal-directed behaviour. At the Preoperational stage (2-7 years) a child acquires ability to use symbols to represent objects in the world. Thinking remains egocentric, with the child not yet capable of abstract conceptualization but still dependent on exposure to concrete reality. Piaget observed a deficiency at this stage which he called the reversibility principle where the child cannot grasp the idea of conservation of quantity. During the concrete operations stage (7-11 years), a child shows progress in their ability to think logically. New abilities at this stage of development include the use of operations that are reversible. The child's thinking and problem solving are less egocentric. However, abstract thinking is not yet possible. Finally at the formal operations stage (11-15 years), abstract and purely symbolic thinking becomes possible. Problems can be solved through systematic experimentation. The child becomes capable of constructing formal operational definitions and comprehends abstract concepts.

The most significant implication of Piaget's developmental theory is the teaching of basic mathematics concepts and skills. A teacher should assist the learner to progressively proceed from the concrete to the more abstract modes of thought (Belbase, 2010). The foregoing developmental stages delineated by Piaget are quite relevant to the teaching and learning of mathematics concepts. Furthermore, structuring the physical environment and providing multiple learning centres for learners to be actively and purposefully involved in the learning process is necessary to enhance their psychosocial learning climate (Alenezi, 2008). It is worth noting that although Piaget took into account the child's experience, he underestimated the learners' individual differences and the importance of social interaction in learning (Goos, 2004).

Bruner's 1966 constructivist learning theory disagreed with Piaget's belief (Wen, 2018) that there was a need to wait until the child was ready to be taught the various aspects of mathematics. There is no need to wait for a child to reach a certain age before a particular concept is taught. The beginnings of a complex concept may be presented to a child at an early stage. This brings in the idea of teaching a concept in a spiral fashion, so that it is developed over a period of time. Using Bruner's spiral curve the elementary aspects of a concept are first introduced, then built upon at successive stages making Bruner's model cyclic in nature (Wen, 2018). While Piaget advocated that children will only be able to perform tasks involving abstractions when they reached the stage of formal operations, Bruner believed that with appropriate conditions in place, these children could understand and learn to perform these activities at an earlier age. According to Bruner's theory, the concepts which children acquire to represent the world, develop in three phases: the enactive phase where the child interacts directly with the physical world and previous experiences are represented in motor responses; the iconic phase during which the child works with mental pictures from the real world; and the symbolic phase when a learner ably manipulates symbols. From Bruner’s supposition that intellect develops in the order of enactive-iconic-symbolic, it would be ideal for teachers to present new mathematics concepts in the same order (Chang, Lee & Koay, 2017). Interestingly, both Piaget and Bruner advocated that learning moves from the use of concrete materials to abstract thought.

Dienes in 1995 accepted both Piaget's and Bruner's work and developed appropriate mathematical principles for teaching. His six-stage theory of learning mathematics (Zoltan Diene’s six-stage theory, 2010) portrays learning as a process of increasingly intricate play. According to Dienes, there are two types of play: primary, trial and error or free play involving a learner interacting repetitively with a situation that involves a problem through manipulation and investigation of materials for its own sake; and secondary or symbolization play when the learner attempts to build with materials, discovers patterns and forms rules or generalizations from the patterns found. Dienes believed that children are constructivists by nature who should be allowed to piece together a picture of reality from their own experiences of the real world (Dooley, 2011).

The teacher’s role would involve provision of learning materials that enable learners to have the concrete experience and perform tasks as proposed by Piaget. According to Dienes the learning cycle of concept development begins with free play using mathematical materials. The learners’ experiences are then structured to enhance development of the concepts. Eventually from the structured play, learners gradually abstract the mathematics concepts (Alenezi, 2008). Teachers facilitate learners to find ways to talk about their findings and abstractions from the concrete materials as they also draw pictograms, diagrams and graphs. The next learning phase would consist of attaching mathematical symbols to the concepts (Chihane, 2013). Learners could be allowed to work back and forth from the concrete stage in order for the symbolism to become permanently connected to the concrete experiences.

Skemp on his part in 1976 described two types of understanding that a child can achieve: instrumental understanding, when a child simply applies the rules and does not know why he is doing so; and relational understanding, when the child knows exactly why he is doing what he is it. There is evidence to show that slow learners often use instrumental understanding when dealing with place-value (Gahagan, 2009; Markusic, 2009). Rules are learnt without reason. Learners finally mix up the rules when they become too many for them to recall. This implies that when the learner is confronted with a mathematical task and has a set of rules to use it is unlikely for the learner to consider how the rules work. For such a learner, the reward is the tick that the teacher gives for the right answer (Bee & Kaur, 2014).

Chowdhury (2017) observed that for children who experienced difficulties in learning mathematics, their informal techniques were sound, but when they were required to apply formal, school-derived techniques they performed dismally. When a learner tries to remember mathematics rules and formulae these tend to cloud each other and the outcome is that they cannot be remembered or if remembered they most likely become distorted (Naroth, 2010).

If, on the other hand, learners are to achieve relational understanding, it would require more effort on the part of the teacher and take a longer time since different relationships have to be recognized by the learner (Brookhart, 2008). Once relationships are made, learning becomes more permanent (Lee & Son, 2015). An important characteristic of mathematics learning is making the connection between a set of understandings and the symbol system. The teacher should be able to observe and take note of any persistent errors in the learners' work then offer remedial support (Spencer, 2013).

Vygotsky (1978) was famous for introducing the Zone of Proximal Development (ZPD), the distance between the actual intellectual developmental level determined by independent problem-solving and the level of potential development determined through problem-solving under adult guidance, or in cooperation with more capable classmates (Siyepu, 2013). Through scaffolding, the teacher can facilitate and adjust the learning climate to enhance the learners' positive attitudes towards mathematics and thereby maximize each one's learning. In a sense, ZPD represents the social context in which learning takes place (Goos, 2004), with individual learning essentially guided by the social realm and by interacting with more experienced members of the community. As a socio-cultural constructivist, Vygotsky embraced the social cognition learning approach, which asserts that individual cognition is socially and culturally mediated (Siyepu, 2013).

Like most of the social cognition learning theorists, Vygotsky (1978) believed that culture teaches children not only what to think but also how to think. To Vygotsky, language is the primary form of interaction through which parents; teachers and caregivers pass on knowledge within their culture to the children. This social context shapes the entire range of potential that each child has for learning (Siyepu, 2013). As learning progresses, the child's own language comes to serve as a primary tool of intellectual progression

(Vygotsky, 1978). Therefore, Vygotsky (1978) viewed the process of learning as mainly an internalization of a body of knowledge and tools of thought that first exist outside the child. As a result of his intense emphasis on the social dimension of learning, Vygotsky's view inherently diverges from that of Piaget.

Belbase (2010) argues that Vygotsky was critical of the way Piaget investigated children's cognitive abilities as they worked independently. Belbase proposes that a true measure of individual ability is only discoverable through collective social interactions. Zhou and Brown (2017) also explain that, with the belief that learning is dependent on the learner's ZPD, Vygotsky rejects Piaget's concept of development as a systematic shift from one distinct stage into another and highlights the role played by artefacts in developing a child's cognition. With this theoretical review of how educationists and psychologists view the leaning of mathematics, the next section reviews the teachers' beliefs, perceptions and ideas about the mathematics ability of the children they are in charge of.

Teachers' Expectations of the Learners' Competence in Mathematics

During school time, teachers have daily contact with their learners and it is fundamental that they establish high but achievable expectations for all learners irrespective of their backgrounds. However, there is minimal data on the P.1 teachers' expectations of their learners' competence in mathematics in Busiro and Luuka North Counties. Researchers like Perkins (2015); Speybroeck, Kuppens and de Bilde (2012); and Rubie-Davies (2010) who have investigated teachers' perceptions of the learners' academic achievement basing on learner characteristics and attributes such as gender, ethnicity, social economic status (SES), classroom behaviour and social skills argue that teachers' expectations may exacerbate individual differences between learners especially when they are based on learners' prior performance records. But Papageorge, Gershenson and Kang (2016) argue that indeed teacher expectations matter, they are informative and predictive; therefore it is possible for the expectations to simply reflect accurate forecasts about their learners' abilities without in any way having influence on the learning outcomes. They also base their argument on the view that teachers form perceptions about the learners basing on records of learners' performance. These arguments raise questions as to whether in the absence of learners' prior performance observed by the teachers, they do not have expectations of their learners' academic abilities.

Yet on the other hand, equity or high expectations for success from all learners and their teachers' assurance that whoever works hard can succeed create a growth mind set in the learners (Cairns, 2015; Donald, 2011; Martinez, Martinez & Mizala, 2014; Ramirez, Hooper & Kersting, 2018). This perspective ought to prevail even in the absence of the learners' prior performance. Nevertheless, teachers might have biased expectations for the majority of learners in the classroom which de Boer, Timmermans and van der Werf (2018) refer to as a general bias depending on the learners' gender, ethnicity or Social Economic Status (SES). They report common negatively biased expectations for learners from families with low SES which may in turn result in low achievement for these learners. Teachers have also been found to differ in their average level of expectations for their learners in the classroom, and this can be reflected in their instructional practices (Hughes, Gleason & Zhang, 2005). Generally, high-expectation teachers are reported to spend more time on providing a framework for the children's learning, provide more supportive feedback, frequently interact with learners using higher order cognitive level questions, and handle learners' behaviour more positively when gauged against fellow teachers with a low level of average expectations (Rubies, 2010). Relatedly, pre-service and in-service teachers ought to be informed that teacher expectation bias exists; and that teacher expectations affect their instructional practices and behaviour towards learners; and thereby the mathematics performance of their learners (de Boer et al., 2018).

Whereas performance may differ depending on the amount of information that different learners have had access to, Gatens (2020) advises teachers that as they help learners to attain teacher expectations, teachers ought to help learners with the skill of discernment in identifying quality and reliable information sources. Gatens extends the dimensions of whose expectations matter when he urges teachers to continually communicate with parents who also have their own expectations of their children's success. Whereas this should be the case when teachers set high expectations for all learners, Kaplan and Owings (2013) contend that expectations can create reality. They say this happens when both learners' and teachers' perceptions and expectations reflect and determine their achievement goals; influence the strategies used to meet the goals; also influence the skills, energy and other resources used to apply the strategies; but also influence the expected reward from obtaining or failing to obtain the goal. Kaplan and Owings (2013) go on to advise that:

> It would be better for every child if teachers thought of student potential like an iceberg—most of it hidden from view—and act upon the belief that high trust, high expectations, and high supports will reveal what lies beneath. (Kaplan & Owings, 2013, p154).

On the other hand, if P.1 learners have a perception that their teacher believes that not everyone is good at mathematics, they are more likely to attain lower mathematics competence (Ramirez, Hooper & Kersting, 2018). This could arise as Mazarin (2018) suggests that when a teacher sees a learner as an achiever, the teacher is likely to use more complimentary language, offer extra or after class help, call on the learner more often or even smile at this particular learner more. Undoubtedly, all these teacher practices and positive feedback toward the learner is bound to help the learner flourish.

Nonetheless, contrary expectations and related behaviour that a teacher has towards a learner will most likely promote under achievement. Moreover, this happens irrespective of whether the teacher portrays the expectations directly or indirectly, in verbal or non-verbal forms. This then requires that if teachers are to make success in mathematics for every learner a key goal, they ought to display equity in their practices and expectations for all learners, and provide them with equal incentives, recognition, and support for independent learning (Gulteke, Tomul & Korur, 2013). Drawing comparisons between these classroom situations and similar everyday life social interactions, Speybrock et al. (2012) remark that in any social group, if the value of someone's ideas or contribution is predicted to be high, that person does in fact receive more opportunities to contribute (express an idea or make suggestions) while other group members will more often refer to this person, respect their ideas and go along with their suggestions. Suffice it to say that when this happens in a classroom environment, participation definitely results in learning whereas learners who are withdrawn or fail to get the attention of the teacher and of their classmates are more likely to end up withdrawn, not engaged, and consequently neither learning nor attaining the desired competence (Speybrock et al., 2012).

Strauss (2014) agrees that if a teacher's evaluation raises a learner's expectations by publicly commending them for being strong on a particular and real ability, the learner believes and respects that evaluation. Classmates are also likely to accept the teacher's evaluation as valid, which results in raising the learner's competence. Unfortunately, those teachers with low expectations may harm their learners' mathematics learning when such teachers respond angrily when learners request for help. Other researchers consider such teacher behaviour to arise from the use of traditional rigid forms of instruction, overemphasis of rote learning and spending little time attending to the learners' queries, which in turn creates learning environments that devalue the learners' efforts in lieu of rote memorization of mathematical facts and formulae (Ramirez, Hooper & Kersting, Ferguson & Yeager, 2018). Any interventions that aim at sensitizing these teachers about the impact of their expectations on the learners' performance, and informing them of the beliefs, attitudes and instructional practices of the high expectation teachers could uplift not only the ways in which they interact with the learners but also the learners' competence (Rubie-Davies & Rosenthal, 2016).

Consequently, it is imperative that P.1 teachers create conditions that support and lift all learners regardless of one's initial ability, gender or social economic status. Teachers can commend all learners publicly for being strong on a particular ability, convince learners that there are different ways to be smart by giving mathematical tasks that require multiple abilities in which all learners can receive credit on their intellectual accomplishments, and have learners take turns as leaders in a variety of tasks (Giganti, 2013; Strauss, 2014). For those teachers who could be promoting rote learning because they are sceptical about their P.1 learners' intellectual capacities, Schwartz (2017) assures them that even 5-year olds are not too young to notice, compare and describe simple patterns; and that with practice, they are capable of explaining their mathematical thinking.

The research reviewed in this section has shown that teachers' expectations are widely reported for Afro-American, Danish, Maori and Hispanic learners, more so with teachers perceiving these learners' as low achievers in mathematics (Perkins, 2015; Rubie-Davies, Hattie & Hamilton, 2006; Sunde & Sayers, 2017). However, teacher expectations and their association with the learners' mathematics achievement are understudied in Africa. The cited studies also concentrated on teachers' expectations within a single classroom, and in some cases with the emphasis being on teacher expectations of learners based on their ethnicity, gender and socio-economic background. The current study extended knowledge on teacher expectations by incorporating a comparison of teachers from two geographical locations in Uganda where there are no issues of ethnic minorities and the learners have comparable socio-economic backgrounds. The study aimed at ascertaining the expectations P.1 teachers in Busiro North and Luuka North Counties held for their learners' competence in mathematics, how these expectations related to the learners' levels of competence and the related instructional practices the teachers used to support the learners' achievement. The next section reviews how children develop competence in mathematics.

Learners' Competence in Mathematics

Children demonstrate a natural curiosity to learn mathematics as they explore space, shapes and compare objects of different sizes. There are reports that children as young as six months and nearly all 2-year-olds have knowledge of the basic number concepts (Aunio & Niemivirta, 2010; Baroody, 2010). The young children explore the mathematical dimensions of their environment as they navigate space, play, find patterns and share items equally with playmates (Aunio, Heiskari, Van Luit & Viorio, 2015). For these young children, parents and caregivers play an important role in providing the experiences that they require to construct number concepts without formal instruction. The above reports point to the need for P.1 teachers to base the teaching and learning of mathematics on what the children have already acquired informally.

Relatedly, investigating how children aged 0 – 8 years learn mathematics, Taylor (2014) observed that since mathematics features in our daily routine life, parents and caregivers quite often intuitively draw the attention of infants to mathematical ideas. She says that this happens when the parents and caregivers talk or point out to the children about numbers, quantities, sizes and shapes in their everyday lives; sing songs; recite rhymes; play with toys and objects; get dressed or even get ready for a meal. So from Taylor's (2014) observation, as children grow up, they begin to use the mathematical vocabulary from their early everyday experiences and progressively grow in their understanding to more academic mathematics. It is worth noting that Taylor's concept does not discriminate children according to any individual characteristics, implying that all children have the ability to learn mathematics. The concept also depicts children's learning of mathematics as a continuum, with children adding to and refining their previous understanding (Barmby et al 2009 cited by Taylor, 2014). It also builds on the idea of a spiral curriculum advanced by psychologist Jerome Bruner and commonly followed in mathematics teaching in which learners meet a concept in P.1, say the addition of natural numbers, then meet it in successive classes but study it at a deeper level and with greater understanding of the concept.

So as children learn mathematics, they apparently go through the three stages proposed by Bruner. Initially, children will manipulate concrete objects such as counters in the enactive stage. Next, they represent ideas with models or pictures in the iconic stage. Finally, children advance to the symbolic stage when they can represent mathematical ideas in abstract forms. It is important especially for P.1 teachers to note that the emphasis is on practical activities or kinaesthetic learning at the beginning. In light of this, the National Association for the Education of Young Children [NAEYC] (2010) considers that since children throughout their early years of life explore mathematical dimensions in their environment and grapple with real problem solving, high quality, challenging and accessible mathematics teaching and learning for 3 to 6 year olds is a vital foundation for future mathematics learning.

In order to strengthen such a foundation and ensure academic success in mathematics for all children, Hassinger-das, Zosh, Hirsh-Pasek and Golinkoff (2018) recommend play-full learning encompassing free play, guided play and games. They hypothesise that playful learning entails how humans learn best – when learners are mentally active in discovering new knowledge; engaged without being distracted; interacting with materials in meaningful ways; and socially interactive. Their assumption is in line with the social constructivists influenced by Vygotsky who also believe that knowledge evolves through social negotiation and evaluation so that any encounter between two or more people is an opportunity for obtaining new knowledge or expanding current knowledge (Lynch, 2016). In this situation, teachers are facilitators of learning, who question the learners' answers be they correct or not but with the aim of ensuring that the learner has a good grasp of the concepts (Siyepu, 2013).

Additionally, in a social constructivist learning environment, learners explain their mathematical ideas, procedures and answers and teachers do not let learners use words or equations without giving explanations and reflecting on their answers (Choppin, 2007). Teachers then must realize that mathematical knowledge is acquired as a shared and not an individual experience and encourage every learner to participate actively in all learning tasks right from an early age.

It has also been reported that children are natural problem setters and problem solvers who deal with problems of mathematical nature in their daily lives and play as and when they occur (Dinc, 2015). There is evidence that children learn mathematics through this problem solving as they develop mathematical thinking skills and apply their understanding in meaningful ways; and as they draw upon previous experiences when considering possible ways of solving a particular practical problem and selecting a course of action (Dinc, 2015; Gifford, 2016; Palmer & van Bommel, 2018). These strategies help the children to appreciate mathematics as relevant in their everyday lives and also gain problem solving skills such as identifying the mathematics required; simplifying decision making; representing , organising and checking; recognising patterns; communicating in different modes; predicting; justifying; explaining; conjecturing or hypothesising; and generalising (Taylor, 2014). With such abilities, McLennan (2014) asserts that children are natural mathematicians. McLennan observes that children push and pull toys, fill and empty containers with water, and stack blocks as they experiment with spatial awareness, measurement and problem solving. They also learn to describe, explain and consider ideas from their immediate environment, creatively make sense of the world around them and generally experience mathematics concepts.

Thus, in problem solving, learners deal with non-routine problems as they learn mathematics. They demonstrate their abilities to understand a problem, connect the unknown with the known information to get ideas about the solution, plan the solution, solve the problem using systematic actions and finally re-examine the solution (Siagian, Saragih & Sinaga, 2019). What cannot be ignored is the fact that in this global scientific and technological era, many children also learn plenty of mathematics from accessing the internet, mobile phones, calculators and many other available ICT resources (Morgan, 2013). Mathematics classrooms should then have learning environments that include current and appropriate technologies for the learners. This would ensure that even those learners without access to ICTs at home can learn the necessary ICT skills and enjoy full participation in the 21st century global societies. It would also be a tool for overcoming geographical isolation through connecting teachers, learners and schools to the so much needed learning resources and the broader learning community (Echazzara & Radinger, 2019).

As children start formal schooling and begin to learn formal mathematics, P.1 teachers ought identify and enable progression for children to build on their mathematical knowledge and vocabulary, and provide them with opportunities to initiate activities and follow their interests. Cairns (2015) believes that when children have a growth mind set rather than a fixed mind set, and their parents and teachers regularly expect them to succeed when they solve mathematical problems then the children are convinced that they have the capacity to learn mathematics and develop new skills and techniques. Teachers would not look on passively but they play the role of facilitator, encouraging children to practice and put more effort in their work (Cairns, 2015; ERO, 2016). Similarly, learners should be actively engaged and responsive during teacher-initiated and directed activities. Effective teachers help support the child's learning in both types of activities (Education Review Office [ERO], 2016). Teachers in early grade mathematics classrooms need a sound understanding of mathematics to enable them effectively capture the learning opportunities within each learner’s environment and make available a range of appropriate resources accompanied by purposeful, interesting and challenging activities. Using this knowledge, effective teachers provide scaffolding that extends a learner's mathematical thinking while simultaneously valuing the learner's contribution. With such support, learners develop elaborate, imaginative and deep interests that extend well beyond their initial ideas (Cairns, 2015; ERO, 2016).

Tracking the numeracy skills development trajectory farther, Aunio et al. (2015) recount that at around the age of 3 years children can say the number names; and at 5 years they know that the last said number name indicates the total number of objects in a set. For these 5 year- olds, this marks their developing ability to explain to others their understanding of the mathematical concepts. Aunio et al. (2015) add that at around 5½ years of age, children are able to continue counting upwards from a recognised number.

The ages given by Aunio et al. (2015) are approximate ages for children nurtured in the European education system, with possible inter-child differences. However, they give us a basis of the level at which we expect the Ugandan children's mathematical competence to be as they enter the formal education system. As many children in Uganda begin P.1 at the age of 6 years, teachers need to ensure that their prior mathematical knowledge or "home maths" is appropriately integrated into their learning by utilizing instructional practices that will build every learner's competence.

Formal mathematics education in P.1 in Uganda focuses on children attaining competence in addition and subtraction of numbers from 0 to 99; learning to multiply by 2, 3 and 10; learning about time , measurement, shapes through a practical approach. This dissertation set out to document whether the P.1 learners in Busiro North and Luuka North Counties are at par in attaining the mathematics competences specified in the national curriculum.

Supposing that all learners are mathematically competent, Gonser (2018) expresses discontent that early grade mathematics skills have not received as much attention as literary skills from both parents and teachers. She argues that not enough mathematics is taught in the early grades yet the lessons are a one-size-fits-all with teachers emphasising getting the correct answer! Such mathematics instruction that stresses more on result than process denies learners attainment of the much needed 21st Century skills that go along with numerical skills like learning and innovation skills; life and career skills; and information media and technology skills (Bradshaw & Hazell, 2017; Ndiung & Nendi, 2018). The learners realise a disconnection between the mathematics taught at school and the opportunities they get to use mathematics outside school right from their early grades (Domazet, Baranovic & Matic, 2015; Turner, 2010). Phonapichat, Wongwanich and Sujiva (2014) add that such learners are impatient , do not enjoy reading mathematics word problems, and often simply guess answers without going through any thinking process. The learners' mathematics competence then remains inactive, and if it is not found and supported at the right time or even undermined by inappropriate experiences, it stands to be lost forever (Borovik & Gardiner, 2006; Qudsyi, 2013).

In order to reverse this situation, Milgram (2010) advises that proficiency is much more likely to develop when a mathematics classroom is a community of learners rather than a collection of isolated individuals. Within the community of learners, teachers need to muster and deploy a wide range of resources so as to support the learners to acquire mathematical competence which enables learners to have all career doors open to them. In experiencing such support, Pipkorn (2015) asserts that learners are confronted with both success and failure as their teachers offer them opportunities for productive struggle during the mathematics lessons. Such confrontation offers learners opportunities to become mathematically proficient as they explain to themselves the meaning of a problem, look for entry points to its solution and make sense of quantities and their relationships in real life problem situations.

Learners attain competence in mathematics through attacking tasks from their own angles; exploring; discussing and disagreeing with one another. They fail, succeed, fail again and succeed but the vast majority of learners end up becoming mathematically proficient (Pipkorn, 2015). This proposition is of much significance to mathematics teachers and requires that they give learners opportunities to understand where and why they are wrong, then have chance to correct the misconceptions and errors. Teachers should desist from calling on different learners until one learner gives a correct answer, let alone giving the answer themselves on the pretext of saving time.

Thus, active participation and communication of mathematical thought processes with classmates of higher ability are critical in developing the learners' mathematics competence (MacGregor, 2013; Samuelsson, 2008). When this happens in daily numeracy lessons with a focus on both mental and oral calculations, and suitable but challenging problems and the space and time to solve such problems, it goes a long way to help learners attain fluency (Baroody, 2006 as cited by Cowan, Donlan, Shepherd, Cole-Fletcher, Saxton & Hurry, 2011; Borovik & Gardiner, 2006). Most of the studies that have been cited in this section are from the developed world and may not adequately reflect the mathematics abilities for P.1 learners with rural, peasantry Busiro and Luuka backgrounds. In addition, research on mathematics performance in Uganda has focused on classes from P.3 and above. The present study will document the mathematics competence of P.1 learners in Uganda. Accordingly, the next section reviews some of the circumstances that lead to the perennial low academic achievement of some primary schools in Uganda.

Why Some Primary Schools in Uganda Perennially Post low Academic Achievement

Guloba, Wokadala and Bategeka (2010) observed that teachers in Uganda's primary school use teacher-centered practices leading to poor quality of education. In the end, teacher practices that do not actively engage learners cannot sufficiently exploit their optimal mathematics capabilities and fully develop their problem solving skills. This deficit in problem solving skills carries on to higher levels of education (Baroody, 2010; Dooley, 2011). Similarly, Vermeulen (2013) described the quality of education in Uganda's rural primary schools as low with some areas performing below the national average. Vermeulen on his part cited lack of resources, the distance both teachers and learners commute between home and school, and unmotivated teachers as some of the education quality indicators. From this observation, unmotivated teachers who lack basic survival requirements including clean water, food and housing are bound to have low self-efficacy, hold low expectations of themselves and also of the learners' achievement (Trang & Hansen, 2020). Such teachers consequently interact with learners in ways that do not help them to succeed in developing competence in mathematics (Dee, 2005).

When Atuhurra (2014) analysed SACMEQ data for the years 2000 and 2007, he noted that rural schools in Uganda performed worse than urban schools in mathematics and reading. Atuhurra cited grade repetition and absenteeism as causes for poor performance, and advised that teachers should be forced to adapt their teaching to suit the pupils' learning abilities. Atuhurra and Alinda (2018) relate disparities in the learners' competence to the lack of nationally agreed, well-thought subject-specific comprehensive taxonomies which results in inconsistencies in content coverage in different schools. What ensues is failure to achieve the expected progressive learning as children move from one class to the next. They also observed lack of a systematic emphasis structure on developing learner performance expectations as they progress across grades.

More specifically, Atuhurra and Alinda (2018) report lesson delivery disparities between lower primary teachers in rural and those in urban schools, which disparities undoubtedly disadvantage learners in the rural schools from early on thus making it hard for them to master the basic competences required for progress to upper classes. The implication of this observation is that Busiro North and Luuka North Counties being rural (UBOS, 2017a), their learners have difficulties mastering the basic mathematics competences. It is also worth noting that since 85% of Uganda's population lives in rural areas (UBOS,

2016) most learners according to Atuhurra and Alinda have difficulties mastering the basic mathematics competences.

Arguing that overcrowded classrooms promote aggression among learners which in turn affects their commitment to learning, Wokadala et al. (2019) reported that Uganda primary schools that put up new physical infrastructure during 2016/2017 and 2017/2018 financial years recorded a significant increase of 1.28 percentage points in numeracy compared to those that did not. But as argued by Vermeulen (2013) and Wamala, Omala and Jjemba, (2013) it is evident that learners' academic success neither depends solely on their mental and physical abilities nor on school inputs.

The foregoing local studies have considered factors that hinder learners from excelling in their mathematics but do not focus on teachers' expectations or instructional practices. In addition, these and other studies cited earlier concentrate on investigating competence in mathematics for classes from P.3 to P.7 (Bold et al., 2017; NAPE, 2015; NAPE, 2018; Uwezo 2012; Uwezo, 2016; Uwezo, 2019). Thus, mathematics competence in Uganda is not yet researched in depth for P.1. With that observation, this study contributed to the existing body of knowledge by filling the gap. The next section is a review of the various instructional practices teachers use to promote the grade one learners' competence in mathematics.

Instructional Practices Used by Teachers to Enhance Their Learners' Competence in Mathematics

The way in which a teacher interacts with the learners makes a big difference in the learners' attainment of competence. Several studies report that mathematics teachers at all levels work hard to master their lesson material which they later ‘broadcast’ to the learners as thoroughly as possible (ThinkingKap Learning Solutions, 2015; Turner, Warzon & Christensen, 2011; Verschaffel, Torbeyns & Smedt, 2017; Yan, 2009). Teachers prefer to teach using one textbook, from page to page (Asikin, 2017) and maintain control over the learners by demanding silence (Garrett, 2008). Teachers talk most of the time (70 – 90%), ask most questions (90 – 95%) and reserve the right to evaluate learners’ responses (Brodie, 2007). For the P.1 learners who still have a short attention span or have not yet mastered the language used as medium of instruction, this mode of instruction is very unfavourable. Furthermore, the traditional physical arrangement of most classrooms in which learners’ desks face the teacher promotes focus on the teacher while limiting both the learners’ activities and optimal interactions amongst themselves or with the teacher (Garrett, 2008). Within this model of teaching, the curriculum is worked through too fast for the majority of learners who might even have failed to consolidate earlier mathematical concepts (Markusic, 2009). As the teacher stands at the front of the class asking learners questions and demanding for silence from the learners unless permitted to talk, learners sit passively, copying worked out examples which the teacher does on the board, and have no opportunity to relate the mathematics content transmitted by the teacher to their real lives (DoodleMaths Team, 2016; Gahagan, 2009; Markusic, 2009; University of Manchester, 2012).

Teachers may dwell on rote methods of teaching possibly because of the high stakes accorded to examinations, which examinations commonly focus on what is learnt by rote at the expense of problem solving skills that modern employers crave for. Many learners, however, end up without achieving their maximum mathematics competence and become more alienated from the subject as they grow older, perform it poorly and finally drop it as soon as it is no longer compulsory (Chowdhury, 2017). Moreover, teachers are reluctant to abandon these traditional ways of teaching mathematics in which there is one acceptable approach and one correct answer to the problem (Chowdhury, 2017). But Dooley (2011) observes that rote methods are insufficient for teaching mathematics, affect learners negatively and contribute to their low competence. It is no wonder that employers question the practical capability of many graduates of this kind of education. This study intends to implore teachers to shift from these traditional practices of delivering mathematics lessons and embrace alternative practices that are of much more benefit to the learners as will be recommended in the last chapter.

As teachers endeavour to embrace learner-centred practices, Sodeman (2007) advises that they should also explore and build on the learners' prior mathematics vocabulary knowledge. Sodeman argues that given the high occurrence of unfamiliar vocabulary in mathematics, explicit teaching of vocabulary in all mathematics lessons for grade one learners can increase achievement by up to 39%. He maintains that vocabulary development in mathematics is crucial for the learners' development and understanding of mathematical concepts; building background knowledge; and conceptualizing and connecting new learning to previous learning. This implies that teachers must include in their lesson preparations and classroom instructional practices a variety of teaching strategies and techniques that help learners to develop an extensive mathematical vocabulary right from P.1. Learners must then be given several opportunities to practice, apply and discuss the mathematics vocabulary in writing, reading and verbal communication. Through practice, the vocabulary that becomes part of a learner's background knowledge is what Lent (2012) describes as the glue that sticks old to new mathematical concepts. Borrowing from these reports, in rural Uganda where teaching is done in the area local language for a given school, teachers could help the learners master the technical mathematical vocabulary through code switching between the local language and English language as and when need arises.

In relation to building on the learners' background mathematics vocabulary, Tucker (2019) proposes a "Three things … Word association" strategy for assessing learners' prior knowledge in which a teacher asks learners to pair up and share the first three words that come to mind when a certain mathematics concept is mentioned. Tucker (2019) believes assessing the learners' prior knowledge reveals a lot about the information or misconceptions that learners of all ages come along with into a learning environment. The teacher can then avoid having one-size-fits-all lesson after they have identified each learner's existing knowledge and pay more attention to the knowledge gaps; misconceptions; diversity of the learners' backgrounds and bridging the learners' old and new mathematics concepts (Beswick, 2019; Center for Teaching Innovation, 2020). Discussing how best a teacher can build on what mathematics the learners already know, Sydney and Alibali (2015) suggest that instructional support and learning materials should guide children to make specific, relevant comparisons between highly similar concepts and note useful similarities and differences.

Likewise, the teaching and learning of mathematics should not be a banking- transmission model of knowledge from the teacher who knows to the learners who are blank, passive recipients (Gahagan, 2009; Markusic, 2009). Rather, teachers should engage learners to find out their existing knowledge, life and academic experiences and use them to inform their teaching. Wray (2006) believes this avoids rote learning which is soon forgotten. A learner's existing knowledge may provide a mental hook that leads to success in acquiring new mathematical concepts and lay the ground work for more advanced skills (Manjunath, 2008; Schenke, Rutherford, Lam & Bailey, 2016). However, the teacher should be aware that a learner may also have some mathematical misconceptions that may lead to failure in learning new concepts unless they are identified and corrected. In other cases, some few learners might lack the pre-requisite skills and knowledge for their age or have a learning disability (Igbo & Omeje, 2014) but Pritchard, Lee and Bao (2008) argue that as a learner's prior knowledge increases, the rate at which they learn is positively affected. By first finding out the knowledge that a learner possesses about a mathematics concept, the teacher is identifying the learner's ZPD so that instruction may be precise (Gervasoni, 2016). Teachers ought to provide learners with the right environment, encouragement and guidance through instructional practices that build on a learner's natural curiosity for developing mathematical skills (Campbell, L. & Campbell, 2009). This helps both teacher and learner to maximize the learning opportunities.

Furthermore, getting learners to be actively involved in learning mathematics through purposeful peer-to-peer talk would arouse their interest in the subject, allow them to practice their communication and teamwork skills, nurture their mathematical abilities, avoid competition for recognition and expand their mathematical power (Asikin, 2017; Conway & Sloane, 2005). Similarly, Alber (2014) contends that all learners need some structured talking time throughout the lesson to process new ideas and information, and to verbally make sense of, and articulate their learning with their classmates. This definitely also applies to the P.1 learners in Busiro North and Luuka North Counties. The onus is on the teachers to ensure that they allot time to each learner to articulate their mathematical ideas. Precisely, Young-Loveridge and Mills (2011) qualify mathematics classroom talk as the most important educational tool for learners to jointly construct knowledge as they make sense of the mathematical ideas presented by their teachers and classmates. Consequently, teachers ought to give special attention to improving the duration and quality of classroom talk.

With improved duration and quality of classroom talk, learners should be engaged in doing mathematics instead of listening to and watching the teacher doing the mathematics (Chappin & O'Connor, 2007). This would help the learners improve their competence through explaining, clarifying and organising their thoughts in order to present their ideas to the rest of the class. Chappin and O'Connor (2007) add that if learners have an opportunity to talk about their mathematical thinking, they are compelled to strive to make sense of what their classmates think. Consequently, learners gain competence by endeavouring to make sense of what their classmates conjecture as they talk about it together. This study sought to determine whether in their instructional practices P.1 teachers in Busiro and Luuka North Counties give learners opportunities to explain their mathematical ideas.

One other aspect of good classroom practice by P.1 teachers in almost all cultures is the abounding use of songs, rhymes, games and play to teach learners various mathematics concepts. As children begin to count numbers in their correct sequence, their teachers will teach them to sing or recite such songs and rhymes as: *One little finger, two little fingers*, …; *1, 2, 3, 4, 5 … Once I caught a fish alive* …; all aimed at developing the children's skills of the counting sequence and one to one matching (Hassinger-Das, Zosh, Hirsh-Pasek & Golinkoff (2018). Teachers together with the learners often role play the songs and rhymes, with the learners taking the lead role most of the time. Hassinger-Das et al. (2018) believe that all developmentally appropriate practices like play-based learning support children's achievement of their socio-emotional skills; general cognitive development; self-regulation; and clarify for the children the connection between academic learning and play. Clements and Samara (2005) agree with Seo and Ginsburg (2004), as cited by Hassinger-Das et al. (2018) that any 4 and 5 year old children playing for 15 minutes will incorporate mathematics in their independent free play. They specify that the mathematics includes: classification in which children group or sort objects by size, shape, colour or any other attribute of their interest; comparing the size of objects, such as a tower built of blocks; and enumeration as they say number words, count, or read and write numerals.

Young children also get involved in mathematical dynamics as they explore motion, put things together or take things apart. They create patterns and shapes, for example, making a necklace out of beads with a pattern of their choice; and explore spatial relations when they describe a direction or location to each other or even to an adult (Hassinger-Das et al., 2018; Taylor, 2014). In their free play, children will also instantly recognise a number of objects and discuss the number and age of each one's siblings. As children elaborate these ideas, Clements and Samara (2005) believe they are undergoing the process of "mathematization". Primary school teachers should therefore do their best to see that this mathematization is not lost in the course of formal schooling.

The observations made by scholars like Clements and Samara (2005) , and Hassinger-Das et al. (2018) indicate that rather than drill children on mathematics facts and formulae, P.1 teachers particularly, and all mathematics teachers in general ought to use age appropriate playful pedagogy in order for all the learners to reach their mathematics optimal potential. It remains crucial that the play activities are learner-directed, but supported by the teachers and parents. As Taylor (2014) proposes, play should be envisaged by learners, teachers, parents, communities and curriculum designers as a versatile education tool that has the potential to make children learn mathematics concepts in a way that promotes memory retention and application of what is learnt to daily life activities. Clements and Sarama (2005) add that as children get intensely engrossed in play, they tackle challenging problems, stick with them, puzzle over them and approach them in various ways. All these aspects lead to powerful learning especially as children discuss amongst themselves the various strategies of tackling the challenges they are faced with, and promote thinking and learning in mathematics. Thomas , Warren and De Vries, (2011) sum it up by saying that the core business of young children is playing and thus, play is a pedagogical tool that can enable optimal learning when there is appropriate , timely and effective adult support

Embedded within children's play is music. Johnson (2017) and Todd (2019) believe that incorporating music into primary grade mathematics lessons can make it a more enjoyable experience for everyone. Johnson cites a song like " *This old man, he played one …"* which is an example of a repetitive, slow and fast, rhythm melody, involving counting with each verse and can be used to teach learners counting, comparing and matching, and number sequences and patterns. Civil (2007) concurs that music can be used to teach and learn all the skills that are required in mathematics. She adds that some learners will enjoy, grasp and retain mathematics concepts better when they are represented in a song than when they are simply spoken by the teacher. Todd (2019) agrees with the other researchers that integrating music and mathematics offers learners an opportunity to participate in mathematics in more different ways than they would when just using pencil and paper.

Estrella (2018) and Johnson (2017) who have experiences of embedding mathematics concepts in the tune of the learners' most enjoyed songs note that music and mathematics are closely related with identical concepts and skills. These include patterns in the demonstration of rhythm, beats and keeping time in music and number systems or shapes in mathematics; fractions and ratios like quarter and half which are mathematical concepts used in music for beats; or even the sequential order of numbers which learners can apply to music as they play an ascending and descending scale on the keyboard. Civil (2007) believes that merging mathematics and music might help learners who find difficulties in mathematics because of the high correlation between music and spatial temporal reasoning, which is similarly used for attaining mathematics skills. In the same vein, Estrella (2018) believes that when teachers incorporate music in mathematics lessons, this teaching approach appeals to more than one of the learners' senses, resulting in higher rates of permanence or long term memory retention and success. Estrella argues that since children right from birth depend heavily on their senses and motor skills to process information and to learn, engaging more than one sense in the mathematics classroom allows for more cognitive connections and associations to be made with a concept.

The discussion about instructional practices cannot be complete without matters of time management. Effective time management in everyday life, at school and at work is a very important skill. In school, educational time has been defined in many different ways according to how it is allocated and spent by the different education systems and institutions. Brodhagen and Gettinger (2012) make the following differentiations in educational time bearing in mind that allocated time is the amount of time specified for an activity or event. According to them, educators and educational researchers speak of allocated time when referring to one of the elements described below.

School time the amount of time spent in school. When used this way, allocated time may refer to the number of school days in a year or the number of hours in a school day. Classroom time refers to the amount of time spent in the classrooms within the school (excluding lunch, recess, and time spent changing classes). Instructional time is the portion of classroom time spent teaching the learners particular knowledge, concepts, and skills pertaining to school subjects and excludes routine procedural matters, transitions, and discipline.

Engaged time, or time-on-task which forms part of the instructional practices this study focused on, refers to portions of time during which students are paying attention to a learning task and attempting to learn. This excludes time spent socializing, daydreaming or engaging in antisocial behaviour. Academic learning time (ALT) is a term and concept emerging from a large-scale research effort called the Beginning Teacher Evaluation Study (BTES) conducted in the 1970s. ALT refers to that portion of engaged time that students spend working on tasks at an appropriate level of difficulty for them and experiencing high levels of success. It excludes time spent engaged in tasks which are too easy or too difficult. There is also dead time which is the periods of classroom time during which there is nothing students are expected to be doing; that is, time which the teacher has failed to manage in any way.

Emphasizing the importance of educational time, Johns, Beverly, Crowley and Guetzloe (2008) remarked that these different measures do not merely refer to different amounts of time or to time spent in different environments, but rather represent different ways of conceiving of time and its expenditure. According to them, allocated time reflects values, that is, the values of a district, school, or teacher are implicit in the relative amounts of time allocated to different activities. Instructional time reveals something about classroom organization and management; since the time actually available for and spent in teaching is indicative of the teacher's ability to organize instructional activities and expedite non- instructional ones such as transitions and discipline whereas dead time measures also permit inferences about the teacher's organization/management skills. Meanwhile, time-on-task, tells you something about teaching, which is, it reveals the teacher's skill in selecting learning activities which engage students' attention and in keeping them focused. Finally, academic learning time indicates something about learning, in that it refers to situations in which student and learning material are well-matched and learning is occurring in a fairly ideal fashion.

In many mathematics classrooms, the time allocated to the subject and the time learners actually spend learning are different. Such variations exist among individual learners in the same classroom, in different classes within the same school and between schools. Research indicates that these variations lead to declines in achievement and retention when not enough time is devoted to learning (Bold et al., 2017). Moreover, Grouws, Tarr, Sears and Ross (2010) found that even within the same mathematics classroom, one third of the available time is spent on previously learned content including reviewing homework and non-instructional activities. In other cases, teachers have been reported to consume up to 90 per cent of the allocated time (Brodie, 2007). Other administrative activities like school assemblies also make teachers lose on the allocated subject time (Jones, 2012).

Consequently, if learners' performance is to improve, classroom teachers need to change how the allocated time is utilized (Fisher, 2009). Goldsmith (2009) urges teachers to examine the pacing, which he refers to as the rhythm and timing of classroom activities in view of the allocated time. He argues that pacing includes the way time is allocated to each classroom component and the process of how one decides that it is the right moment to change to another activity. It exists in every decision in the day-to-day classroom practice and it is assumed that teachers know how to do it and make the various elements of a lesson fit together as time ticks by.

Furthermore, learners in P.1 in Uganda have a one 30-minutes lesson period of mathematics each day from Monday to Friday (NCDC, 2013). The 30 minutes is the maximum amount of time available each day for the teacher and learners to complete the instruction, learning and assessment loop. Often times, some of this time will be spent on administrative and discipline issues in the classroom or in the school as a whole.

As Bold et al. (2017) revealed, in Uganda's public primary schools, almost half of the classrooms are likely to have learners but with absent teachers; 3 per cent of lesson time is lost to non-teaching and learning activities; and in the long run the scheduled teaching - learning time is reduced from the expected 5 hours and 27 minutes per day to an average of 2 hours and 46 minutes per day. The teachers are then most likely going to teach mathematics at a very fast pace and probably fail to give learners sufficient "time on task" -the proportion of the 30 minutes used by learners to engage in oral, written and practical mathematics activities . Different learners will require differing time on task but it is incumbent on the teacher to ensure that all learners receive appropriate time to complete any set classroom mathematics task. This study intends to appeal to teachers to give ample time for learners to attend to their classroom mathematics tasks as one way of enhancing competence.

To wind up this review of the existing body of researched knowledge on teachers' instructional practices, I take a look at what happens in the classrooms during the phases of assessment and feedback. Teaching and learning will never be complete without assessment and feedback. For this reason, in yet more effort to assist P.1 learners to attain mathematical knowledge and skills; teachers assess the learners' progress as an integral part of teaching and learning. Teachers observe the learners' practical activities, ask them oral questions and sometimes give them written exercises. During the assessment, the learners receive feedback from the teacher, which according to Brookhart (2008, p.1) is "just-in-time, just-for-me information" given at that very moment "when and where it can do the most good". Feedback should be used to help both the teacher and learner identify strengths and weaknesses in the learners' mathematical understanding, to know where learners have acquired the desired competence and where they still need scaffolds (Australian Association of Mathematics Teachers [AAMT], 2008). It should help learners accept criticism and praise, and distinguish between positive and negative comments given to them (Choppin, 2007). For the learners, supportive feedback is necessary information from the teacher, given for correction, evaluation, clarification, encouragement or suggestion of alternative strategy (Roschelle, Feng, Murphy & Mason, 2016). It must transform misconceptions into significant learning and improve the mathematics competence of all learners (Brookhart, 2008; Crawford, Saul, Mathews & Makinster, 2005; Hattie & Timperley, 2007; Lee & Son, 2015; Schwartz, 2017). If done well, supportive feedback addresses both cognitive and motivational factors as learners get to understand where they are in their learning, where to move to next and why; and develop a feeling that they are in control of their own learning (Naroth, 2010).

Supportive feedback offers learners an opportunity to reflect on the mathematical procedures, facts, skills and relationships to everyday activities in their work; talk about the work with their classmates; resolve any differences in view points and revise or justify their solution strategies after classmates have gone through it and made submissions on it for improvement (van Geel, Keuning, Visscher & Fox, 2016; Spencer, 2013). This approach greatly improves the learners' competence unlike when a teacher simply gives ticks and crosses or circles mistakes then awards a score or grade as is commonly practiced by mathematics teachers at all levels (Bee & Kaur, 2014) who then leave learners to simply match the ticks with the obtained score to ascertain if and only if they correspond.

In a classroom where supportive feedback is practised, learners continuously appreciate the efforts made by their classmates as they attempt mathematics tasks be they oral, written or practical. Teachers do not encourage learners to laugh at the mistakes made by others but encourage the learners to help one another in identifying and correcting misconceptions so that each learner improves their competence (van Geel et al., 2016). In such a learning environment, learners comfortably identify the gaps between their actual understanding of a mathematics concept, procedure or skill and the required level of understanding so that the gaps are filled appropriately with scaffolds from both the teacher and the more able peers (Denhere, Chinyoka & Mambeu, 2013; van Geel et al., 2016).

The foregoing discussion underlines the need for teachers to revise their formative assessment practices. The discussion disapproves reports from Flores (2010) and Killian (2016) that in many mathematics classrooms, assessment and grading are synonyms. Teachers should not assess learners in order to grade, rank or discriminate them; rather they ought to use the outcomes of assessment to provide learners with the necessary feedback for improving performance. They need to know that the feedback which learners receive concerning their competence and improvement in performance influences their achievement goals. Killian (2016) describes such feedback as the "breakfast of the champions", the breakfast served by extraordinary teachers around the world. The implication is that when mathematics teachers deny learners supportive and timely feedback, they are denying them the most fundamental requirement that would make them champions of the subject. Undoubtedly, success feedback promotes mastery and positive emotions within the learners, whereas failure feedback promotes negative emotions and anxiety when they are performing new tasks (Pekrun, Cusack, Murayama, Elliot & Thomas, 2013). It is hoped that the findings of this study will encourage mathematics teachers to give their learners timely and very supportive feedback.

To sum it up, Hattie and Timperley (2007) portray effective feedback as that which must answer three major questions asked by a teacher or by a learner: Where am I going? (What are the goals?). This question is in relation to the set learning goals and related to the task or learner's performance. How am I going there? (What progress is being made toward the goal?), and Where do I go to next? (What activities need to be undertaken to make better progress?). They propose that effective feedback works at four levels as illustrated in Figure 2.1.

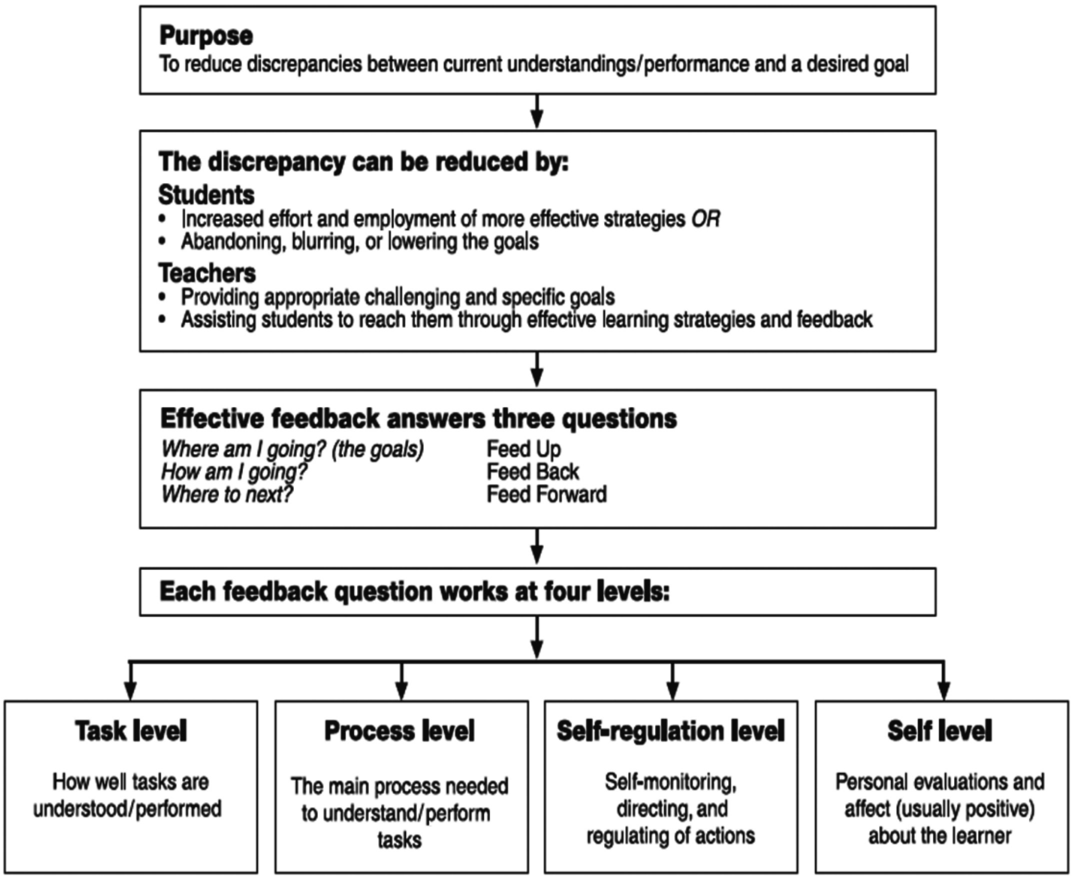


Figure 2.1: A Model of Feedback to Enhance Learning. Source: Hattie and Timperley, 2007.

This study sought to identify the exact forms of practical, oral and written supportive feedback that P.1 teachers in Busiro North County and Luuka North County give to their learners to enhance their mathematics competence. The study will broaden knowledge on supportive feedback in a P.1 mathematics classroom by specifying teacher and peer practical, oral and written behaviours or activities that are used to enhance learning.

The foregoing extensive review of the instructional practices shows that very many studies on teachers' instructional practices have been carried out in Indonesia, Singapore, US and several other European countries (Asikin, 2017; Baroody, 2010; Bee & Kaur, 2014; Brodie, 2007; Clements & Samara, 2005; Dooley, 2011; Estrella, 2018; Hattie & Timperley, 2007; Sodeman, 2007; Tucker, 2019). However, instructional practices are seldom reported for lower primary classes in Uganda. This study contributed knowledge to fill the gap.

Chapter two of this dissertation has provided a fundamental understanding on three aspects of the study: the teachers' expectations of their learners' mathematics performance; the learners' mathematics performance; and the various instructional practices that teachers use to enhance the learners' mathematics competence from a global perspective. The review has shown that there is need to obtain researched evidence on the three aspects in lower primary classes in Uganda. The findings of this study will particularly provide literature on the teachers' expectations of their learners' mathematics performance; the learners' mathematics competence; the association between teachers' expectations and their learners' mathematics performance; and the various instructional practices that teachers use to enhance the learners' mathematics competence in the counties of Busiro North and Luuka North in Uganda. Chapter three will detail the study's methodology.

Chapter Three

Methodology

Introduction

This chapter on the methodology of the study describes the research paradigm, design, approach, methods and the geographical locations of the study. Justifications for the choice of research paradigm, design and research methods for this study are given. The target population, sample size and sampling techniques that were used are presented. The chapter also describes each of the research instruments used to collect data for each objective including the teachers' questionnaire, the learners' competence test; interview guide and the lesson observation tool. The measurement of the variables and the procedures for ensuring the validity and reliability of the research instruments are discussed. Also discussed are the data collection procedure, the data processing and analysis techniques, and the ethical considerations for the study.

Research Paradigm

The study adopted postpositivism as a research paradigm because of its pluralistic elements of positivism and constructivism (Krauss, 2005). The postpositivist combination of the deductive approach in positivism and the inductive approach in constructivism within the scope of one study enabled the researcher to pursue objectivity in the learners' competence in mathematics as well as recognise the subjectivities in the teachers' expectations and instructional practices (Creswell, 2009; Kaushik & Walsh, 2019; Morgan, 2013; O'Leary, 2017). This enabled the researcher to collect data through surveys, observation and interviewing the teachers, to produce objective and generalizable knowledge and affirm the associations between the study variables (Taylor & Medina, 2013).

Research Design

In this study, the concurrent embedded (nested) research design was chosen to provide answers to different research questions and hypotheses (Halcom & Hickman, 2015). This was because the study objectives, research questions and hypotheses required a combination of the quantitative and qualitative research approaches as neither approach could solely address the purpose of the study (Andrew & Halcomb, 2009). Use of the two approaches enabled the researcher to collect quantitative testable data on the learners' competence in mathematics as well as qualitative descriptive data on the teachers' expectations and instructional practices.

Collection of quantitative and qualitative data was done concurrently so that the qualitative data could substantiate the findings from the quantitative data (Almalki, 2016). Within the concurrent embedded research design, data integration was done at the time of interpretation and discussion of the results to determine the influence of teachers' instructional practices on the relationship between teacher expectations and the learners' mathematics competence ((Andrew & Halcomb, 2009; Halcom & Hickman, 2015; Leech, 2012).The embedded design thereby enabled the researcher to draw freely from both the qualitative and quantitative research assumptions in order to produce a fuller account of the research problem and provide a comprehensive analysis

(Creswell, 2009; Levers, 2013); thereby obtaining the best understanding of the research problem. An illustration of how the embedded mixed approach design was employed is given in Figure 3.1.

Research Approach

The study was conducted following the mixed research approach. Within the mixed approach, the use of both quantitative and qualitative approaches was planned and pre-determined at the outset of the study. The mixed research approach offered to the study a combination of the advantages of the quantitative and the qualitative research approaches, drawing from the strengths of both approaches while at the same time minimizing their weaknesses (Creswell, Klassen, Clark & Smith, 2011; Creswell, 2012; Onwuegbuzie & Leech, 2007). The approach involved collecting and analysing both quantitative and qualitative data, and also mixing quantitative and qualitative methods in a single study. The approach was chosen for the purpose of providing answers to the different research questions and hypotheses that called for different types of data and therefore, different research approaches (Almalki, 2016; Creswell, 2012; Yu & Khazanchi, 2017).

Whereas in this study both the teacher expectations of the learners' mathematics competence, and the learners' competence required the collection of quantitative data; the teachers' instructional practices called for qualitative data collection procedures. The data was collected simultaneously, with the intent of having secondary qualitative data on observed teachers' instructional practices play a supplemental role and help in understanding the outcomes of the correlation between the teacher expectations and the learners' mathematics competence (Borrego, Douglas & Amelink, 2009; Creswell, 2012). The two data sets were analysed separately since they addressed different research questions and hypotheses (Creswell, 2009). The approach in that way yielded what Creswell (2012) refers to as the "numbers" and the "stories" of the research problem, and gave a condensed understanding of the problem derived from the mixed approach. The findings demonstrate that quantitative and qualitative approaches are not exclusive but can be used in cooperation.

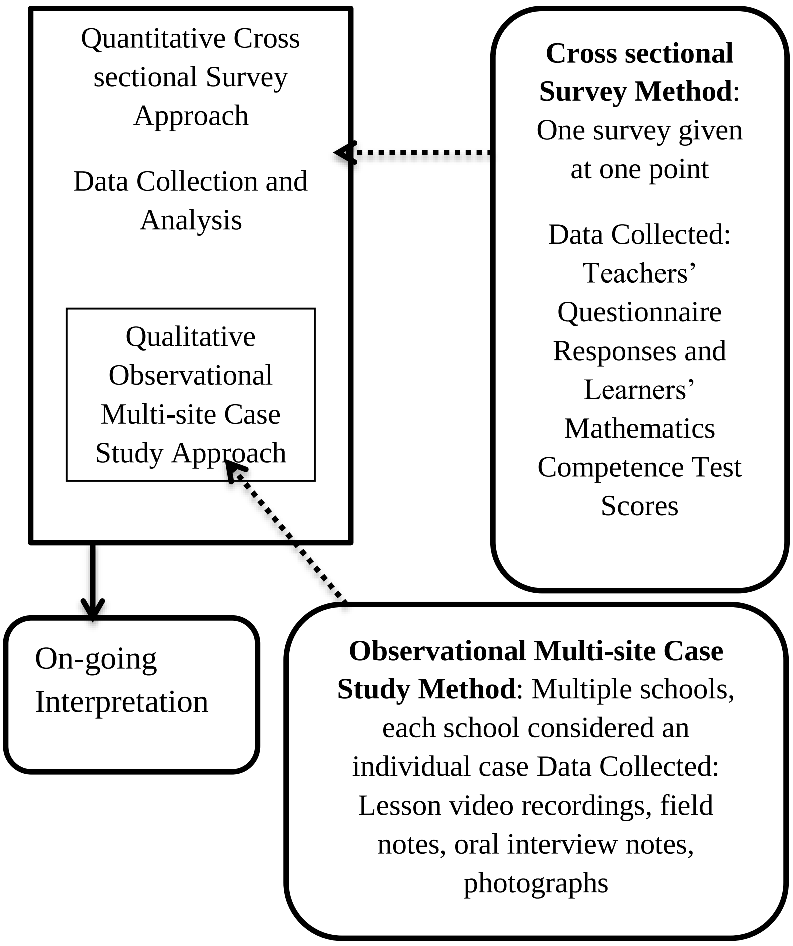


Figure 3.1: Embedded Mixed Research Design Procedure

(Adapted from Yu & Khazanchi, 2017)

Research Methods

The quantitative part of the study used a cross-sectional survey with a questionnaire method for data collection to determine the teacher expectations and to compare learners' performance on some identified mathematics competences. The cross- sectional survey proved useful in providing a systematic, factual and as accurate as possible a description (Amin, 2005) of teacher expectations and the learners' mathematics competence. It also allowed for representativeness and generalizability of the findings on the teacher expectations and the learners' competence in mathematics from the sample studied to the target population (Amin, 2005; Creswell, 2012; Kumar, 2011). Data on the learners' competence in mathematics was also collected through a cross sectional survey using a written test to assess the learners.

For the qualitative part of the research, exploratory observation method involving multiple case study was used to obtain text data for purposes of understanding and describing how various teachers' instructional practices promote learners' mathematics competence, and to provide insight into the prevalent situation in the study's target population (Amin, 2005; Creswell, 2012; Kumar, 2011). Non-participant observation and oral interviews were used to obtain the qualitative data. The qualitative findings expounded on the quantitative findings on teacher expectations and learners' competence, thereby providing a basis for adoption of the observed instructional practices (Amin, 2005).

Location of the Study

The study had two locations: Busiro North County and Luuka North County. Luuka North County is found in Luuka District, which lies between zero degrees 42 minutes North and 33 degrees 18 minutes East in Eastern Uganda, Busoga subregion. Luuka District is bordered by the districts of Kaliro in the North East, Iganga to the South East, Mayuge to the South, Jinja to the South West, and Kamuli in the North West (Luuka District Local Government, 2015). Luuka population is largely Basoga with 96% of the population living in the rural areas where they engage in crop and animal farming (Uganda Bureau of Statistics [UBOS], 2016). Luuka North County currently has 50 primary schools. The area was chosen for three major reasons. First reason was that Luuka District has been consistently listed amongst the worst performing in PLE, an indication that the teaching and learning especially for mathematics is an issue in the area (Makuma & Mukama, 2012; Mubiru, 2020; Yolisigira, 2014). Secondly, there are very few research based interventions that have been implemented in Luuka District to change the trend of the unsatisfactory performance at the primary school level (Kan & Klasen, 2020; Namukwaya & Kibirige, 2014; National Planning Authority [NPA], 2015). Thirdly, the researcher is conversant with Lusoga, the local language commonly used for instruction in P.1 in Luuka. Hence, findings of this study include an account of the achievement of the P.1 learners in Luuka North County with regard to the expected mathematics competences outlined in the national primary school curriculum.

Busiro North County, on the other hand is found in Wakiso district which lies between zero degrees 24 minutes North and 32 degrees 29 minutes East in Central Uganda, Buganda subregion. Wakiso District surrounds Kampala, bordered by the districts of Nakaseke and Luweero to the North, Kalangala to the South, Mpigi to the Southwest, Mityana to the Northwest and Mukono in the East (Wakiso District Local Government, 2009). The people are Baganda with 59% of the population settled around peri-urban centres (UBOS, 2016). Busiro North County currently has a total 77 primary schools. Unlike Luuka, this area is commonly ranked among the best performing in PLE, offering an excellent choice for comparison with Luuka on the three major aspects of this study. In addition, the two study areas were chosen so that the researcher could explore the instructional practices that P.1 mathematics teachers in Busiro North County and Luuka North County could learn from each other and adopt them in order to enhance their learners' mathematics competence.

Furthermore, Luganda, the local language used in Busiro for instruction in P.1 is one the researcher understands and speaks sufficiently well. Consequently, this study has contributed information on whether P.1 learners in Busiro North County attain the expected competences in mathematics as outlined in the national primary school curriculum, which is very important for the development of the county.

Target Population

The target or parent population to which the research findings are applied and generalized was composed of all the P.1 teachers and learners in

Uganda. However, due to financial and time constraints, the parent population was not accessible. The sampled or accessed population composed of all the P.1 teachers and learners in all the 77 primary schools in Busiro North County in Wakiso District and the 50 primary schools in Luuka North County in Luuka District which was selected for the study. The study sample was then drawn from the accessed population. The research finding will specifically apply and be generalised to the target population (Amin, 2005).

Furthermore, the Social Economic Status (SES) of the people in Busiro North County and Luuka North County is given by the National Population and Housing Census of 2014 area specific profiles and reported by UBOS (2017b). This UBOS data shows that the SES of the population in the two areas is comparable on: people aged 18 years and above who are working, radio ownership and engagement in non-agricultural household based enterprises. Whereas Busiro North is better off in mobile phone and bank account ownership, internet use, access to piped water and electricity, Luuka is better off in access to primary schools and health facilities, owner occupied households and provision of two or more meals for members aged 5 years and above.

Mapping the Primary One Learners in Uganda

Uganda has made significant steps in providing primary schooling to the great majority of young children across the country. The introduction of UPE in 1997 significantly increased access to primary education for both boys and girls, with total enrolment tripling from about 3.1 million in 1996 to 8.5 million in 2014 (UNICEF, 2015). In Uganda, the official age for starting primary school education is 6 years (Kan & Klasen, 2020; UNESCO Institute for Statistics [UIS], 2013). However, just as in other countries in the East African region, more children are enrolled in P.1 than there are children in the population of the appropriate age, suggesting that some enrolled children are either under- age or over-age for P.1 (Brunette et al., 2017). Reports suggest that of all the P.1 learners only 62% are of the right age (6 or 7), while most learners (31%) who are not of the appropriate age are over-age and a much smaller percentage (7%) are under-age (Grogan, 2008; Kan & Klasen, 2020; National Planning Authority [NPA], 2018; Brunette et al., 2017). It should be noted that some primary schools in Uganda especially those in urban settings admit only children who have undergone 1-3 years of pre-primary school education, despite the fact that almost 90% of the children in Uganda do not have access to pre-primary education (Budget Monitoring and Accountability Unit [BMAU], 2016; UNICEF, 2015). However, primary school is still considered the first level of formal education in which pupils follow a common basic curriculum.

Furthermore, there are drastic enrollment declines from P.1 to P.2 which are commonly attributed to learners dropping out, but could also arise out of under-reported P.1 repetition associated with a lack of pre-primary education or starting P.1 before attaining 6 years of age (MoES, 2017; Brunette et al., 2017). While the primary school enrolment in Uganda increased from 8.5 million in 2013 to about 8.8 million pupils in 2017, with no gender gap, just about half of all P.1 learners (54.5%) have adequate classroom sitting space and the pupil: teacher ratio has remained constant at 43 pupils per teacher since 2015 (UBOS, 2020). The knowledge content for P.1 has competences organized within a thematic approach aimed at a rapid development of numeracy and life skills (NCDC, 2006; NCDC, 2013; NPA, 2018). The teachers are expected to present the learning experiences in languages in which the learners are already proficient as well as carry out continuous assessment of the learners' achievement (NCDC, 2013; NPA, 2018).

Sample Size and Sampling Techniques

Sample Size

Computation of the required teacher sample sizes was done using Cochran's formula based on a 5% margin of error (Johnson & Shoulders, 2019) and an estimate that only 2.5% of the teachers who teach P.1 learners do not teach them mathematics. The Cochran formula gave a sample size of 37 teachers. Consequently, 37 P.1 teachers from Busiro North County and 37 from Luuka North County were selected to participate in the study, resulting in 74 teachers participating in the study (Table 3.1). The 37 teachers selected in each county filled the questionnaire and were observed teaching a mathematics lesson. The same number of teacher participants was used for the questionnaire and lesson observation for representativeness/ saturation trade-off (Onwuegbuzie & Collins, 2007). Of the 37 teachers in each study area, 13 were selected systematically until when data saturation was attained; taking every third teacher after the first one was selected and given an oral interview (Amin, 2005).

The study sample also comprised of 296 P.1 learners, 148 learners from each study area, and four learners selected from each of the 74 sampled primary schools (37 in Busiro North County and 37 in Luuka North County).

Both the teachers and learners' sample sizes agreed with the minimum of between 10 and 30 participants in each group to be compared (Amin, 2005). These learners' and teachers' sample sizes were representative of the target population and also cost-effective (Amin, 2005; Johnson & Shoulders, 2019). The sample sizes were therefore considered large enough for this study to ensure inclusion of teachers with diverse backgrounds in their expectations of the learners' mathematics competence. The selected sample of teachers would also possess a wide variety of instructional practices. The learners' sample size catered for inclusion of learners with a variety of competence levels in mathematics, ensuring representativeness of the target population (Kumar, 2011).

Sampling Techniques

Simple random sampling (SRS) was used to select the 37 primary schools in each county and also the 296 Primary one learners who participated in this study. Simple random sampling ensured that there was no bias in the selection of the schools and the learners' study sample (Kumar, 2011). Random numbers were used to select four learners in each of the 74 schools. The participating schools were selected using random sampling from a list of all the schools in a county. The 74 primary one mathematics teachers in the selected schools automatically participated in the research, hence were selected purposively.

Table 3.1: Sample Size Determination

PARTICIPANTS	*POPULATION SIZE (N)	SAMPLE SIZE	SAMPLING TECHNIQUE
SCHOOLS			
Busiro North	77	37	Simple Random Sampling
Luuka North	50	37	Simple Random sampling
TOTAL	**127**	**74**	
TEACHERS			
Busiro North	79	37	Purposive Sampling
Luuka North	53	37	Purposive Sampling
TOTAL	**130**	**74**	
LEARNERS			
Busiro North	2240	148	Simple Random Sampling
Luuka North	2150	148	Simple Random Sampling
TOTAL	**4390**	**296**	

*Source: District Education Offices, Luuka District and Wakiso District

Research Instruments

Questionnaire.

In order to establish the teachers' expectations of the mathematics competence of P.1 learners required for objectives 1 and 4 of this study, a questionnaire with 36 close ended items on a 5-point Likert scale was constructed. It had three sections on teachers' expectations in relation to: the learner's background, the P.1 mathematics curriculum content as stipulated by the National Curriculum Development Centre (NCDC) and teacher's instructional practices or routine classroom procedures. The questionnaire provided quick and standardised responses from the teachers (Amin, 2005). A questionnaire survey was carried out by personal administration and on spot collection in order to produce quick responses on the teachers' expectations of the P.1 learners' competence in mathematics. Having personal contact with the teachers during the filling of the questionnaires enabled them to seek clarifications on any unclear questionnaire items and also made it possible to complete the data collection within the stipulated time (Amin, 2005; Creswell, 2009; Kumar, 2011). Using questionnaires made it possible to gather the teachers' responses in a more objective, standardised way and yielded a very high response rate (Ahmad, 2012).

Learners' mathematics competence assessment test

In order to determine the learners' mathematics competence required in objective 2 of the study, a mathematics test was constructed by the researcher with the help of two P.1 teachers and the in-charge of basic education at the National Curriculum Development Centre (NCDC). Artefacts of the learners' work were also collected by photographing the learners' written work from their exercise books, on the chalkboards, on slates or on the ground.

Lesson observation tool

A lesson observation tool was designed by the researcher, with one open – ended and ten close-ended items to record information on the teachers' instructional practices as required in objective 3 of this study. Each of the ten close-ended items had four alternatives on the frequency of the teachers' use of the instructional practice. Frequency counts of the occurrences of each instructional practice were used to determine if the practice was used in a lesson: Never (0 times), Rarely (1 or 2 times), Sometimes (3 or 4 times) and Consistently (5 or 6 times). Each 30 minutes lesson was divided into 5-minute clusters and a record made of whether an instructional practice did or did not occur during each cluster (Creswell, 2009). As Amin (2005) contends, observational techniques of data collection enable the researcher to get first-hand and valid information about the subject-event interaction of interest which in this case was the teacher-instructional practice - learners' mathematics competence interaction. In addition, lesson observation was used to obtain first-hand valid information and to provide a rich data set including non-verbal and physical behaviour of the teachers (Amin, 2005) in relation to the teachers' instructional practices. There was open observation with the researcher as a nonparticipant, passive observer. Oral interviews were used to obtain the observed teachers' views and in-depth information on their instructional practices. The interviews were also a supplement to the information obtained from observing the teachers through them talking about their non-observable instructional practices (Kumar, 2011). Document analysis of scripts of the learners' mathematics competence test and artefacts of their written work provided information on learners' ability levels on the identified competences.

Furthermore, audio video recordings of lessons were made to enable the researcher make any necessary reviews of the lessons in regard to the instructional practices. Field notes were made by the researcher to provide more information on the instructional practices as used by the teachers.

Interview guide

In addition to lesson observations, 26 of the observed teachers (13 from each study area) were each given a one-on-one, face-to-face oral interview to help the researcher get detailed information and more clarity from them concerning their expectations of the learners' competence in mathematics and their instructional practices (Amin, 2005; Creswell, 2012). An eight-item, open- ended structured interview guide was constructed and used for this purpose. The first question was on the teachers' expectations of the learners' competence in mathematics. Question two was on the learners' competence and Questions 3 to 8 focused on instructional practices. The interview with each teacher lasted between 10 to 15 minutes. Teachers' responses to the interview were recorded in writing.

Measurement

The teachers' expectations were measured on an ordinal scale with very high expectations rated 5 and very low expectations rated 1. Instructional practices had their indicators measured on a nominal scale with: building on learners' existing knowledge related to daily life activities =1; working out examples for the learners = 2; learners explaining mathematical ideas = 3; sufficient time for tasks = 4; supportive feedback =5; drilling = 6; assessment for grading = 7; use of songs, music , rhymes, drama, game competitions =8; use of pair work in problem solving =9; use of wall charts for shapes, numbers, number line for 1-20, Calendar, The School, The Home =10; and other common instructional practices = 11. Frequency counts of the teacher's use of instructional practices (classified as consistently, sometimes, rarely and never) were also made. All indicators were sub variables of instructional practices and made equal contribution to the instructional practices.

The mathematics competence of primary one learners was indicated by their ability to recognise numbers 0 – 9; count and match objects symbolising numbers 0 – 9; recognise numbers 10 - 99; add and subtract 2-digit numbers without carrying and borrowing respectively; multiply by 2, 3 and 10; and apply addition and subtraction to familiar social contexts. Competence was measured on a numerical scale as a score corresponding to the number of each learner's correct responses.

Validity of the Research Instruments

The validity of a research instrument is the degree to which it accurately measures what the researcher intends it to measure (Kumar, 2011). Sullivan (2011) considers validity in research as the degree of accuracy to which a study answers the research questions and hypotheses, and also as the strength of the conclusions of the study. Noting that determining validity is like constructing an evidence-based argument regarding how well the tool measures what it is intended to do, Sullivan (2011) advises researchers who create their own assessment instruments to use content experts in constructing the instruments as well as piloting the instruments in order to determine their validity. A panel of experts can effectively establish the face validity and the content validity of a research instrument (Kumar, 2011; Sullivan, 2011).

In order to establish the validity of the questionnaire, the learners' mathematics competence test, the lesson observation tool and the interview guide , the researcher sought advice from ten experts, piloted the instruments, and then redesigned and improved on them where necessary. From the content validity judgements by the experts, the Inter-judge Coefficient of Validity given by: (Number of judges declaring item valid) / (Total number of judges) and the Content Validity Index (CVI) given by: (Number of items declared valid) / (Total number of items) were computed (Amin, 2005). The questionnaire and lesson observation tool had CVI of 0.906 and 0.925 respectively, while the mathematics competence assessment test had a CVI of 0.911. The interview guide had a CVI of 0.9. Hence, all the tools attained CVI ≥ 0.70 and were considered valid to be used for data collection.

In order to strengthen the validity evidence of the survey research instruments, construct validity, which in this study was the appropriateness of the inferences made on the basis of the teachers' questionnaire responses and learners' mathematics competence test scores, was evaluated. The evaluation was based on the hypothesis that whereas the questionnaire would be able to distinguish between teachers with high expectations and those with low expectations; the test would distinguish learners according to their levels of competence in Mathematics (Bolarinwa, 2016; Fink, 2010; Ginty, 2013). This hypothesis provided the theory evidence that the instruments had construct validity (Heale & Twycross, 2015). In addition, both the questionnaire and the learners' test had homogeneity as evidence of construct validity (Ibid.) in that each had one construct to measure. The questionnaire measured teachers' expectations whereas the rest measured learners' competence in mathematics. It is worth noting that the researcher could have used factor analysis to determine the construct validity of the instruments. However, the requirement of a large sample size of at least 300 participants in order to conduct a reliable factor analysis (Costello & Osborne, 2005; Field, 2009), could not be met during the piloting of the instruments. The P.1 teachers' population size in either county was less than 100, and the pilot study could not have a sample size larger than the main study.

Reliability of the Research Instruments

When a research instrument is consistent, predictable and accurate it is said to be reliable and the greater the degree of consistency the greater the reliability (Kumar, 2011). A research instrument is considered reliable according to the extent that repeat measurements made with it under constant conditions will give the same outcome (Sullivan, 2011). Reliability of a research instrument is the degree to which the results obtained when it is used can be replicated (Kumar, 2011; Sullivan, 2011). Reliability can be established through piloting the instrument and can also be assessed by test-retest reliability, alternate form reliability and internal consistency reliability.

In this study, the reliability of the teachers' questionnaire was computed using the Cronbach Coefficient Alpha (α) since the items were not scored dichotomously, but had five alternative responses(Amin, 2005). The questionnaire had $\alpha = 0.71$ and a test-retest reliability of 0.73. The reliability of the learners' mathematics competence assessment test was computed using the Kuder-Richardson 21 formula. It had KR-21 = 0.79 and a test-retest reliability of 0.86. The test-re-test reliability was used at a two-week interval between the tools' administrations. All the research tools had a computed reliability (either α or KR-21) ≥ 0.60 which made them reliable for data collection (Creswell, 2012).

Furthermore, the validity and reliability of the research instruments used for the qualitative part of the study was ascertained through triangulation of data sources. Data was gathered through lesson observation field notes, audio video recordings of the lessons, oral interviews with the teachers and artefacts of learners' written work. Additionally, as Kumar (2011) suggests, the validity and reliability of the lesson observation tool and interview guide were determined through their credibility, transferability, dependability and confirmability. Seven participating teachers did a "member check" on the themes of the qualitative findings to establish that they accurately represented their instructional practices.

The pilot Study

A pilot study was undertaken as a precursor to the main study with the goal of trying out the research instruments (Creswell, 2012). The pilot study was used to determine the feasibility and clarity of the items of the survey questionnaire, the mathematics competence assessment test, the lesson observation tool and the teachers' interview guide. It was also used to check the suitability of the data collection procedures, particularly the time required by the teachers to complete the questionnaire and do the oral interview; and also time required by the learners to complete the test. Seven primary one teachers of mathematics (9 % of the major study sample size) and 47 learners (16 % of the major study sample size) were selected from 7 primary schools in

Kampala District and they participated in the pilot study. The outcomes of the pilot study were used to refine the language of the research instruments, ascertain the validity of the tools and compute values for the test-retest reliability of the instruments. The outcomes of the pilot study were also used to check the suitability of the statistical and analytical data analysis procedures for yielding meaningful results.

Data Collection Procedure

Data collection in a school began with observing a P.1 mathematics lesson. A lesson observation tool with eight close-ended items each with four alternatives designed by the researcher was used to record information on the teachers' instructional practices as required in objective 3. As Amin (2005) contends, observational techniques of data collection enable the researcher to get first-hand and valid information about the subject-event interaction of interest which in this case was the teacher-instructional practice and learners' mathematics competence interaction. Each 30 minutes lesson was divided into 5-minute clusters and a record made of whether an instructional practice did or did not occur during each cluster (Creswell, 2009). Frequency counts of the occurrences of each instructional practice have been used to determine if the practice is used by the teacher in a lesson: Never (0 times), Rarely (1 or 2 times), Sometimes (3 or 4 times) and Consistently (5 or 6 times). The findings report the modal frequency for use of each observed instructional practice by the teachers in Busiro North County or Luuka North County.

In addition, the lesson observations were recorded on video by an assistant researcher-videographer while the researcher made handwritten field notes. On the day a lesson was observed, the teacher was interviewed orally after the lesson, and the researcher made hand written notes during the interview. The teacher thereafter filled a questionnaire on her or his expectations of the learners' mathematics competence. In order to establish the teachers' expectations of the mathematics competence of P.1 learners for objective 1, the researcher constructed a questionnaire with 36 close ended items on a 5-point Likert scale. It had three sections on teachers' expectations in relation to: learner's background, the Primary One mathematics curriculum content laid out by the national Curriculum Development Center and teacher's instructional practices portrayed by common routine classroom procedures. The questionnaire was used to provide quick responses from the teachers (Amin, 2005).

During the time when the teacher was filling the questionnaire, the learners were given a mathematics competence test. In order to determine the learners' mathematics competence required in objective 2, a mathematics test was constructed by the researcher with the help of two P.1 teachers and the in-charge of basic education at the National Curriculum Development Centre. Also on the day of lesson observation in a particular school, artefacts of the learners' work were collected by photographing the learners' written work which could be in their exercise books, on the ground, on slates or on the chalkboards. This procedure was repeated in all the 74 schools. Data collected from any one school was labelled with a distinct code to distinguish it from data gathered from another school.

Data Processing

All the tools used for data collection underwent field and central editing. The returned questionnaires were checked manually for patterns of response to locate any dissimilar (similar) responses to similar (dissimilar) items in order to improve the data quality. The data was entered into Microsoft Excel for cross-tabulation and easy tracking, and then copied to the Statistical Package for Social Sciences (SPSS) software for analysis. The learners' test scripts were scored by assigning 1 mark for a correct answer and zero for an incorrect answer. The total score for each learner and by county was entered into SPSS for data analysis. The lesson observation data was checked by the researcher to ensure that it was free of inconsistencies before it could be coded. The data was summarised by identifying main themes, assigning keyword codes, and classifying the responses under the main themes (Kumar, 2011).

Data Analysis

Data analysis for objective one

The first objective of this study was to establish the teachers' expectations of their learners' competence in mathematics. The question to be answered was: "Which are the prevalent teachers' expectations of the P.1 learners' competence in mathematics? Data gathered from the questionnaire on teachers' expectations of the mathematics competence of P.1 learners in relation to the curriculum content was entered, edited, processed, analysed and presented using the (SPSS) software. To establish whether the teachers' expectations of the learners' competence were very high, high, moderate, low or very low; frequency counts, percentages, means and standard deviations were computed. Content analysis was done for the oral interview responses on expectations.

Data analysis for objective two

The second objective of the study was to compare the learners' competence in mathematics for the two study areas. This objective had an alternative hypothesis stating that H_1: There is a statistically significant difference between the P.1 learners' competence in mathematics in the two study areas. The hypothesis was tested at $\alpha = 0.05$ significance level. The data obtained from the learners' mathematics competence assessment test had its entry; editing; processing; analysis; and presentation done using SPSS software. To establish whether there was a statistically significant difference in the mathematics competence of learners from Busiro North County and those from Luuka North County as required in the second objective of this study, the Student t-test for two independent groups was computed. Data from artefacts of learners' written work was captured to support the statistical analysis.

Data analysis for objectives three

The third objective of the study was to examine the instructional practices P.1 mathematics teachers in the two study areas used to enhance their learners' competence in mathematics. The question for this objective was: "What instructional practices do P.1 mathematics teachers in the two study areas use in order to enhance their learners' competence in mathematics? The narrative data collected from the lesson observation tool, the interview guide and the field notes to identify the teachers' instructional practices and determine the practices to be adopted by the teachers in Busiro and Luuka was summarised and coded. The codes were developed to identify common themes that cut across the data sources for analysing the data.

The qualitative data gathered was built from common themes to more abstract units of information then to a comprehensive set of themes that has been used for presentation and analysis of the data (Creswell, 2009). Frequency counts from the lesson observations specifying how often an instructional practice was used by the teachers have been tabulated. These provide information on the instructional practices that some teachers do not use consistently in order to enhance the learners' mathematics competence. Such teachers' instructional practices have been recommended for adoption by all P.1 teachers in Busiro North County and Luuka North County.

Data analysis for objectives four

The study's fourth objective was to determine the relationship between the teachers' expectations and their learners' competence in mathematics. The objective had an alternative hypothesis stating that H_1: There is a statistically significant relationship between the teachers' expectations and their learners' competence in mathematics. This hypothesis was tested at $\alpha = 0.01$ significance level. Using data from the first and second objectives of the study, the relationship was determined by computing the Pearson correlation coefficient between the means of the teachers' expectations and the learners' average score. Two correlations were computed, one for Busiro and a second one for Luuka.

Ethical Considerations

The study obtained official clearance from Kyambogo University Graduate School and ethical approval from Gulu University Research Ethics Committee (GUREC). After obtaining the GUREC approval, the research was registered with the Uganda National Council for Science and Technology (UNCST).

As an educational researcher, I operated within an ethic of respect for everyone involved in this undertaking. All participants were treated fairly, sensitively, with dignity, and within an ethic of respect and freedom from prejudice regardless of age, gender, ethnicity, faith, disability, political belief or any other significant difference. They were explained to and understood the purpose of the research and agreed to their participation without any duress. The teachers were informed that they were to be observed and recorded on video as they taught a mathematics lesson to P.1 learners; supervise the learners as they did a mathematics assessment test; fill a questionnaire on their expectations of the learners' mathematics competence; and have an oral interview which would be audio recorded.

Permission was sought from the District Education Officers (DEOs) of Wakiso and Luuka to visit the selected schools in their area of administration; and from the Headteachers and teachers of the selected schools to observe lessons, interview teachers, have teachers fill the questionnaires, test the learners, and access learners' class work artefacts. The right of any participant to withdraw from the research at any time was respected. Data gathered from the participants was treated with confidentiality and anonymity, used only for purposes of this research, kept securely, and any publication accruing will not directly or indirectly lead to a breach of the agreed confidentiality and anonymity.

Obtaining Consent and Assent of the P.1 Learners

The consent and assent of the learners was requested for both orally and in writing. In order to protect the rights of the P.1 learners who participated in the study, they were assented after getting consent from their parents or guardians and their teachers. The teachers were consulted both orally and in writing to seek their consent to participate in the study. The researcher discussed with each teacher the purpose of the study, their role, benefits and any risks arising from participating in the study. After the discussion, both researcher and teacher read through the consent form and the researcher explained any issues as required by the teacher before the teacher gave consent and signed the forms. After obtaining the teacher's consent, the researcher randomly selected four learners from the class list to do the competence assessment test. Teachers were requested to avail the physical and telephone contacts of the learners' parents or guardians to enable the researcher seek the parents' or guardians' permission for their child to participate in the study. The parents or guardians were then contacted. The researcher physically met the parents and guardians to discuss the research purpose and go through the consent/ parental permission and assent forms before they filled the form.

After a parent or guardian had consented to their child's participation in the study, the child was also explained the purpose of the study, their role, the benefits of the study, and what was expected of them if they agreed to participate. The researcher explained to the children the purpose of the test and requested for their acceptance to do the test. No child was forced to do the test if they or their parent or guardian was not willing to let them participate in the study. The children's acceptance to participate in the study was requested for both orally, in English language and in the appropriate local language (Luganda or Lusoga) and in writing. The researcher read through the assent form with each child and made necessary explanations before a child filled it.

Ensuring confidentiality of the audio and video recordings

Precaution was undertaken to protect the confidentiality of all research participants. All the data collected in form of video or audio recordings and field notes has not been used in any way that unfairly compromises the research participants. Original file copies of the recordings have been kept securely by the researcher with password protection on an external hard drive and under lock and key. In any case, no information has been made public when it includes any personal identifiers like photographs or voices. If there is need to use any video or audio clips, the participant's consent will be sought to disguise the original appearance and tone.

Chapter three has detailed the research design and methods adopted for this study. The location of the study and sampling techniques were discussed. Also discussed were the research instruments; their validity and reliability; and the data collection and analysis procedures. The chapter ended with an elaboration of the ethical considerations that were undertaken. Chapter four will lay out the outcomes of the research.

Chapter Four

Presentation of Findings, Analysis and Interpretation

Introduction

The purpose of the study was to explore teachers' expectations and establish the instructional practices that Primary One mathematics teachers in Busiro North County and Luuka North County could adopt in order to enhance their learners' mathematics competence. The findings of the study are presented in this chapter in four sections. The first section is a presentation of the teachers' expectations of their learners' competence. This is followed by the outcomes of the learners' competence assessment test. The third section is about the relationship between teachers' expectations and the learners' competence in mathematics. The fourth and last section is a presentation of the various instructional practices the teachers used to enhance their learners' competence in mathematics.

Demographic Characteristics of the Teacher Participants

The majority of the teachers totalling 71 (95.9%) who participated in the study were females and only 3 (4.1%) teachers were males. Of the three male teachers, one was in Busiro North County and two were in Luuka North County. The other demographic characteristics of the teacher participants are summarised in Table 4.1.

Table 4.1: Demographic Characteristics of the Teacher Participants

Age (years)		Highest qualification attained		Duration of service (years)	
Range	**Number (%)**	**Qualification**	**Number (%)**	**Range**	**Number (%)**
18 – 27	34 (45.9%)	Degree	4 (10.8%)	1 -5	17 (23%)
28 – 37	28 (37.8%)	Diploma	21 (28.4%)	6 – 10	36 (48.6%)
38 – 47	7 (9.5 %)	Certificate	47 (63.5%)	11+	21 (28.4%)
48 +	5 (6.8 %)	Senior Four	2 (5.4%)		

From Table 4.1, most of the teachers who participated in the study, that is 47 (63.5%) of them attained a Grade III teachers' certificate as their highest qualification. Two teachers (5.4%) did not have any qualification as professional teachers.

Teachers' Expectations of Their Learners' Competence in Mathematics

The first objective of this study was to establish the Busiro North County and Luuka North County P.1 teachers' expectations of their learners' competence in mathematics. This section begins by answering the research question: Which are the prevalent teachers' expectations of the P.1 learners' competence in mathematics? Findings from the questionnaire are presented first followed by those from the oral interviews.

Teachers' Expectations of Their Learners' Competence in Mathematics in Relation to Their Background

The findings of this study revealed that P.1 teachers in Busiro North and Luuka North Counties had several expectations on the background of the children who joined the class. Some of the expectations are as per government guidelines like the age of entry to P.1 being 6 years; equal numbers of girls and boys joining P.1; all children to have had some form of pre-primary education; and a good mastery of the area local language.

The findings of this study revealed that more than half (51.4%) of the teachers in Busiro had very high expectations of the learners' competence in mathematics for those taught in the local language and for the ones who attended nursery school. In Luuka, the majority of teachers (70.3%) had high expectations of the learners' competence in mathematics for those taught in the local language but less than one in four teachers (24.3 %) had very high expectations of learners who attended nursery school. Similar proportions of teachers of 40.5% in Busiro and 37.8% in Luuka had very high expectations of the learners aged 7 years and above. Teachers from both study areas did not consider the learners' gender, social economic status (SES) and parents' education level key factors in a learners' competence in mathematics.

Teachers' Expectations of Their Learners' Competence in Mathematics in Relation to the Curriculum Content

Findings on the teachers' expectations of their learners' competence in the different curriculum content areas are shown in Tables 4.2 and 4.3. In

Busiro North County, the most prevalent teachers' expectations were for the learners' ability to recognize, count, write and match symbols and objects representing the numbers 0 to 9 where very high expectations were reported by up to 91.9% of the teachers. More than half of the teachers, that is 62.2% in Busiro had high expectations of their learners' ability to multiply 1-digit numbers by 10.

The findings further revealed that up to 51.3% of the teachers held low expectations of their learners' ability to multiply one digit numbers by 3. Some teachers also had low expectations of the learners' ability to recognise and count the numbers 10 to 99; and to apply addition or subtraction to real life contexts. This defies the ideal situation of all teachers having equally high expectations for all learners to attain competence in all mathematics content areas.

Table 4.2: Prevalence of Busiro Teachers' Expectations of the Learners' Competence in Relation to the Curriculum Content

BUSIRO TEACHERS' EXPECTATIONS OF THE LEARNERS' COMPETENCE IN RELATION TO CURRICULUM CONTENT

Content	Very High Expectations		High Expectations		Moderate Expectations		Low Expectations		Very Low Expectations	
	N	Row Valid N %	N	Row Valid N %	N	Row Valid N %	N	Row Valid N %	N	Row Valid N %
Recognise 0-9	34	**91.9%**	3	8.1%	0	0.0%	0	0.0%	0	0.0%
Count 0-9	30	**81.1%**	6	16.2%	0	0.0%	1	2.7%	0	0.0%
Recognise 10-99	18	48.6%	17	45.9%	0	0.0%	2	5.4%	0	0.0%
Count 10-99	7	18.9%	18	48.6%	0	0.0%	5	13.5%	7	18.9%
Add1-digit	23	**62.2%**	14	37.8%	0	0.0%	0	0.0%	0	0.0%
Subtract 1-digit	16	43.2%	19	**51.4%**	0	0.0%	2	5.4%	0	0.0%
Add 2-digits	10	27.0%	24	**64.9%**	0	0.0%	3	8.1%	0	0.0%
Subtract 2-digits	10	27.0%	22	**59.5%**	0	0.0%	5	13.5%	0	0.0%
Multiply by 2	7	18.9%	23	**62.2%**	0	0.0%	7	18.9%	0	0.0%
Multiply by 3	0	0.0%	18	48.6%	0	0.0%	16	43.2%	3	8.1%
Multiply by 10	3	8.1%	23	**62.2%**	0	0.0%	11	29.7%	0	0.0%
Apply addition	2	5.4%	25	**67.6%**	0	0.0%	10	27.0%	0	0.0%
Apply subtraction	2	5.4%	25	**67.6%**	0	0.0%	10	27.0%	0	0.0%

Note: Percentage values above 50% are in bold

On a scale of 1 to 5 (1= very low expectations, 5 = very high expectations), teachers in Busiro had an average expectation of their learners performance on the identified competences of 4.16, standard deviation = 0.47.

Table 4.3 shows that in Luuka North County, the most prevalent teachers' expectations just as in the case of Busiro, were for the learners' ability to recognize, count, write and match symbols and objects representing the numbers 0 to 9 with very high expectations reported by up to 81.1% of the teachers. More than three quarters of the teachers, that is 78.4% in Luuka had high expectations of their learners ability to subtract one-digit numbers. However, more than half of the teachers (56.8%) had low expectations of their learners' ability to multiply one digit numbers by 3 or by 10.

Table 4.3: Prevalence of Luuka Teachers' Expectations of the Learners' Competence in Relation to the Curriculum Content

LUUKA TEACHERS' EXPECTATIONS OF THE LEARNERS' COMPETENCE IN RELATION TO CURRICULUM CONTENT

Content	Very High Expectations		High Expectations		Moderate Expectations		Low Expectations		Very Low Expectations	
	N	Row Valid N %	N	Row Valid N %	N	Row Valid N %	N	Row Valid N %	N	Row Valid N %
Recognise 0 to 9	29	**78.4%**	8	21.6%	0	0.0%	0	0.0%	0	0.0%
Count 0 to 9	30	**81.1%**	7	18.9%	0	0.0%	0	0.0%	0	0.0%
Recognise 10 to 99	9	24.3%	28	**75.7%**	0	0.0%	0	0.0%	0	0.0%
Count 10 to 99	22	**59.5%**	8	21.6%	0	0.0%	7	18.9%	0	0.0%
Add one digit	11	29.7%	26	**70.3%**	0	0.0%	0	0.0%	0	0.0%
Subtract one digit	8	21.6%	29	**78.4%**	0	0.0%	0	0.0%	0	0.0%
Add two digits	7	18.9%	30	**81.1%**	0	0.0%	0	0.0%	0	0.0%
Subtract two digits	7	18.9%	12	32.4%	18	48.6%	0	0.0%	0	0.0%
Multiply by 2	6	16.2%	11	29.7%	2	5.4%	18	48.6%	0	0.0%
Multiply by 3	4	10.8%	12	32.4%	0	0.0%	21	**56.8%**	0	0.0%
Multiply by 10	5	13.5%	11	29.7%	0	0.0%	21	**56.8%**	0	0.0%
Apply addition	3	8.1%	27	**73.0%**	0	0.0%	7	18.9%	0	0.0%
Apply subtraction	3	8.1%	28	**75.7%**	0	0.0%	6	16.2%	0	0.0%

Note: Percentage values above 50% are in bold

On a scale of 1 to 5 (1= very low expectations, 5 = very high expectations), teachers in Luuka had an average expectation of their learners performance on the identified competences of 4.06 with standard deviation = 0.41. Hence, the mean teacher expectation for Luuka was slightly lower than that of 4.16 for teachers in Busiro.

In addition to expressing their expectations of the learners' competence in relation to the curriculum content, the teachers indicated their expectations in relation to the common routine classroom procedures. These are the procedures followed by both teacher and learners as they interact during the mathematics lessons with the goal of ensuring that each learner fully understands all the concepts presented by the teacher. Teachers in both study areas did not expect the majority of their learners to benefit from drilling and extra tutoring. Surprisingly, more than half of the teachers, 56.8% in Busiro and 67.6% in Luuka had low expectations of the learners' ability to possess appropriate prior mathematical knowledge of the concepts taught in class.

A large proportion of teachers, who were 34 (91.9%) in either study area had very high expectations of the learners' ability to complete oral exercises. Only 2 (5.4%) teachers from either Busiro or from Luuka had very high expectations of learners benefiting from drilling or extra tutoring after school. It is worth noting that although findings on the teachers' instructional practices revealed that teachers in both counties rarely asked learners to explain their mathematical ideas and procedures for answering tasks, 23 (62.2%) teachers in Busiro and 25 (67.6%) in Luuka expressed high expectations of their learners' ability to give explanations to the teacher. Similarly, 23 (62.2%)

teachers in Busiro and 27 (73%) in Luuka expressed high expectations of their learners' ability to give explanations to their classmates.

Oral Interview Responses on Teachers' Expectations of P.1 Learners' Competence in Mathematics

This section presents teachers' expectations of their learners' competence in mathematics from the oral interviews conducted after the lesson observations. The teachers were asked "Do you have high expectations for each learner's ability to succeed in mathematics or are there some learners who can never make it in mathematics?" Their responses to the researcher indicate that whereas some teachers held high expectations for their classes, others had reservations on the mathematics ability of some few learners in the class. Some of the responses in which teachers expressed high expectations are cited below. Responses for teachers from Luuka are presented first followed by responses for teachers from Busiro.

Teacher L4: Oh yes, yes. All our learners are good. In fact P1 to P3 do not have any problems with mathematics (teacher, Luuka).

Teacher L5: They are all able to learn mathematics very well. What we do like on Tuesday and Thursday from 2 00pm to 2 30 pm we do some mathematics revision for the whole class so that everyone can catch up. Some really need more time, like we are doing subtraction for them they still want to add, or even with multiplication they still add …but I have to be patient with them and give them more time in the afternoon (teacher, Luuka).

Teacher L6: These learners are… most of them actually have the ability to do all the mathematics well, I have not noticed any who I can say is not able (Teacher from Luuka).

Teacher L7: The majority of them can get a concept by the end of the lesson. There are some three learners who need special help, a SNE teacher but there is none in the school (teacher, Luuka)

Teacher L8: I expect them all to have the ability …. But maybe by our standards here, you cannot compare our school with … (teacher, Luuka).

Teachers L4, L5, L6, L7 and L8 had positive expectations of the learners. These teachers' expressions of high expectations of their learners' mathematics ability concur with the findings from the questionnaire survey (Table 4.3). The survey showed that large proportions of up to 81.1 % of the teachers in Luuka had very high expectations of the learners' ability to recognise and count numbers from 0 to 99. Similar percentages of teachers had high expectations of their learners' ability to add and subtract 1-digit and 2-digit numbers. In addition, teachers L5 and L7 believed that with extra support like remedial classes or the presence of a special need education (SNE) teacher all learners would be able attain even better competence in mathematics. However, Teacher L8 expressed feelings of low self-efficacy, indicating inability to make her learners attain competence levels as high as attained by learners in other schools. The next presentation is the responses from teachers in Busiro North County.

Teacher B1: Yes, I have really high expectations for them! They are all very good. You saw them doing division very well even though other schools teach it in P.2, for me I teach it in P.1 and they always pass it…..We cannot stick to the NCDC guidelines, we cannot complete the syllabus in the given time (teacher, Busiro).

Teacher B2: Yeah, I know they are all very good learners. I remind all of them to work neatly, quickly and accurately, they make very few mistakes and it is not all the time just one or two mistakes for some few of them …. No one makes the same mistake again. Each one is doing their best (teacher, Busiro).

Teacher B3: I expect most of them to do very well … We have a week for revision to help them where they are still doing not so well like maybe subtraction, vertical addition. I am sure they will all do well (teacher, Busiro).

Teacher B4: My expectation? It is that they all have the ability; all of them will be able to do all the mathematics by the end of the year. They have been learning very well and I do not foresee any problems with anyone of them (teacher, Busiro).

Teachers B1, B2, B3 and B4 had high expectations of the learners. It is noteworthy that teacher B2 had even stretched the learners to do P.2 work during the third term of P.1, which could be putting pressure on the learners because their teacher has very high expectations of their competence in mathematics. However, just as was the case for Luuka, teachers in Busiro also verbally conveyed high expectations of their learners' mathematics ability. Relatedly, findings from the questionnaire survey (Table 4.2) showed that very large proportions of up to 91.1 % of the teachers in Busiro had very high expectations of the learners' ability to recognise and count numbers from 0 to 9. More than half of the teachers in Busiro had high expectations of their learners' ability to work with and apply addition and subtraction to familiar social contexts 2-digit numbers.

Some other teachers made the following responses:

Teacher L1: Umm, many of them are good but you see there are children like (teacher makes reference to some learner), you can imagine this is third term, October, but he was not even writing any number correctly… And that other learner, this is the third year in P.1 yet I don't see any chance of the learner progressing to P.2 (teacher, Luuka)

Teacher L2: You know P.1s, some of them can cry a lot, someone cries almost for the whole lesson then they will not have learnt anything (teacher, Luuka).

Teacher L3: Umm, they are really good, maybe one or two, there is one we even told the father to take her to preschool because she is not yet six but he refused, and he brings her to school very early in the morning. Now like today, she was just sleeping all the time. So that one might have to repeat but the others I expect them to progress very well (teacher, Luuka).

The three teachers (L1, L2 and L3) expressed low expectations of the learners who are younger than the official age for entry into P.1 (less than six years old), those who did not attend any form of preschool and also those who were repeating the class. These low expectations were reflected in the findings from the questionnaire which indicated that small proportions of teachers from Luuka (16.2% -18.9%) had low expectations of their learners' ability to count from 10 to 99 and to apply subtraction to social contexts. Furthermore, up to 56.8% of the teachers had low expectations of the learners' ability to multiply one-digit numbers by 2, 3 and 10 (Table 4.3).

Teacher B5: Aaah, like there are those siblings, in fact they were three, one of them is even almost making 14 years old, but as you saw, they always misplace their exercise books or pencils, they cannot settle in class but we try to make them do something... they cannot count in the correct sequence as yet but they keep trying (teacher from Busiro)

Teacher B6: In this area here, children report to school two weeks after the start of the term so you cannot compare them with those in ……. Parents want the children to help them in the gardens so every term we start late then by the end of the year, some topics are not yet covered (teacher from Busiro)

Teacher B7: Let me say 50 – 50. Some join school late when first term is almost ending, some transfer from other schools when they are already far behind but those we started the year with are

> progressing very well, I do not expect any problem with them (teacher from Busiro).

The three teachers (B5, B6 and B7) had low expectations of some learners who are older than the official age for entry into P.1 or even being in primary school (over 12 years old), those who are absent from school for any reason and also those who fail to locate their exercise books and pencils when required. These statements of low expectations coincide with the teachers' questionnaire responses. The questionnaires showed that up to 43.2% of the teachers in Busiro had low expectations of the learners' ability to multiply one-digit numbers by 3, apply addition or subtraction to social contexts, and add or subtract 2-digit numbers.

This section has highlighted the teachers' expectations of their learners' competence in mathematics. The next section presents the learners' scores on the assessment test as an indicator of their competence in mathematics.

Learners' Competence in Mathematics

Most of the learners who took part in the study were males (55.1%). Slightly more than one in five of the learners (22.3%) were less than seven years old. More demographic characteristics of the learner participants are given in Table 4.4.

Table 4.4: Demographic Characteristics of the Learner Participants

	Busiro North County	**Luuka North County**	**TOTAL**
Characteristic	**Number (%)**	**Number (%)**	**Number (%)**
Female	64 (43.2)	69 (46.6)	133 (44.9)
Male	84 (56.6)	79 (53.4)	163 (55.1)
Aged below 7 years	44 (29.7)	22 (14.9)	66 (22.3)
Aged 7+ years	104 (70.3)	126 (85.1)	230 (77.7)

Findings on the learners' competence in mathematics are presented in this section. The learners' competence is presented as an outcome of their teachers' expectations and associated instructional practices. The second objective of the study was to compare the P.1 learners' competence in mathematics for the two study areas. The objective's hypothesis was H_1: There is a statistically significant difference between the P.1 learners' competence in mathematics in the two study areas. Results on the hypothesis are given in this section. The learners' average scores on the identified competences and according to County are shown in Figure 4.1.

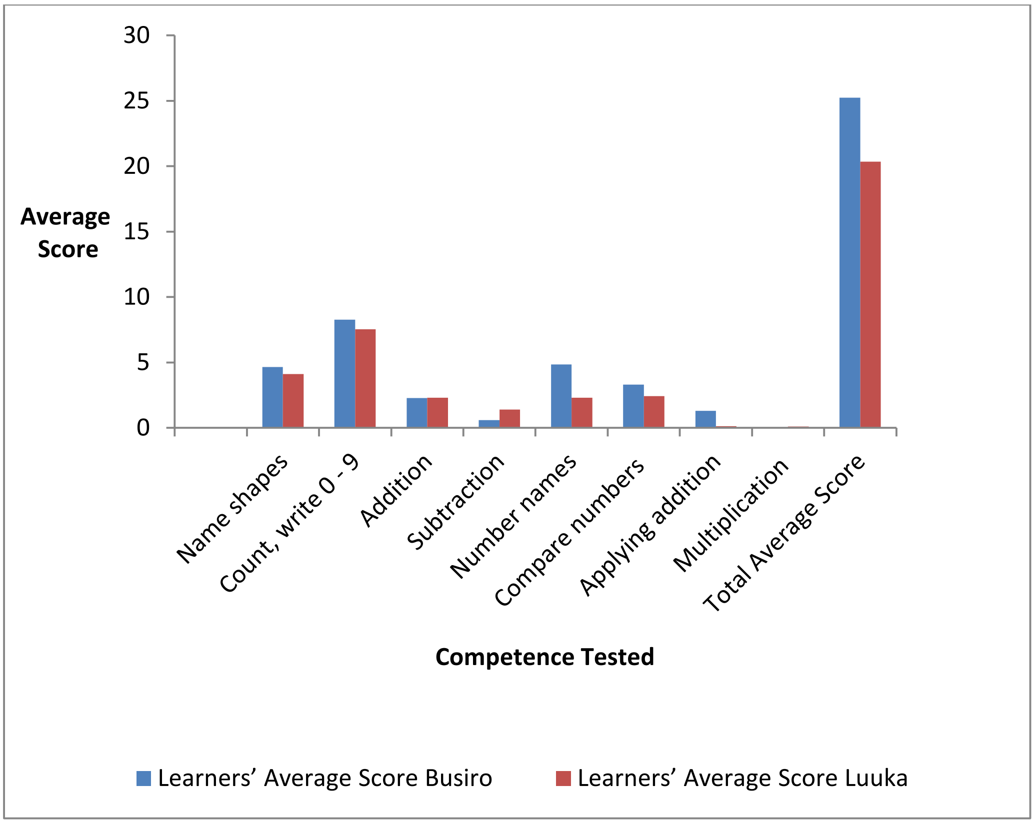


Figure 4.1: Learners' Average Scores on Identified Competences

Figure 4.1 indicates that the learners were most competent in counting and matching objects symbolising the numbers from 0 to 9 with 132 (89.2 %) from Busiro and 122 (82.4%) from Luuka scoring at least 7 out of 10. This was followed by naming of shapes in which 102 (68.9%) of the learners from Busiro and 86 (58.1%) from Luuka scored at least 5 out of 6. Whereas 101 (68.2%) of the learners in Busiro were able to answer correctly at least one of three parts of the question that required applying addition to a familiar social context, only 9 (6.1%) in Luuka were able to do so. Learners in Busiro performed better in the identified competences than those in Luuka, except for addition in which the average score was the same, and in subtraction in which learners from Luuka had better competence with 71 (48%) who were slightly less than half of the learners getting at least half of the subtractions correct.

Some artefacts of the learners' work on the mathematics competence assessment test are presented here. Figure 4.2 shows how a learner worked out part of Question 2 on the test. The learner counted the 9 boxes as 7 boxes then counted the six boxes correctly but in either case failed to write the number symbol correctly.

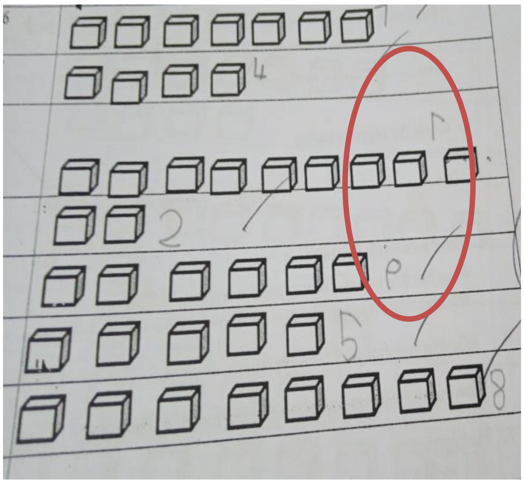


Figure 4.2: A Learner with Difficulties Counting and/or Writing 6 and 9

In Figure 4.3, both learners used the counting strategy to do subtraction in Question 4 of the test. Whereas the picture on the left shows that the learner did the subtraction correctly, the one on the right shows that the learner failed to distinguish between subtraction and addition.

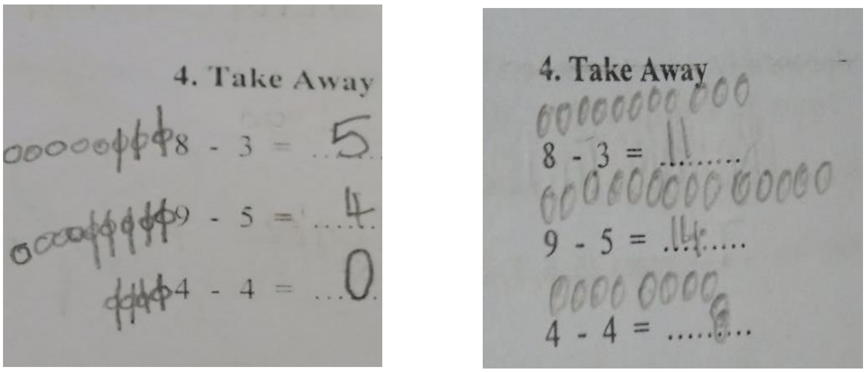


Figure 4.3: Learners' Subtraction Work Using the Counting Strategy

The findings of the study indicate that not more than 30% of the learners could answer correctly Question 8 that required applying addition to a familiar social context. Similarly, learners did not do well the multiplication in Question 9. However, Figure 4.4 depicts work of a learner who had the competence to apply addition when given a word problem and also to multiply 1-digit numbers by 10, 2 and 3.

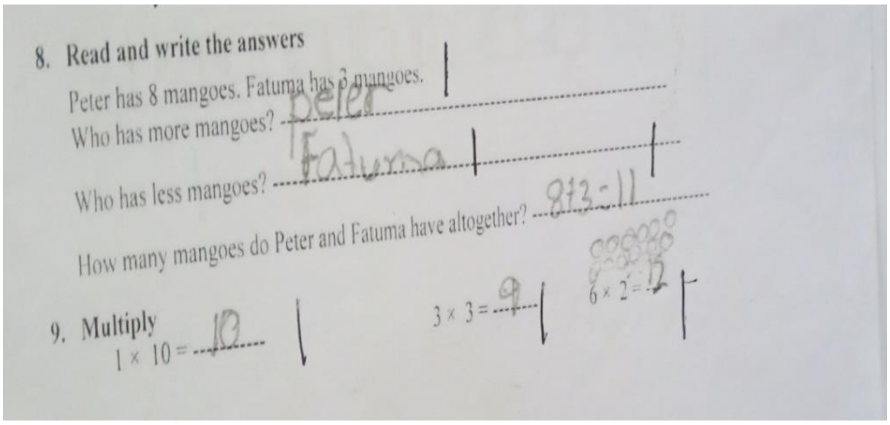


Figure 4.4: A Learner's Answers to Questions 8 and 9 of the Test

Findings presented in Table 4.5 show that the mean score on the competence test for Busiro learners was 25.24 (rounded to two decimal places) while the mean score for Luuka learners was 20.35 (rounded to two decimal places). This means that Busiro learners got a higher mean score on the competence test compared to those of Luuka. In addition, Table 4.5 shows that the standard deviation for the scores of the Busiro learners was smaller than that for Luuka. The implication of this is that the Busiro learners' scores were closer to their mean score than in the case of Luuka. The bigger standard deviation for Luuka implies that the learners got more low scores as compared to the learners in Busiro.

Table 4.5: Comparison of Busiro and Luuka Learners' Mathematics Scores

Group Statistics

	County	N	Mean	Std. Deviation	Std. Error Mean
Score	Busiro	148	25.2432	6.21674	.51101
	Luuka	148	20.3514	9.65730	.79383

Table 4.6 indicates that the mean score for the Busiro learners was 4.89 points (rounded to two decimal places) higher than the one for the Luuka learners. Furthermore, the positive t-value of 5.182 with $p < 0.001$, testifies that the mean for Busiro learners was statistically significantly greater than the mean for Luuka learners at $\alpha = 0.05$ significance level. The alternative hypothesis H_1: There is a statistically significant difference in the competence in mathematics of the P.1 learners in the two study areas was accepted.

Table 4.6: Independent Groups t-test Results

Levene's Test for Equality of Variances		t-test for Equality of Means						
F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
26.121	.000	5.182	294	.000	4.89189	.94408	3.03387	6.74991
		5.182	250.977	.000	4.89189	.94408	3.03256	6.75123

Instructional Practices Used by Teachers' to Enhance Learners' Competence in Mathematics

The third objective of the study was to examine the instructional practices P.1 teachers use to enhance the learners' competence in mathematics. The research question for the objective was to find out the instructional practices used by the teachers. The data from the lesson observations revealed that teachers in Busiro North and Luuka North counties used a variety of instructional practices (IPs) to help P.1 learners attain competence in mathematics. The instructional practices have been categorised and reported using eleven (11) different themes. The themes are given in Table 4.7. Before the narration of each theme, an outline of its components is stated.

Table 4.7: Themes used for Presenting Data from Lesson Observations

Instructional Practice (IP) Code	**Theme of the Instructional Practice (IP)**
IP 1	Teachers built on the learners' existing knowledge which is closely related to their everyday life activities
IP 2	Teachers worked out (modelled, demonstrated) at least three examples of the mathematics concept for the learners
IP 3	Teachers allowed for explanations and asking of questions between learner and learner, and between learner and teacher
IP 4	Teachers allotted learners sufficient time for tasks, be they oral, written, or practical
IP 5	Teachers gave learners timely and supportive feedback
IP 6	Teachers drilled learners (Used traditional teacher centred mode of teaching)
IP 7	Teachers used assessment for grading
IP 8	Teachers used songs, music, rhymes, drama, game competitions
IP 9	Teachers used pair work to help learners develop their problem solving skills
IP 10	Teachers made appropriate use of wall charts for shapes, numbers, number line for 1-20, Calendar, The School, The Home
IP 11	Other common teacher instructional practices observed

IP 1: Teachers built on the learners' existing knowledge which is closely related to their everyday life activities.

In order to determine the learners' existing knowledge and build on it the new mathematics concepts in a lesson, the teachers : asked learners open ended questions with more than one answer; made learners count fingers, count themselves, and count objects in the classroom or in the school compound. The teachers gave learners visual cues, for example flash cards or picture cards for the number symbols1-5; asked the learners oral problem questions (for example, I have 4 bananas, Daddy gives me 1 more, how many bananas do I have altogether?). Teachers also dealt with the learners' mathematics misconceptions immediately.

All the 37 (100%) teachers in Busiro and the majority 36 (97.3%) of teachers in Luuka used objects that learners are familiar with to teach them to count numbers. Learners counted objects including: 2 ears, 3 cooking stones, four legs of a chair, and the number of legs that three learners have altogether. They counted sticks, pencils, stones, mugs and various seeds. Learners were asked to match familiar objects such as egg and hen or leaf and tree. Two (5.4%) teachers in Busiro and one (2.7 %) in Luuka asked learners open ended questions such as "What things do we have at home and also have them at school?" All these familiar objects and oral problem questions assisted the learners to connect the mathematical concepts to their existing knowledge which is closely related to their everyday life activities. They were then able to practise the concepts on their own both inside and outside the classroom, thereby strengthening their competence and retention of the concepts.

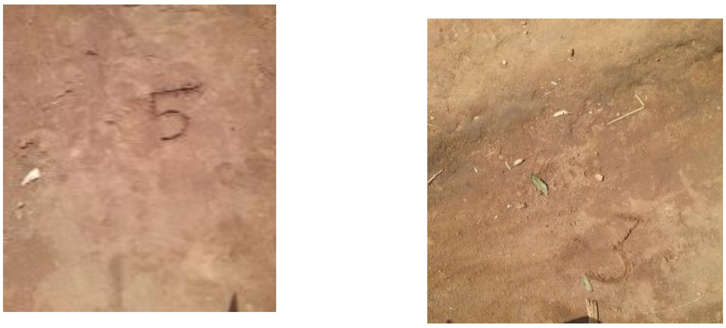
The majority of teachers, 36 (97.3%) in Busiro and 33 (89.2%) in Luuka used flash cards with the numbers 1 to 10, or even 1 to 20 written on manila cards or on pieces of paper boxes for the learners to say the number names or to look at as an aid to writing the number symbol. One teacher in Luuka innovatively cut the numbers 1 to 5 from old rubber slippers (*flip-flops*) as shown in Figure 4.5.

Figure 4.5: A Teacher's Innovative Cuttings for Numbers 1 to 5

This teacher's learners not only looked at the numbers but also "touched" and manipulated them, and consequently had the opportunity to learn and experience the numbers with an extra sense and skill as compared to their fellow P.1 learners in other schools.

All 37 (100%) teachers in Busiro and the majority of 36 (97.3%) teachers in Luuka dealt with learners' misconceptions and mathematics errors immediately. These teachers often asked classmates whether a peer's oral, written or practical response to a task was correct. If a response was not correct, the peer was helped by both classmates and teacher to identify and correct any mistakes. Many teachers, 32(86.5%) in Busiro and 31(83.8%) in Luuka , emphasised correct writing of number symbols and 2-digit numbers, correct and neat spellings for number words, and correct pronunciations of the number words.

Some few teachers, 3 (8.1%) in Busiro and 2 (5.4%) in Luuka sometimes wrote the correct number symbol on the chalkboard or in a learner’s exercise book, while others 7 (18.9%) in Busiro and 9 (24.3%) gave learners oral instructions on how to write a number symbol correctly, for example: a straight sleeping stick (—), followed by a straight standing stick (|), then a curve facing backwards (⊃); are both verbal and practical steps and cues teachers gave to the learners to assist them become competent in writing the number symbol **5** correctly. The writing could be air-writing, on the chalkboard, in a learner’s exercise book, on a slate or even on the ground (soil) just outside the classroom. Figure 4.6 has illustrations of how two learners in Luuka wrote the number 5 on soil.



LHS RHS

Figure 4.6: Illustrations of P.1 Learners’ Writings of the Number 5 on the Ground

The illustrations in Figure 4.6 shows that the learner whose writing is on the left hand side (LHS) has already attained the competence to write the number 5, whereas the one whose writing is on the right hand side (RHS) is yet to attain that competence (also the writing in Figure 4.7). This learner needs to be helped to distinguish 5 from 3 and possibly also to overcome reversal of number symbols in which this very pupil could write 6 as 9 and vice versa.

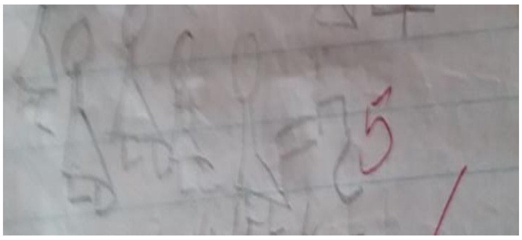


Figure 4.7: Work of a P.1 Learner who Needs Help to Overcome the Reversal of Number 5.

IP 2: Teachers worked out (modelled, demonstrated) at least three examples of the mathematics concept for the learners.

The teachers ensured the learners had concrete materials such as sticks, bottle tops, beans, and stones which were used for counting. They worked out and explained lots of examples, and also provided learners with many opportunities for practice. Teachers demonstrated practical activities in front of the whole class and gave learners oral, visual, and practical prompts/hints as they practised what the teacher had demonstrated. Learners were given opportunity to do air writing, write on the ground, and write on slates when they needed to practice writing number symbols.

The majority of 36 (97.3%) teachers in Busiro and all 37 (100 %) teachers in Luuka modelled tasks for and with the learners, demonstrated practical work, and made use of concrete materials such as counters, some of which like the stones, leaves, flowers, empty maize cobs and sticks were picked by the learners from the school compound. One teacher in Busiro used concrete objects on a chart showing different sets of objects as shown in Figure 4.8.

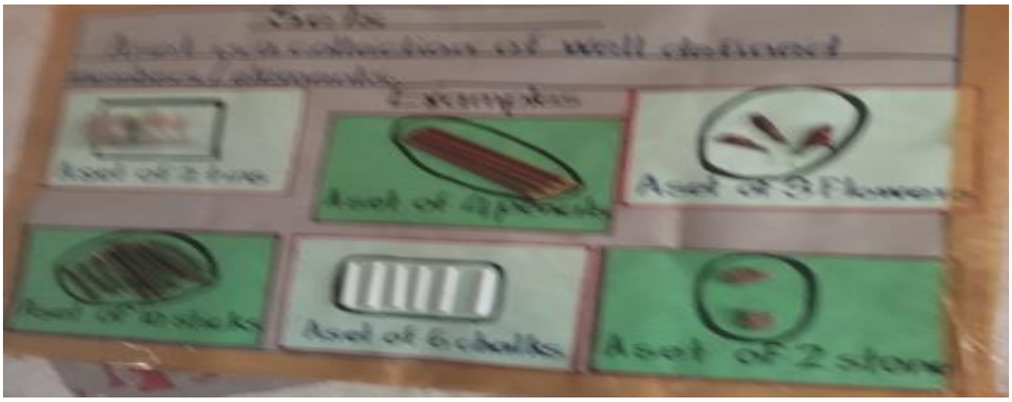


Figure 4.8: A Wall Chart Showing Different Sets of Objects Made With the Actual Real Materials.

Note. Materials include 2 tins, 4 pencils, 3 flowers, 10 sticks, 6 pieces of chalk, and 2 stones.

All 37 (100%) teachers in Busiro and all 37 (100%) teachers in Luuka spent on average not less than 10 minutes in each lesson writing on the chalkboard (this involved drawing as accurately and as neatly as possible, for example a jelly-can or a broom). The chalkboard writing commonly meant copying work from a textbook or the teacher’s lesson preparation notebook to the chalkboard. This was then followed by working out the copied examples for and with the learners, then copy-writing related activities for the learners to work out. The learners also commonly first worked out the examples on the chalkboard, copied the worked out examples from the chalkboard to their exercise books, then copied the activities from the chalkboard to the exercise books and finally worked out the activity individually in one’s exercise book. Figure 4.9 shows one teacher writing on the chalkboard examples of how sets are joined.

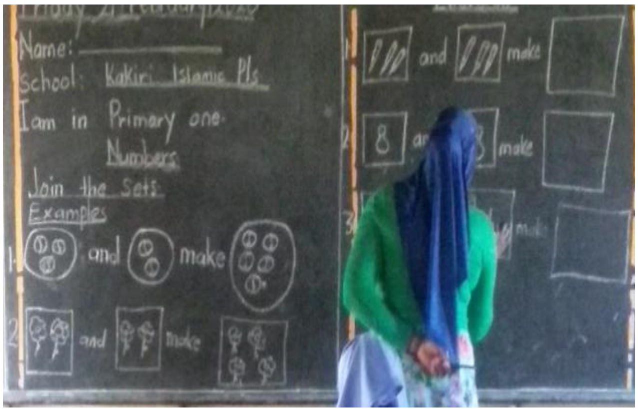


Figure 4.9: A Teacher Writes Examples of Joining Sets on the Chalkboard.

Figure 4.10 shows an activity a learner copied from the chalkboard and then answered it in her exercise book.

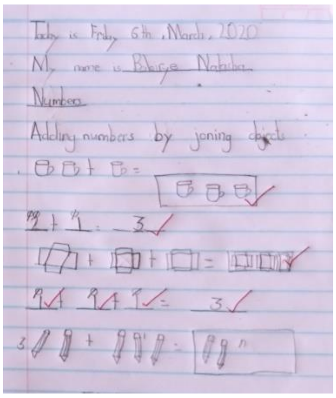


Figure 4.10: A Learner Copies an Activity From the Chalkboard and Works it out in her Exercise Book.

Note. The activity was marked by the teacher as indicated by the red ink ticks.

All the teachers demonstrated practical work, especially counting fingers, counting concrete materials, drawing various objects and writing number symbols for their learners, including air-writing. They commonly used repetitive oral prompts, saying incomplete sentences or incomplete words for the learners to complete like "*The number is …?", "They are only …?"*

However, the teachers rarely used visual prompts, like glancing at the charts or at some other visual learning aid so that learners could follow the teacher's eyes, locate the learning resource and make appropriate use of it. Teaching learners to locate and use resources within their environment is one way of helping them to apply the same skill to all mathematical problems and also to their real life experiences. Using the resources in turn helps promote the learners mathematics problem solving competency which ability they would apply to their everyday life activities.

IP 3: Teachers allowed for explanations and asking of questions between learner and learner, and between learner and teacher.

The teachers restated statements in order to clarify them and prompted learners for further explanation, reasoning or justification of their mathematical ideas. They gave all the learners opportunities to connect concepts to real life, initiate doing tasks, and use guessing to answer questions. The teachers emphasised that learners use correct mathematical vocabulary, helped all learners to become active problem-solvers, and ensured the learners were confident and happy discussing mathematics ideas with the teacher and with their peers.

The majority of 36 (97.3%) teachers in Busiro and similarly 36 (97.3%) teachers in Luuka rarely asked P.1 learners "why" questions during a mathematics lesson. In one instance in Busiro, the learners were able to explain why they matched an egg to a hen and a leaf to a tree but not vice versa. These teachers sometimes used "conversational language" (non-authoritarian) in order to communicate precisely to the P.1 learners. Some few teachers , 3 (8.1%) in Busiro and 2 (5.4%) in Luuka put emphasis on the use of correct mathematical vocabulary, especially pronunciations of number names like three and thirteen when teachers guided learners by telling them to "bite the tongue for *th*". This helps learners attain competence in appropriate mathematics language and communication.

IP 4: Teachers allotted learners sufficient time for tasks, be they oral, written, or practical. (For instance, at least 3 seconds of waiting between teacher's oral question and learner response)

The teachers provided learners time to think and become patient problem solvers, observed to see if the learners were on task, appropriately paced the lesson and made effective transitions between portions of the lesson.

All 37 (100%) teachers in Busiro and all 37 (100%) teachers in Luuka gave their learners sufficient time to think and become patient problem solvers, although sometimes this made the teachers to run into the next lesson's allotted time. The duration of a mathematics lesson in P.1 varied from school to school with some schools having 30-minutes periods, others have 40-minutes periods while others taught 60-minutes periods. It was common practice for these teachers to tell learners to work faster as the time for the bell to end the lesson drew near. However, in urging learners to work faster, most of the teachers, 27

(73%) in Busiro and 24 (64.9%) in Luuka emphasised neatness, accuracy and speed.

IP 5: Teachers gave learners timely and supportive feedback.

Teachers gave learners timely and on-spot feedback, also allowed learners to provide feedback to each other, indicated to the learners how to do corrections and used mistakes as opportunities for children to learn. They attended to precision, speed and accuracy (mathematical procedural skills and fluency), and employed effective, distributed summarising throughout the lesson.

All 37 (100%) teachers in Busiro and the majority 36 (97.3%) teachers in Luuka gave the learners on-spot feedback especially for oral activities and those that learners worked out on the chalkboard. The teachers commonly asked the class whether a classmate was right or not. Clapping (Pa-pa-pa for you, Umeme-umeme, fire), dancing by both learners and teacher, stamping the feet by both learners and teacher, giving flowers or a bottle of soda (mimicked) and a hi-five with the teacher were common physical forms of feedback given to learners when they complete a task correctly. “You are smart”, Very Good, Thank you, Lovely, Thank you for trying, Super; Wonderful; Excellent; were some verbal expressions these teachers use as on-spot feedback. Often learners were requested by the teacher to give some of these verbal on-spot feedback expressions to a classmate and sometimes both verbal and practical forms of feedback were combined.

In a few instances, 3 (8.1%) in Busiro and 2 (5.4%) in Luuka, learners laughed at classmates whose chalkboard work was not correct and the teacher ignored the laughing! This could discourage some learners especially if this happens to them repeatedly. One teacher in Busiro required learners to tap their desks gently when a classmate made a mistake while working on the chalkboard. This could be a good prompt for the learner working at the chalkboard to check his or her work and correct any mistakes with or without the teacher's or classmates' assistance.

IP 6: Teachers drilled learners or predominantly dwelt on the traditional teacher-centred mode of teaching.

In the traditional mode of teaching, teachers recited information, dominated the talking, did not interact with the learners, were on phone, and kept moving out of the classroom to speak to colleagues or to attend to other issues not related to the lesson. They allowed chorus answers and ignored passive learners.

All 37 (100%) teachers in Busiro and 37 (100%) in Luuka did at some point during the mathematics lesson ask learners to count together numbers say 1 to 20 as a class or give a chorus answer to an oral task. In these events, the teacher could not to tell which learner had responded and which one had not. In 2 (5.4%) cases in Luuka female teachers who had babies aged between 2 and 4 years with them in class were once in a while disrupted by the babies. This compromised their interaction with the learners they were teaching by reducing on the time that the teachers were available. These and other similar incidents that divert the teacher and learners' attention are a hindrance to the development of each learner's mathematics competence. In some cases, 2 (5.4%) in each of Busiro and Luuka, teachers ignored learners who were passive or were sleeping during the lesson. There is a possibility that teachers will ignore learners of whom they have low expectations which is likely to make such learners perform poorer than they would have if the teacher did not ignore them.

IP 7: Teachers did not use assessment for grading learners.

As they carried out formative assessment, the teachers checked the learners' work, especially the practical and written work; and they did not just collect the learners' exercise books for marking at end of the lesson. In case a learner gave an incorrect response to an oral question, the teachers never called on other learners till the correct answer was given but supported the learners who needed to be helped to correct their work.

All 37 (100%) teachers in Busiro and 37 (100%) in Luuka took time to check the learners' work for neatness, correctness and accuracy, but also to ensure that the learners were on task. In a few instances 2 (5.4%) in Busiro and one (2.7%) in Luuka teachers put a single tick across an entire written exercise or called on other learners till a correct answer was given, without giving opportunity to a learner who made a mistake to understand where they went wrong and how to correct the mistake. A learner who is denied an opportunity to correct their mistake might feel demoralised to the extent of failing to pay attention to what is done by a classmate who is called upon later. This compromises the "errant" learner's competence development.

IP 8: The teachers used songs, music, rhymes, drama and game competitions.

Teachers used mathematical stories (Mary has 2 mangoes, she is given 3 more), songs, rhymes, games, puzzles and number patterns that emphasize mathematical concepts and the use of numeracy.

All 37 (100%) teachers in Busiro and 37 (100%) in Luuka began their mathematics lessons with a song or rhyme that involved counting from1 to 10. The song or rhyme was either in English language or in the local language as an original composition, or translated from English to the local language. Teachers also used songs, rhymes and games involving counting together with activities like: dancing; jumping; stretching; squatting; sitting and standing alternately as teacher dictated pace from slow to fast; boys and girls alternately sitting or standing as they said a number; and making groups of 1, 2, 3 or more while leaving an odd man out at some intervals (10 – 20 minutes) within the lesson to keep the learners awake, attentive and on-task. The use of songs, rhymes and mathematical games was observed to be very popular in P.1 mathematics lessons. Learners ably, quickly and happily joined in when a teacher started a song, rhyme or game.

IP 9: Teachers used pair work to help learners develop their problem solving skills.

While engaging learners in pair work, the teachers ensured that the learners planned and discussed how to solve a problem set by the teacher, learners tried out the discussed plan, and that they reported the procedure of their plan and the outcomes to the teacher and the entire class. The teachers supervised and facilitated but did not interfere unnecessarily as each pair of learners worked through the different steps of problem solving.

Two (5.4%) teachers in Busiro with small classes of twenty or less learners used pair work/ peer support in problem solving. Learners paired up to sort, count and form sets of familiar objects (Figure 4.11). No teacher in Luuka was observed using pair work. Some 4 (10.8%) teachers in Busiro used group work of 3 or more members followed by "gallery walks" for the learners to see, ask questions, clarify, revisit and explain their problem solving approaches to their classmates. Only one teacher in Luuka used group work with groups of four learners to solve addition problems.

Figure 4.11: Learners Work as a Pair to Sort Bottle Tops by Colour

IP 10: Teachers had wall charts for shapes, numbers, the number line for 1-20, the calendar, the school, and the home

Majority of teachers 36 (97.3%) in Busiro and 35 (94.6%) in Luuka had printed wall charts for the numbers 1 to 100. In addition, these teachers had written and sometimes made use of their own charts for learners to refer to when forming and naming sets, counting numbers orally , writing number symbols or number words and carrying out horizontal or vertical addition. Although most teachers commonly used Manila paper, one teacher (2.7%) in Busiro and 5 (13.5%) teachers in Luuka made use of woven propylene plastic bags (*kaveera*) to write on mathematics information for P.1 learners. It is important to note that the bags were being re-used by the teachers since they are initially used for commercial packaging. Mathematics work written on pieces of a louver bag and displayed on walls in P.1 classrooms is shown in Figure 4.12.

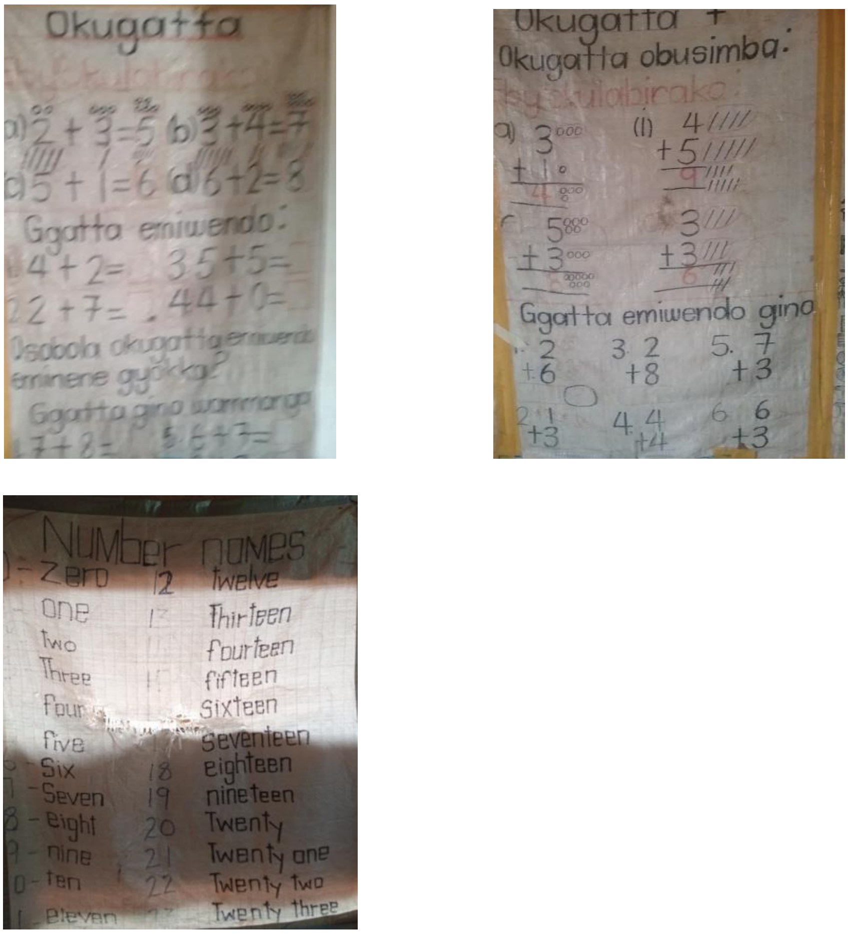


Figure 4.12: Mathematics Work Written on Re-Used Woven Propylene Plastic Bags

Another teacher in Luuka wrote the number symbols with their number words on small manila cards which she put inside re-used 500ml mineral water plastic bottles. The teacher tied the bottles on a string and displayed them at the back of the classroom. One such bottle is shown in Figure 4.13.

Figure 4.13: Number Symbol and Number Word for 10 on Manila Card Inserted in Plastic Bottle

In many cases teachers displayed charts for mathematics in a specific space in the classroom marked “Mathematics”. This could be referred to as the **mathematics learning area** for the class. One teacher in Busiro gave her classroom’s mathematics learning area a title “**Mathematics is wealth**” (Figure 4.14), giving the learners a positive message about mathematics.

Figure 4.14: A Mathematics Learning Area in a P.1 Classroom Labelled “Mathematics is Wealth”

Another teacher in Luuka whose classroom was in a structure which was nowhere near the required minimum standard still found space to put up charts for the learners (Figure 4.15).

Figure 4.15: Mathematics Charts Displayed on the "Walls" of a P.1 Class

One other teacher in Busiro had the numbers 1 to 50 each written on its own card, large enough to be seen from anywhere in the classroom and pasted around the classroom high up on the walls such that the learners could read the cards in a gallery walk. Four teachers used sticks or meter rulers/blackboard rulers as pointers for the charts and the chalkboard. Teachers sometimes referred the learners to the number chart to help them count numbers in the right sequence.

IP 11: Other common teachers' instructional practices observed

All the 74 (100%) teachers in Busiro North County and Luuka North County began a lesson by exchanging greetings with their learners, thereby making the learners feel welcome to school and class in particular, and specifically to the mathematics lesson. The majority of teachers always referred to the learners individually and by name, an indication of recognition and good teacher-learner interaction. This also kept the learners attentive, waiting to be called upon by the teacher anytime.

All the 74 (100%) teachers predominantly used the chalkboard to demonstrate to the learners how to solve mathematics problems, and for the learners to practise the mathematics concepts before working on the related activities in their exercise books. They took time to draw straight lines on the chalkboard which they then used to illustrate to the learners good and neat handwriting. The learners copied their teachers' example and had good, neat handwritings.

The teachers had a wealth of "attention grabbers" which they used to get the learners'' attention when they seemed to be going off-track, especially when teacher was writing on the chalkboard. The following teacher-learner exchanges repeated three or more times at an instant were common at such moments:

Teacher: Hullo Children

Learners: Hullo Teacher

Teacher: Good Children

Learners: Good Teacher

Teacher: We We

Learners: Work Work

Teachers gave learners opportunities to do mental work in which learners counted objects in two different sets, joined the sets and mentally told the teacher the number of objects in the new set formed. This helped the learners to grasp and memorise the number facts as early as possible.

Teachers predominantly used either English language or the local language (Luganda or Lusoga) as medium of instruction. However, when need arose, teachers used both English language and the local language. It was common for a teacher to pose a question in one language (usually local language) and a learner responds in another language (English language). Teachers were sensitive to the participation of both boys and girls while calling on learners to answer oral, written and practical tasks. They also chose non-volunteering learners, or those who did not put up their hands to try out tasks.

In classes with mentally challenged children, teachers either sought the help of an experienced special needs teacher say for text transcription into braille, or gave such learners more time and attention to help them reach their optimum mathematics potential. In a few instances, teachers repeatedly sent the same learner on non-academic errands outside the classroom.

The teachers in their practice have integrated mathematics with other school subjects especially music, physical education and English language. Teachers used more than one reference textbook and learners' work books from various publishers including Sipro, Prime, MK, and RS publishers. Teachers have modified the traditional sitting arrangement where all learners sit with their desks arranged in rows facing the blackboard to non-traditional arrangements that give more learner-to-learner interaction during the lesson and also allow the teacher to move around the class facilitating and supervising the learners' activities. Several teachers organised the learners' desks in an inverted T layout as in Figure 4.16 to maximise learner-to-learner and learner-to-teacher interaction.

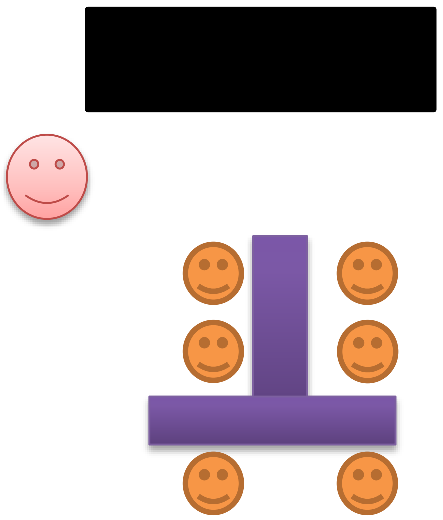


Figure 4.16: An Inverted T Classroom Seating Arrangement for the Learners

A few teachers, 11(29.7%) in Busiro and 3 (8.1%) in Luuka allotted time for learners to do revision/remedial work either before the lessons began (8 00am to 8 30 am) or after the lessons had ended (2 00pm – 3 00pm). This extra time helped both teacher and learners to practice and consolidate mathematical concepts. Some teachers kept the learners' exercise books and pencils in a box within the classroom so that the children could easily access them when required, but also this provided a record of what the learners had been doing for weeks or even months spent in the school.

Teachers' Oral Interview Responses Regarding Their Instructional Practices

This section gives a selection of the typical teachers' responses to the oral interview questions regarding their instructional practices. The teachers were asked: "What instructional practices do you use to help your learners become competent in mathematics?" The teachers' oral responses concur quite well with the observed teachers' instructional practices reported in the preceding section.

Teacher W1: I use counting rhymes, counters like sticks, stones, leaves, making them do examples on the blackboard, air writing, taking them outside to write in the soil (teacher, Busiro)

Teacher W2: I encourage them to use the things in the classroom like the charts, counters, number cards (teacher, Busiro)

Teacher W3: We do plenty of practice exercises on the black board, sometimes I demonstrate or they do role play of addition or subtraction (teacher, Busiro).

Teacher W4: I sometimes put them in groups of about six to do some activity like multiplying a number by 3, one group can work with sticks, another with pencils, mugs, and stones they move around to see how others have done it (teacher, Busiro).

Teacher L1: I give them concrete materials or sometimes they carry things from home like sticks for counting especially, we do some mathematical games (teacher, Luuka).

Teacher L2: When I give them a sentence to complete (verbal cue or verbal clue?) or point at the chart without mentioning the answer, some can get the answer (teacher, Luuka).

Teacher L3: When someone does not seem to understand the concept in English, I can repeat or ask a classmate to repeat it in Lusoga, our local language (teacher, Luuka).

The teachers commonly used mathematical songs, rhymes and games to motivate the learners and help them learn the facts. Some practical or visual prompts used by the teachers included pointing or looking at charts or other resources in the classroom, telling learners to use counters or to move around the classroom and see what and how classmates had done a task. Teacher L3 mentioned code-switching as a way of clarifying instructions or concepts for the learners. When asked about the various provisions they have to ensure that each learner's individual needs are met, the teachers gave the following responses.

Teacher W1: During the lesson, I move around to see that each one is attentive or doing the exercise, then I mark them as they finish. Or when they collect the books I mark them and note who needs corrections. Usually we work out the correction on the chalkboard as a whole class (teacher, Busiro).

Teacher W2: I give them a chance to answer oral questions or work on the blackboard, then mark everyone's book and help them to do any corrections (teacher, Busiro).

Teacher L1: As you saw the class is really big so sometimes it is hard to attend to each child in one lesson, some of them lose the books or pencils and they miss that day's activity (teacher, Luuka).

Teacher L2: I sometimes put them in groups then I can call one group at a time and one member at a time to come to the front and answer a question (teacher, Luuka).

Teachers' responses indicate a good attempt by most of them to attend to individual learner's needs. However, there are indications that some learners are ignored especially in large classes of more than 30 learners. Asked whether they encourage learners to to apply mathematics in their everyday lives, teachers cited the following experiences of interacting with the children.

Teacher W1: I use stories say about going to the market to buy fruits and vegetables, talk about the different people in a family like brothers and sisters when counting, we sometimes go out in the compound and compare things like trees of different sizes (teacher, Busiro).

Teacher W2: When learning about time, we talk about waking up in the morning, eating lunch in the afternoon time and going to sleep at night (teacher, Busiro).

Teacher W3: When they are learning to compare numbers, we also compare sizes like a cup and a bucket, a learner's height and teacher's height, they can go outside and compare two trees in the compound, we talk about the distance between home and school (teacher, Busiro).

Teacher L1: In stories Like Anne has two eyes, Bob has two eyes and Grace has two eyes. They can role play and learn to multiply but it also applies to them (teacher, Luuka).

Teacher L2: Some come with money to buy something at break. We can talk about the price of a banana, two bananas like that (teacher, Luuka).

Teacher L3: We follow the themes in the curriculum then talk about say things in the classroom or at school that are also a at home, they can mention tables, chairs, mugs, flowers (teacher, Luuka).

In an attempt to help children see the connections between the mathematics taught at school and what the children experience in their everyday lives, the teachers bring in a variety of examples from real life as indicated in their responses. Role-playing, the classroom environment, the immediate outdoor environment and the learners' daily life routine activities are some of the avenues the teachers use to link school mathematics and the children's daily life experiences. The teachers also provided information on the various oral, written and practical forms of feedback that they use to motivate the learners and help them to overcome any mathematical misconceptions.

Teacher W1: For feedback, I mark the books then in class other children can clap, give flowers, give a soda or sometimes a learner is given another chance to do something on the blackboard. I ask the class if someone is right or if not one can suggest how to do the correction (teacher, Busiro).

Teacher L1: Usually …clapping, hi five, ask to give classmates to give flowers or a soda, then in the books I can write Good, Very Good (teacher, Luuka).

Teacher W2: I can ask the classmates to say thank you very much, they can say where or how someone can make corrections (teacher, Busiro).

It is apparent that teachers in the two study areas used very similar forms of feedback like clapping, giving flowers and some chants like "Thank you very much …:". The learners in both Busiro and Luuka demonstrated familiarity with "giving and receiving" the different forms of feedback. The interview also sought to know whether teachers employed dialogue in the mathematics lessons. Teachers were asked about opportunities accorded to learners to clarify, justify or explain their mathematical ideas and procedures for answering tasks. The dialogue could be between teacher and learner or between learners themselves. The teachers had the responses given next.

Teacher W1: I don't ask them maybe why because sometimes also they find it difficult to explain they are still just learning the vocabulary (teacher, Busiro).

Teacher W2: Once in a while, I can ask them to tell me why the answer they have given is the correct one (teacher, Busiro).

Teacher W3: When the topic is new they cannot explain much but after sometime, they try to explain how to solve a problem (teacher, Busiro).

Teacher W4: They can say maybe what the next step is going to be … (teacher, Busiro).

Teacher L1: For explaining, they can't really do it in details but they can try (teacher, Luuka).

Teacher L2: Depending on what content, like for some word problems or comparing numbers they explain a bit (teacher, Luuka).

Teacher L3: I encourage them especially when they are working on the blackboard to explain to the rest what they are doing (teacher, Luuka).

The teachers' responses indicated that they do not commonly ask each learner to clarify, justify or explain their mathematics ideas and choice of procedure for answering an activity or doing a practical task. Teachers commonly talked about their verbal behaviour as they interacted with the learners while nonverbal behaviour like eye contact, facial expressions (smiling or frowning), hand movements, touch or silence were not commonly mentioned.

Instructional Practices That Could be Adopted by the Teachers

The last research question for this study was: What instructional practices could be adopted by the teachers in Busiro North and Luuka North Counties in order to enhance their learners' competence? This section provides answers to this question. The different instructional practices as they were used by the teachers in a single mathematics lesson with varying modal frequencies in each county are summarised and presented in the Table 4.8. The frequency counts made at 5-minutes intervals during a lesson were classified into: never (0 times); rarely (1 or 2 times); sometimes (3or 4 times); and consistently (5 or 6 times). Table 4.8 shows that only two instructional practices : the use of songs, rhymes and games; and the allocation of sufficient time for oral, written and practical tasks were used consistently by all the teachers (100%) in both Busiro and Luuka. The remaining effective practices (excluding assessment for grading and drilling learners) qualify to be taken up by the teachers in Busiro and Luuka.

Table 4.8: Proportion and Frequency of Teachers' use of the Instructional Practices

Teachers' Instructional Practice (IP)	Number of teachers (%) using IP		Modal Frequency of IP use (% of lesson)	
	Busiro	Luuka	Busiro	Luuka
Built on learners' existing knowledge	37 (100%)	36 (97.3%)	4 (66.7%)	3 (50%)
Worked out several examples	35 (84.4%)	35 (84.4%)	6 (100%)	6 (100%)
Allowed for explanations, asking questions	01 (2.7%)	01 (2.7%)	2 (33.3%)	1(16.7%)
Allotted sufficient time for tasks	37 (100%)	37 (100%)	5(83.3%)	5(83.3%)
Gave Supportive feedback	37 (100%)	36 (97.3%)	6(100%)	5(83.3%)
Drilled learners, moved out *, ignored passive learners	0*(0%)	2*(5.4%)	1(16.7%)	2 (33.3%)
Used assessment for grading	0 (0%)	0(0%)	0 (0%)	0(0%)
Used songs, rhymes, game competitions	37 (100%)	37 (100%)	6(100%)	5(83.3%)
Used pair work in problem solving	2 (5.4%)	0 (0%)	2 (33.3%)	0 (0%)
Used charts for shapes, numbers, Calendar	36 (97.3%)	35 (94.6%)	4(66.7%)	3(50%)
Other instructional practices used	37 (100%)	37 (100%)	3(50%)	3(50%)

Relationship Between Teachers' Expectations and Their Learners' Competence in Mathematics

This section of the results for objective 4 combines findings from the first and second objectives of the study. It correlates the teachers' expectations and the learners' competence thereby being presented here after the findings on the learners' competence have been given. The findings in this section answer the fourth objective's hypothesis which was H_1: There is a statistically significant relationship between teachers' expectations and their learners' competence in mathematics. The association between the mean teacher expectations and their learners' scores was evaluated using the Pearson correlation coefficient and the results are summarized in Table 4.9.

Table 4.9: Correlation Between Teachers' Expectations and Learners' Competence

Correlations

		Luuka Teachers' Expectations Score	Luuka Learners' Test Score	Busiro Teachers' Expectations Score	Busiro Learners ' Test Score
Luuka Teachers' Expectations Score	Pearson Correlation	1	**.596****	.215	.087
	Sig. (2-tailed)		.000	.202	.607
	N	37	37	37	37
Luuka Learners' Test Score	Pearson Correlation	.596**	1	.267	.081
	Sig. (2-tailed)	.000		.110	.636
	N	37	37	37	37
Busiro Teachers' Expectations Score	Pearson Correlation	.215	.267	1	**.711****
	Sig. (2-tailed)	.202	.110		.000
	N	37	37	37	37
Busiro Learners' Test Score	Pearson Correlation	.087	.081	.711**	1
	Sig. (2-tailed)	.607	.636	.000	
	N	37	37	37	37

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4.9 shows a statistically significant, positive strong relationship between the teachers' expectations and learners' competence for Busiro (r = 0.711) at the 0.01 significance level. It also shows that the relationship between the teachers' expectations and learners' competence for Luuka was statistically significant (same level of significance) but moderate (r = 0.596). Hence, the alternative hypothesis, H_1: There is a statistically significant relationship between teachers' expectations and their learners' competence in mathematics was accepted.

Additionally, the correlation results mean that the Busiro teachers' expectations gave a better prediction of their learners' competence. A further comparative analysis between the results in Table 4.2, Table 4.3 (pages 111 and 113) and Figure 4.1 (page 121) shows that high proportions of teachers in both counties had very high expectations of their learners' competence in the mathematics concepts of recognizing, counting and writing the numbers 0 to 9; and adding 1-digit numbers (Table 4.2 and Table 4.3). The learners correspondingly exhibited high competence in these concepts as expected by their teachers (Figure 4.1). Table 4.10 summarises the relationship between the teachers' expectations and their learners' scores on the identified mathematics competences. It highlights mathematics concepts where both teachers' expectations and learners' scores were high; and also those concepts where the teacher expectations were high but the leaners' scores were low.

Table 4.10: Relationship Between Teachers' Expectations and Learners' Scores

	Teachers' Expectations
Learners' Score (%)	Very High/High
80 – 100 (High)	Recognise, Count and Write 0 – 9 (80.6% of learners)
	Add 1-digit numbers (63.8%)
Less than 20 (Low)	Add 2-digit numbers (68.1%), Multiply by 10 (91.5%)
	Apply addition in familiar contexts (93.6%)

A large proportion (80.6%) of the learners scored between 80% and 100% on recognizing, counting and writing 0 - 9, while 63.8% scored in the same range on addition of one-digit numbers (Table 4.8). However, although the teachers believed that their learners had high competence in adding 2-digit numbers that do not require carrying and in applying addition to familiar real life contexts, the learners' competence was low. Similarly, teachers had high expectations of their learners' ability to multiply 1-digit numbers by 10 but the learners had low competence in this concept with 91.5% of them failing to multiply by 10 (Table 4.10).

This chapter has presented the research findings on the teachers' expectations of their learners' mathematics competence; the learners' mathematics performance; the association between teachers' expectations and their learners' mathematics performance; and the various instructional practices that teachers use to enhance the learners' mathematics competence in the counties of Busiro North and Luuka North in Uganda.

In summary, the research findings have shown that teachers in Busiro and Luuka had high expectations of their learners' mathematics competence. The teachers in Busiro had higher expectations which in turn were better predictors of their learners' competence. The teachers used a wide range of instructional practices including the use of songs and rhymes; giving supportive feedback and working out several examples of the mathematics concepts. A detailed interpretation and discussion of these findings is given in the next chapter.

Chapter Five

Discussion, Conclusion and Recommendations

Introduction

This study was motivated by one major factor: that the majority of learners in the classes P.1 to P.3 in Uganda's primary schools do not acquire the basic mathematics competence even after three years of attending school, and that it is not until P.5 that at least 50 per cent of the learners attain full competence of P.2 basic numeracy skills as discussed in the background to this study. Teachers' expectations and instructional practices were considered critical in helping P.1 learners attain competence in mathematics. This Chapter gives a detailed discussion of the findings of the study.

There are four major sections in the discussion. Initially in each section, the findings from Busiro North County are discussed, followed by discussion of findings from Luuka North County. Each section ends with a comparative discussion of findings from the two study areas. The teachers' expectations of their learners' competence in mathematics are discussed in the first section. The second section discusses findings on the learners' competence in mathematics. In the third section, a discussion of the various practical, oral and written instructional practices the teachers used to enhance the learners' competence in mathematics is presented. The last section discusses the relationship between teachers' expectations and the learners' competence in mathematics. Conclusions based on the findings are drawn and recommendations that could be adopted by the teachers, teacher training institutions, district education officials and the Ministry of Education and Sports have also been given.

Discussion

Teachers’ Expectations of Their Learners’ Competence in Mathematics

Teachers’ expectations of the learners who join P.1 in all schools in Uganda are driven by the learner competences prescribed in the curriculum and mandatory guidelines in terms of age (Wilson, 2009). For both Busiro and Luuka North Counties, teachers are expected to have equally high expectations for learner competences that include addition; subtraction; multiplication by 2, 3 and 10; telling time using nonstandard units and drawing shapes (National Curriculum Development Centre [NCDC], 2006).

This study established that on a rating of 1 to 5 (1 = very low, 5 = very high) the teachers in Busiro had an overall average expectation of their learners’ competence in mathematics of 4.16. This indicates that the majority of teachers had high expectations of their learners’ competence in mathematics. High teacher expectations are in conformity with the NCDC (2006) guidelines for the P.1 teachers who are urged to select their teaching approaches with the aim of fostering a speedy achievement of numeracy skills for each learner. When teachers have high expectations of their learners, they believe that all their learners will be successful and they provide the learners with challenging activities alongside motivating feedback (Hinnant, O’Brien & Ghazarian, 2009; Johnston, Wildy & Shand, 2019; Rubie-Davies & Rosenthal, 2016). Research has shown that teacher expectations influence the teachers’ choice of content to be taught to the learners, the activities or tasks to be given to the learners and the instructional practices to be used (Rubie-Davies, Peterson, Sibley & Rosenthal, 2014). The high expectations could also be explained by the fact that teachers in Busiro based their expectations on their previous assessment of the learners' abilities as was similarly reported by Gentrup, Lorenz, Kristen and Kogan (2020). It is also likely that as Rubie –Davies et al. (2014) observed, the P.1 teachers in Busiro begin the year when they are very optimistic about what their learners will be able to achieve. Such optimism enables them to expand their learners' opportunities to attain competence in mathematics (Sæbø & Midtsundstad, 2018).

Another possible explanation is that teachers based their expectations on the different learner characteristics like age and school readiness as a result of preschool attendance. This is supported by the findings of Rubie-Davies, Flint and McDonald (2011) who reported that teachers' future –oriented judgements on the amount of mathematics achievement progress the learners could make by the end of a school year were often related to the learner's prior ability, ethnicity, social class, gender or any other characteristics of the learner. The implication of this finding is that teachers in Busiro should be able to raise their learners' competence in mathematics through planning and utilizing instructional practices that help learners to demonstrate understanding of the mathematics concepts and apply the concepts to their everyday life experiences. These high expectation teachers would achieve this when they take a facilitative role while supporting all learners equally to be actively involved in their learning, engage in challenging tasks and work with a variety of classmates as well as offering learners emotional and behavioural support (The Education Hub, 2018; Trang & Hansen, 2020).

However, a small number of teachers in Busiro expressed low expectations of their learners' competence in mathematics. This could be because as observed in three schools, these teachers had some learners with mental or physical disabilities yet the teachers did not know how to handle such learners (Verhulp, Stevens, Thijs, Pels & Vollebergh, 2019). In these instances, the teachers either ignored the learners or left them to work at a very slow pace while appreciating whatever little effort they showed, irrespective of whether they demonstrated any competence in mathematics or not. This concurs with a report by Tunner, Rubie-Davies and Webber (2015) in which even without streaming of learners according to their mathematics ability, teachers formed subgroups of learners within a class, had high expectations for some learners, and low expectations for others. The teachers were observed to offer differential treatment to the different subgroups of learners in favour of the high expectation learners which in turn contributed to widening the achievement gap between the learners (Trang & Hansen, 2020). This means that learners in Busiro who have a mental or physical disability are likely to lag behind their classmates in their competence in mathematics. Tunner et al. (2015) further noted that when teachers had low expectations of some students, they were more likely to disown responsibility for student learning and performance, and assign the blame for failure to achieve on student characteristics, in this case of Busiro the characteristics being the mental, visual or other physical disability.

On the other hand, teachers in Luuka had an average expectation of 4.06 on the rating of 1 to 5 (1 = very low, 5 = very high). Most of these teachers had high expectations of their learners' competence in mathematics. This could be explained by the fact that teachers begin the year believing that their learners will make significant and positive changes by the end of P.1. Similar observations were made by The Education Hub (2018) who reported that high expectation teachers believed that students would learn faster and improve on their level of performance in the course of one school year. It is also possible that in their teaching experience, teachers have had the majority of their P.1 learners attain the expected competence in mathematics, making them believe that this will recur every year. This expectation of the recurrence of a general pattern is supported by the findings of Rubie-Davies, Hattie and Hamilton (2006) who also found that teachers formed their expectations basing on a variety of individual learners' characteristics that included stereotypes, diagnostic labels, physical attractiveness, language style, the age of the learner, personality and social skills, the relationship between teacher and student background, names, other siblings, gender, ethnicity, social class, and the level of education of one parent.

There were some few teachers in Luuka who had low expectations of the learners' competence in mathematics particularly in the aspects of counting numbers 10 – 99; applying addition and subtraction; and multiplying 1-digit numbers by 2, 3 and 10. This could be because some learners in Luuka did not attend pre-school yet it has been shown that children who attend pre-school are more ready to start school, perform better in mathematics and are generally more successful in primary school (Baroody, 2010; Clements & Sarama, 2007;

Nakajima et al., 2016). Another reason could be that some learners were too young for P.1 (less than 6 years old as they entered P.1), therefore regarded by the teachers as not yet ready for P.1 work or were too old (more than 8 years old) because the parents did not make them start school at 7 years of age (Nakajima et al., 2016) for various reasons including mental or physical disabilities or other health issues that may cause regular absenteeism from school.

Dhuey (2016) argues that although governments mandate a school-entry age of 5 to 7 years with 6 years as the most common, the optimal school entry age is unknown. Dhuey further adds that school-entry age has been decreasing around the world except for the US where the opposite is happening following an argument that children need to be older when they start school. The reason for this is that when the student group entering primary school is older on average than they otherwise would have been, this may not only improve their school readiness but also improve their relative test-score rankings (Black, Devereux & Salvanes, 2008; Dhuey, 2016). However, there is a possibility that children starting school at 8 years or older might experience short term benefits on test scores but are more likely to drop out of school before they complete high school (Dhuey, 2016). However, the baseline remains that teachers should exhibit equity in their expectations irrespective of any differences between the learners.

Regarding absenteeism from school be it for justified or unjustified reasons, Carroll (2010) revealed that absence of half a year for 7-year olds resulted in a reduction of one year in mathematics scores and poor teacher ratings for other aspects of the curriculum. This revelation would be justification for teachers in Luuka to have low expectations of the mathematics ability of those learners who miss lessons because they are often absent from school. Luuka being a peasantry area, some children spend most of the rainy seasons working in gardens with their parents and attend school occasionally, thereby reducing their chances of attaining optimal competence in mathematics.

There have also been reports of school-age boys in Luuka working in sugarcane or rice plantations and rarely attending school (Kirya, 2010; Nakato, 2017). The teachers would have low expectations for the academic achievement of these learners. It is also possible that some learners were repeaters having not been promoted to P.2 basing on their academic attainment. Gilligan, Karachiwalla, Kasirye, Lucas and Neal (2018) concurred with this finding when they reported that in rural peasantry Uganda, teachers and school administrators encouraged weaker students to repeat or to drop out of school to avoid the negative attention the school would get when the learners performed poorly at the end of the primary school cycle. The implication of this finding is that once teachers have low expectations of a learner based on prior unsatisfactory academic attainment, they do not give the learner opportunity to improve. Such teachers disown responsibility for student learning and performance and assign the blame for low attainment on the learner’s characteristics (Tunner, et al., 2015).

Comparing the teachers’ expectations in the counties, this study found that teachers from Busiro had slightly higher expectations of their learners as compared to those of Luuka. The possible explanations for this may be the differences in socio-economic status and other contextual factors that interact with the educational process and its outcomes, and location of the counties that seem to put more demands on teachers in some of the peri-urban areas of Busiro to do more with their children compared to the more rural areas in Luuka. This finding is in line with that of Atuhurra and Alinda (2018) that points out that teachers in lower primary in urban classes put much more effort in trying to make their learners become more proficient in given number concepts and emphasize that learners demonstrate understanding while their counterparts in the rural areas emphasize more of performing procedures and recall. In addition, the teachers' expectations could have differed because of the varying school cultures in Busiro and Luuka, which influence the beliefs, perceptions and the written or unwritten rules that shape any school community (Melesse & Molla, 2018). Variations in school culture could also influence the teachers' self-efficacy; making teachers in Luuka have lower expectations of themselves and the learners, have pessimistic attitudes towards teaching and learning mathematics and also believe that they cannot do much to enhance the learners' competence in mathematics (Adams, 2019; Melesse & Molla, 2018; Rubie-Davies, 2007).

In terms of the attainment in the identified competences, on average, learners in Busiro scored higher than those in Luuka. The possible reason for this difference in scores could be that learners in Busiro were exposed to more challenging learning opportunities since their teachers had higher expectations of them than those in Luuka. This finding is in line with that of Adams (2019) who suggested that learners' attainment increased with high teacher expectations, and assurance to all learners that practice and hard work lead to success in mathematics. Additionally, the finding affirms the Rosenthal effect (Pygmalion effect) that when the teacher sees a learner as an achiever, they are likely to interact more with them in ways that help the learner to flourish (Mazarin, 2018; Owaja, 2007).

Learners' Competence in Mathematics

The outcome of the assessment test for the learners' competence in mathematics had learners from Busiro score an average mark of 25.24 out of a maximum possible mark of 42. A very high proportion of 92.6% of the learners were able to recognise, count, match and write at least half of the numbers from 0 to 9. In addition, more than 74% of the learners answered correctly at least half of the 42 items covering the different curriculum content areas. This outcome demonstrated that these learners had acquired the desired mathematics competence in counting, understanding, and writing number symbols; writing number names; comparing numbers; and adding and subtracting 1-digit numbers that did not require regrouping (NCDC, 2006). The outcome is supported by a report from the Science Education Institute [SEI] (2011) which describes a mathematically competent learner as one who is able to read mathematics and communicate it with clarity and coherence both orally and in writing.

This attainment of competence could be explained by the observation that even before children get to nursery school, many of them will have developed a strong informal sense of numbers through play, interactions with older children and with adults, and also through direct interactions with the environment (Woods, Geller & Basaraba, 2017). During such interactions, the children's understanding of numbers grows from their desire to find patterns and solve problems as they play, work with and manipulate concrete objects through activities that investigate counting, comparing, sorting, joining, and sharing all of which have a central role in basic numeracy (Clements & Sarama, 2005; McLennan, 2014). These experiences lay the foundation for children to develop a formal understanding of mathematics in their first year of formal schooling. With the additional support received from their P.1 teachers during the mathematics lessons, the learners from Busiro were able to make connections between their informal pre-school mathematics and the formal school mathematics to reach the demonstrated level of competence. Similar results have been reported by Sarnecka and Carey (2008) who found that even before reaching kindergarten, 49% of children aged between 2 to $3\frac{1}{2}$ years had already mastered some fundamental mathematics concepts such as basic counting and shape recognition, and that they understood that addition increased numerousness of the objects in a set while subtraction did the opposite.

The findings also indicated that 54.3% of the learners were able to answer correctly at least half of the items that required the application of addition to a familiar social context. These were items that required a learner to be able to read and understand a mathematical word problem then answer the related questions. The questions required that a learner understood basic mathematics vocabulary such as "more than" or "less than" and was able to translate the mathematics language to mathematics symbols by writing number symbols and carrying out addition. Yeh et al., (2019) refer to this ability attained in the elementary school mathematics curriculum as strategic competence. Demonstrating this competence shows that learners can apply the learned mathematics concepts to their everyday life experiences. When the learners encounter situations in their real lives in which they need to figure out what exactly the problem is, they can formulate it into a mathematical problem, represent it using mathematical symbols and language, select an appropriate strategy for solving the problem and then find an appropriate solution (Baroody, 2010; Clements & Sarama, 2005; Yeh et al., 2019). However, when it came to subtraction of 1-digit numbers, only 17.6% of the learners answered more than half of the items correctly. This could be a result of teachers not giving the area sufficient attention, using less practical approaches while teaching subtraction as compared to what happens when teaching addition and introducing subtraction too early for the majority of learners even before they have mastered the addition facts (Baroody, 2010).

In Luuka, the outcome of the assessment test for the learners' competence in mathematics showed an average mark of 20.35 out of a maximum possible mark of 42. A high proportion of 87.2% of the learners were able to recognise, count, match and write at least half of the numbers from 0 to 9. This outcome which indicated that the majority of learners had acquired the desired competence in mathematics in the listed curriculum content areas differs from what Gervasoni (2016) found when 56% grade one learners could not count up to 10 objects. But whereas some learners in Gervasoni's study made errors by skipping some numbers in the sequence as they counted, it was noted that the learners rarely made identical errors which presented a big challenge to their teachers when it came to recognising common counting difficulties.

Considering counting alongside other content areas such as writing number names; comparing numbers; and adding and subtracting 1-digit numbers that did not require regrouping, only 48% of the pupils in Luuka answered correctly at least half of the 42 items. A much smaller proportion of 4.7% of the learners were able to answer correctly at least half of the items that required the application of addition to a familiar social context. These were items that required a learner to be able to read and understand a mathematical word problem then answer the related questions (strategic competence). The questions required that a learner was able to read and understand basic mathematics vocabulary such as “more than” or “less than”. The questions further required the learner to translate the mathematics language to mathematics symbols by writing number symbols and then carrying out the necessary addition.

Failure by the majority of learners to demonstrate this competence showed that learners cannot apply the learned mathematics concepts to their everyday life experiences. When these learners encounter situations in their real lives in which they need to figure out what exactly the problem is, they would be unable to formulate it into a mathematical problem, represent it using mathematical symbols and language, select an appropriate strategy for solving the problem and then find an appropriate solution. The learners might not see any meaningful connections between the mathematics learnt at school and the mathematics in their normal activities outside school.

One exceptionally outstanding outcome was in subtraction of 1-digit numbers in which 48% of the learners answered more than half of the items correctly. This finding concurs with that of Aunio and Niemivrita (2010) who reported that first graders were able to operate with the numbers between 0 and 100; and to carry out basic addition and subtraction including their use in the context of problem-solving tasks (Mother has two pencils, father gives her three more pencils, how many pencils does mother have altogether?). They argued that the learners most likely learnt counting, which involves the acquisition of whole- number- word sequence skills before they began formal schooling which helped them to have better arithmetic skills and overall mathematics performance in grade one (Aunio & Niemivrita, 2010).

Luuka being a rural peasantry area, there is also a possibility that children engage in activities that involve practical mathematics. Such activities like buying or selling of domestic commodities enhances their mental and written competence in subtraction (Chowdhury, 2017). It is also possible that as these learners receive instructions from adults regarding activities like buying or selling, they use decomposition strategies rather than counting strategies to understand the relationship between the money given to them by the adult to do a purchase (or to sell), the cost of the item(s) to be purchased, and the change if any that is to be brought back to the adult. Research has shown that decomposing numbers advances children's ability to handle arithmetic tasks, since it means splitting numbers and combining them in ways that make the task easier to comprehend (Kullberg, Bjorklund, Brkovic & Kempe, 2020). A 6-year old P.1 learner in Luuka given a 500 shillings coin to purchase items worth 450 shillings might think of the transaction involving (500 - 450) shillings as (500 - 400 –50) shillings where 500 - 400 is easily seen as 100, and then subtracting the remaining 50. Although at school the learner would encounter subtractions of up to 2-digit numbers, in real life the learner experiences subtraction of hundreds and possibly bigger numbers. (Uganda has denominations of 50, 100, 200 and 500 shillings as coins; and 1,000; 2,000; 5,000; 10,000; 20,000 and 50,000 as paper money).

It is important to note that whereas learners from Busiro did better in many areas, those in Luuka were better in the area of subtraction. One possible explanation for this could be that children from Luuka do a lot of petty trade to support their families including some of them selling snacks at school during break time. Another possible reason could be that parents in rural areas send children frequently to purchase merchandise for family use. These transactions involve subtraction which could make the children do better in it in class. This finding tallies with that of Chowdhury (2017) who found that 90% of children working in markets got calculations of their transactions right without much effort.

Learners from Busiro performed better in counting numbers 0 to 9, writing number names and applying addition as compared to those in Luuka. This result may be explained by the likelihood that learners in Busiro not only benefit from early exposure to the language of numbers from their parents from as early as 14 – 30 months of age, but also from attending pre-primary education. This finding matches that of Levine, Suriyakhan, Rowe, Huttenlocher and Gunderson (2010) who argue that variations in children's mathematical knowledge which occur even before they begin pre-school and continue in elementary school may be related to "parent number talk". Also in agreement with the finding are Aunio, Korhonen, Ragpot, Tormanen, Mononen and Henning (2019) who found that kindergarten attendance greatly enhanced the numeracy performance of first graders. The implication of this finding is that more children in Luuka should be supported by their parents and other stakeholders to attend pre-school education. In addition, parents especially mothers need sensitisation on the importance of using the language of numbers with their children right from conception.

The study has reported a statistically significant difference in the P.1 learners' competence in mathematics in favour of learners from Busiro. Learners from Luuka had lower scores with some of them scoring zero and even unable to write their names. The significant difference between Busiro and Luuka learners' competence has remarkable implications on their future competence development in higher classes, since basic numeracy skills form a basis for all future learning. The learners in Luuka might not only find it difficult to catch up with their classmates in Busiro but also find difficulty with the rigour of mathematics in later classes, thereby lagging behind in competence in mathematics and going to upper classes with wide learning gaps as reported in a similar study by Yeh et al. (2019).

Instructional Practices Used by Teachers to Enhance Learners' Mathematics Competence

Differences in teachers' instructional practices may result in significantly different learning environments being created for the learners (Wang, Rubie-Davies & Meissel, 2019). Teachers in Busiro and Luuka are expected to employ similar instructional practices that include use of mathematical songs, rhymes and games; use of learning resources made from low cost locally available materials; and use of constructive, supportive feedback; all of which aim at supporting all P.1 learners to develop their optimal mathematics competence (NCDC, 2006). These practices must be entrenched in non-traditional child centred pedagogies for the benefit of all learners (Altinyelken, 2010; NCDC, 2006).

Some teachers in Busiro were observed to base their teaching on the learners' prior knowledge. They did this by asking learners open ended questions that related the mathematics concepts to the learners' home experiences. Teachers endeavoured to connect the learners' knowledge, skills, everyday experiences and the new mathematics concepts encountered during the lesson. They did this to ensure that all learners attained their highest levels of competence in mathematics. This practice conforms to the observation that in order to learn, children compare new information with what they already know or have experienced in their lives (Campbell, L. & Campbell, B. 2009; Wray, 2006). Learners, therefore, need opportunities to retrieve their existing knowledge through responding to the teacher's questions, and then they can build on that prior knowledge to acquire new learning (Darling-Hammond & Cook-Harvey, 2018; Walberg, 2010). The Busiro teachers' use of the learners' experiences, existing knowledge and skills could have been a means of getting to a learner's ZPD in order to personalize teacher support since each child's experiences create for them a unique trajectory for learning and development (Siyepu, 2013; Walberg, 2010). This enabled teachers to nurture each learner's mathematics potential and progress.

Teachers also used mathematical songs and rhymes that were part of the learners' existing knowledge. Arguing from Gardner's (1983) theory of multiple intelligences, DiDomenico (2017) supposes that if a learner has difficulties in mastering the mathematics concepts (equating to Gardner's logical-mathematical intelligence), the teacher could present the same concept using another intelligence pathway as a medium of comprehension for the learner. This implies that music-based activities (equating to Gardner's musical intelligence), can be used to further the learners' numeracy skills through enhancing the learner's engagement, creating a conducive learning environment and improving memory or recall of mathematical facts (Altinyelken, 2010).

A few teachers used pair work especially when learners where involved in sorting objects according to size, shape and colour. Learners had opportunity to share with and listen carefully to a classmate about the strategies for accomplishing the set tasks. Pair work gave learners a chance to build on each other's ideas and come up with an agreed solution superior to what would result from an individual's effort. In this way, pairs of learners practiced what the Social Interdependence Theory refers to as positive interdependence (Johnson, D. W. & Johnson, R.T., 2005; Wickham & Knee, 2012). In a few cases, teachers used gallery walks for learners to see what the other pairs had done. In this and several other ways, the learners were involved in assessing the work of their classmates and in giving timely, supportive feedback.

A relatively small proportion of the teachers asked learners to explain to the teacher or to their classmates their mathematical ideas especially the choice of procedure for answering a practical or written task. This happened regardless of whether the procedure or the response was correct or not. This finding implies that the majority of teachers denied learners the opportunities to communicate mathematics orally by elaborating on their procedures and responses, and hence to demonstrate deep understanding of the mathematical ideas and procedures which they encountered. This is in spite of the realization by Ross (2008) that the most powerful form of discourse is asking for an explanation and getting a high-quality one. Ross (2008) believes that receiving an explanation gives learners the opportunity to observe and model the understanding of more able classmates; it leads to cognitive restructuring as the listeners recognize the gaps in their understanding and fill them with ideas from the explanation; and also, as peers receive an explanation it could be a strategy for sharing information processing demands through availing mental space, enabling them to focus on the acquisition of new ideas.

The teachers in Busiro engaged the learners for mathematics periods of 60 minutes each. They also provided an extra 30 minutes after school for the learners to consolidate on the day's mathematics lesson content. During the 60 minutes lesson, the learners were actively engaged for 35 - 40 minutes, while for the rest of the time, the teacher wrote, worked out and explained examples on the chalkboard, wrote activities on the chalkboard and gave corresponding instructions or distributed learning materials. There is evidence to show that whereas just about half of the time learners spend in school is used for instruction, the time spent on learning is an important predictor of the resulting achievement (Fisher, 2009). While considering the effects of an increase of one hour of instruction per week in mathematics or reading, Lavy (2009) found an increase in test scores of 0.15 standard deviations, indicating that instruction time has a positive, significant effect on the pupils' academic achievement. This could explain why teacher in Busiro engaged learners in 60 minutes' mathematics lessons as opposed to the official 30 minutes stipulated by the National Curriculum Development Center. In addition, teachers had several boxes in the classrooms in which they kept the learners' exercise books, pencils, counters and other learning materials. This made it easy for the learners to access their books, pencils and the other materials when required and saved time for doing the mathematics activities.

Although it is not a direct responsibility of the teachers in Busiro, their learners received a warm midmorning meal at school. This boosted the learners' attention and memory during the lessons. most reported benefits include increased school attendance for 5 -11 year olds (less absenteeism); increased enrollment; improved learners' cognitive functioning, classroom participation and attention span; and improved academic achievement with up to 20 % increase in test scores (Lawson, 2012; Tanika & Rajshri, 2016).

Teachers in Busiro largely taught learners using English language as the medium of instruction. However, it was common for both teacher and learners to use Luganda, the area local language and first language for some of the learners, to clarify communication. Teachers used code-switching to clarify instructions for doing a task, to regain the learners' attention and also to ensure that all the learners understood the mathematics concepts. Similar observations were made by Sen (2011) in primary school mathematics lessons in Malaysia when teachers code-switched to achieve conversational, affective, social and managerial purposes including appealing to learners who were more competent in one language, capturing attention ,when learners are not responding to the teacher's question, reaching everyone in the classroom and emphasizing a point. Sen (2011) further observed that learners became less active when the teacher used English language to teach mathematics, suggesting that code-switching is an important instructional practice when dealing with learners for whom English is a second language, and for those whose proficiency in English is limited and are afraid of making mistakes which often results in being laughed at by the classmates. Other researchers believe that code-switching creates a more interactive learning atmosphere in which learners contribute more and share ideas without communication hindrances, and it promotes better bonding between teacher and learners (Mahofa, 2014; Munoz & Mora, 2006).

The majority of teachers in Luuka used concrete materials that learners are familiar with as counters or objects for sorting and matching which provided learners with a concrete way of appreciating mathematics. These included sticks, stones, seeds, leaves and mugs. The teachers also had charts made from reused woven plastic propylene sacks with the numbers from 1 to 100 hanged on the classroom walls. One teacher made models of the numbers 1 to 5 by cutting old flip-flops. These provided manipulatives for the learners as they learnt to recognise and write the number symbols 1 to 5. The learners were able to see, touch and move the numbers, as well as saying the number names and writing them. These learners in Luuka had opportunity to use a multisensory approach encompassing the visual, auditory and kinaesthetic modalities to learning mathematics. This boosted everyone's competence since different children learn in different ways and at different rates. It has also been reported that using a multisensory environment to teach mathematics makes learning more motivating and richer; makes children active participants in their own learning; allows for a variety of entry points into the mathematical concepts; helps learners organize their thinking; focuses on the learners' unique strengths; enhances memory; and it is also an excellent way for catering for learners with visual, hearing or any other physical disability (Anthony & Walshaw, 2009; Mattuvarkuzhali, 2012; Obaid, 2013). This teacher in Luuka used this highly creative instructional practice which involves hearing, speaking, seeing, touching, moving and acting to meet the learners' individual needs and abilities; increase their understanding and effectively build their mathematics knowledge base (Mattuvarkuzhali, 2012; Taljaard, 2016).

Teachers in Luuka commonly gave learners opportunity to answer an oral question or a written activity on the chalkboard before assigning them individual seatwork for independent practice. Peers were asked to determine whether the classmate who worked out a task on the chalkboard had come up with a correct response or not. In case of a correct response, the teacher asked peers to give a hand clap or some other nonverbal (acted) feedback, accompanied with some chanting or verbal feedback to appreciate the classmate. In the case of an incorrect response, the majority of teachers gave the learner a chance to try again, with suggestions of correcting the error from both teacher and peers. The learner who received feedback appreciated it with a smile and dancing in front of the class. This shows that teachers understood the importance of supportive feedback. The teachers knew that as they engage in formative assessment of their learners, if the learners do not receive any effective and supportive feedback, good performance would not be reinforced, the learners' motivation and competence could be adversely affected, and any errors or misconceptions would continue uncorrected. Minnoni, Tomei and Collini (2017) concur that the feedback moment is essential for learner growth;

it favours self-awareness, increases motivation and sense of self-efficacy, and improves performance.

Some teachers initiated learners into writing the symbols for the numbers 1 to 5 by use of air writing. This involved the learners imitating their teacher as she demonstrated writing the number symbols in space using finger movements (finger pencil) with corresponding verbal cues. Through air writing, children had the opportunity to learn how to trace and form numbers more efficiently by moving their fingers in large free motions. For some other learners, practising writing number symbols was done by using sticks to write in the soil outside the classroom or by using chalk to write on slates. Such practice prepared the learners to competently write the symbols neatly and accurately in their exercise books. This concurs with the observation made by Ipatenco (2017) that air writing helps to familiarize learners with the shape of the numbers and lays a foundation for handwriting and later life mathematics skills. Ipatenco (2017) suggests that in the absence of soil or sand, learners can finger-write on other media like sugar or salt when they are spread on a flat surface. The different writing media keep the learners interested in writing the number symbols.

Teachers in Luuka widely made use of mathematical rhymes and songs during their lessons. The rhymes and songs were mainly used as a means of teaching counting the numbers from1 to 10 in their correct sequence. They were also used at the start of a lesson to create an atmosphere of readiness and relaxation, at regular intervals during the lesson for transition between whole class and individual activities, and to deliver positive messages of the mathematics learnt during the learners' entire stay at school. Whereas the teachers could have used the rhymes and songs as a multisensory approach to learning, research has shown that mathematical songs enliven a classroom; improve listening and oral language development; enhance children's learning in an enjoyable manner; promote abstract thinking, attention and memory; decrease mathematics anxiety; increase positive attitudes towards mathematics; develop a feeling of inclusion for the learners; and increase learners' achievement (Early Years, 2018; Kocabas, 2009). In addition, the words, linguistic metaphor, repetitive nature and tunes of the rhymes and songs are a good way to assist learners in the recollection of the mathematics concepts they would have been taught (Civil, 2007). Teachers in Luuka used the learner-centered rhymes and songs instructional practice as a breakaway from the traditional talk and chalk method which favors rote learning, low motivation and less achievement. The practice concurs with An, Capraro and Tillman (2013) that music can be used to make connections to all mathematics content areas including counting, addition, subtraction, multiplication and word problems.

Comparing teachers' instructional practices in the two counties, this study found that as they taught new mathematics content more teachers in Busiro than in Luuka built on the learners' existing knowledge. The teachers in Busiro also used the learners' existing knowledge and related mathematics to the learners' everyday life activities more frequently during the lesson duration than the teachers in Luuka. This could be explained by the fact that teachers in Busiro have higher expectations of their learners than teachers in Luuka. Busiro having more peri- urban zones than Luuka, teachers in Busiro expect the majority of P.1 learners to have attended some form of pre-school education that gives them an opportunity to have more prior mathematical knowledge as compared to the P.1 learners in rural Luuka.

It has also been established that in Uganda, 42% of children aged 3 to 5 years living in urban areas attend pre-school as compared to only 24% of their age mates living in the rural areas (UBOS, 2017a). This finding concurs with that of Wang, Rubie-Davies and Meissel (2019) who found that high expectation teachers (those teachers who have overall high expectations for their learners in relation to the learners' performance) made more statements that were related to their learners prior knowledge and experiences compared with low expectation teachers (those teachers who have overall low expectations for their learners in relation to the learners' performance).

The findings of the study also revealed that a large and similar proportion of teachers in Busiro and Luuka rarely asked learners open ended questions or gave learners opportunities to explain their mathematical ideas and choice of procedure for handling a task. Teachers did not provide for asking of questions between learner and learner and never emphasised correct mathematical vocabulary use. This could be because teachers think that the learners are still very young and are not yet able to discuss and explain their mathematical ideas and procedures or even pronounce mathematical words correctly. Such teachers' instructional practices contradict Schwartz (2017) who contends that even pre-schoolers are able to verbally articulate and justify their solutions to the mathematical problems they deal with in their everyday lives.

Another possible explanation for this is that teachers themselves never had chance to discuss and explain their mathematical ideas during their early grade schooling and thereby teach in the same way as they were taught, simply emphasising pencil and paper work. This concurs with a finding by Serio (2014) who realised that teachers' past experiences with mathematics had a big role to play in whether or not they implemented student discourse in their classroom practice. The implication of this finding is that engaging in classroom mathematics talk where there is meaningful learner-to-learner and learner-to-teacher communication should begin as early as the first year of formal schooling. In-service teachers should have continuous professional development training to help them implement effective classroom mathematics talk.

As regards time for mathematics instruction, findings showed that whereas in Busiro most lessons began at 8: 00 am, many of the lesson periods lasted 60 minutes each and the P.1 learners left school after 3:00 pm, for most schools in Luuka lessons began at 8: 30 am and they had lesson periods of 30 minutes each yet P.1 learners here left school at 1: 00 pm. Also there exists a culture of beginning teaching and learning at school a week or two after the official date for the school term to begin especially in rural areas like Luuka. This results in big differences in content coverage, with some teachers in Luuka lagging behind the NCDC guidelines by two or even more weeks. This implies that P.1 learners in Luuka will most likely lag behind in attaining mathematics competences when compared to P.1 learners in Busiro. However, in Busiro there is also a likely mental fatigue effect and excessive pressure to perform arising from keeping the P.1 learners at school for long and having long lesson periods. This finding could be moderated by emulating Jez and Wassmer (2011) who found a statistically significant positive relationship between the number of instructional minutes in a year and the test scores of elementary children. Jez and Wassmer (2011) observed that only an extra 15 minutes per school day (or an additional week of classes in a school year) led to a 1 % increase in academic achievement. Similarly, Lavy (2009), Meroni and Battistin (2016) and Rivikin and Schiman (2013) found that lengthening instruction time raised learners' mathematics scores. The current study has reported a higher average score with a smaller standard deviation for learners in Busiro than for learners in Luuka.

The variations in instruction time could be one other possible explanation for the difference in performance. But as Cattaneo, Oggenfuss & Wolter (2016) caution, learners with different mathematical abilities might benefit to different extents from additional instruction time. In this vein, Huebener, Kuger and Marcus (2016) reported that low-performing students did not benefit from an increase in weekly instruction hours while high-performing students benefited most.

The finding further revealed that more teachers in Busiro compared to those in Luuka gave learners timely and supportive feedback especially for oral tasks and those worked out on the chalkboard. The teachers indicated to the learners how to do corrections and attended to speed, precision and accuracy. They involved classmates in judging whether a learner's work was correct and in giving on-spot verbal and practical feedback. Teachers often asked classmates to chant phrases of praise to a learner who had done a task correctly and as the chanting went on, the learner who performed the task stood in front of the classroom and danced to the rhythm of the chant in appreciation of the feedback. On the other hand, when classmates judged that a learner was not correct, the classmates together with the teacher offered the learner step by step verbal and practical guidelines to correct mistakes. This helped the learner to overcome their misconceptions. Rarely did teachers call on another learner to attempt a task until one got it correct.

One reason why teachers gave such feedback is because they understand that it motivates learners, boosts their mathematics performance and helps them to avoid repetitive mistakes. When classmates get involved in assessing a learner's work, they also gain skills in evaluating their own work. This finding is supported by various scholars including Hattie and Timperley (2007), Jones (2005), McFadzien (2015), Norlin (2014), and Minnoni, Tomei and Collini (2017) who concur that meaningful, timely and constructive feedback promotes dialogue between teacher and learners; it targets the learners' individual needs; and it is received by a learner when the assessed work is fresh enough in the mind of the learner and before learner moves to subsequent work so that it is of benefit to subsequent tasks.

All teachers in Busiro and Luuka were found to use formative interactive assessment to determine their learners understanding of the mathematics content that had been taught during the lesson. The assessment was done for oral, written and practical activities. This could be explained by the fact that teachers from their training and teaching experience understand the role and importance of formative assessment and timely, specific feedback especially in learning mathematics in the primary school (Jones, 2005; Klute, Apthorp, Harlacher & Reale, 2017). These teachers know that formative assessment improves learning by addressing individual needs, builds the learning to learn skill especially when they involve learners in peer assessment, and promotes the learners' mathematics competence. The teachers are not compelled to teach to the test as is the case with most of the summative assessment being done in schools but aim at building the learners' confidence in their own knowledge, and their skills and ability to manage their own learning. Similarly, the learners' mindsets are not focused on attaining high scores and grades but rather focus on understanding the content and achieving the learning outcomes (Klute, Apthorp, Harlacher & Reale, 2017; Widiastuti, 2018).

Similarly, all the teachers who participated in this study were found to use songs, rhymes and games with mathematical concepts at consistent intervals throughout a lesson. This practice is in agreement with the guidelines given to the teachers by the National Curriculum Development Centre (NCDC, 2006). Whereas many of the mathematical rhymes and songs used by the teachers in Busiro and Luuka are in English language, teachers also use rhymes, songs, and games in the area local languages or even translate the ones in English language to the local language. Since the majority of learners speak and understand their area local language, rhymes, songs and games in these languages greatly enhance their mathematics competence.

As learners enjoy singing or rhyming repeatedly, they are practising the mathematical concepts and vocabulary which enhances retention. Several researchers also agree that effective elementary grade teachers should use mathematical songs, rhymes and games since children enjoy chanting, singing and playing in their everyday activities. Children would learn better at school if teachers incorporate music in all their lessons (Bose & Seetso, 2016; Civil, 2007; Early Education, 2012; Early Years 2018; Fleer & Raban, 2015; Neal, 2007; Taylor, 2014).

However, whereas teachers could use the think-pair-share cooperative learning strategy to help learners explain their mathematical ideas to each other, only a small proportion of teachers in Busiro and none in Luuka used pair work. This could also be because in their schooling and teacher training, these teachers were never exposed to the think-pair-share as a mathematics problem solving strategy. Consequently, using the strategy poses a challenge to the teachers. Likewise, these teachers have not embraced the use of technology in teaching mathematics. This finding is in agreement with Altinyelken (2010) and Owens (2013) who concur that if pre-service teachers are not taught in new ways different from the traditional talk-and-chalk methods, and they do not experience novel ways of learning during their training, they too cannot teach differently from “stand – and – deliver.” The implication of this finding is that the cycle continues and the young generation misses out on creative, participatory learning environments.

This cycle needs to be broken because as Kwok and Lau (2015) observed, the think-pair-share strategy significantly improved the mathematics learning outcomes for primary school learners. This is because the strategy had each pair of learners initially think and work independently on a mathematics task; then as a pair talk about their understanding of the task, the strategies chosen for solving the problem, the answers got and a decision on the best answer; and finally the pair shared their decision with the whole class. Tint and

Nyunt (2015) add that the think-pair-share technique encourages learners to justify their mathematical ideas using clear examples, clarity of thought and expression and correct mathematics vocabulary. The technique gives learners time to think, respond and help each other (Lee, Li & Shahrill, 2018; Tanujaya & Mumu, 2019). This helps learners to improve their understanding of the learnt mathematics concepts and to build on other learners' opinions to strengthen their own (Kwok & Lau, 2015; Tint & Nyunt, 2015). It also helps learners to appreciate the value and applications of mathematics in their daily lives (Afthina, Mardiyana & Pramudya, 2017).

On the other hand, findings of this study revealed that the majority of teachers in Busiro and Luuka use several visual representations of the numbers from 1 to 100 to help the P.1 learners build a strong foundation in number concepts. The teachers use wall charts or posters with the numbers 1 to 100, both printed and locally made calendars and the Number Line. These are used to help the learners develop number sense as they visually follow how the numbers grow from 1 to 100 and apply the counting on strategy for numbers. Teachers may use wall charts, calendars, the Number line and other learning aids because they appreciate that children learn best through a multi-sensory approach. Naturally, children have been observed to discover their surroundings by using all their senses (Taljaard, 2016).

There is also evidence that when teachers elicit the learners auditory, visual and tactile-kinaesthetic modalities so that in turn learners are able to hear, see, touch and move mathematical objects, the learners' brains act optimally. Consequently, learners are able to grasp any elusive mathematics concepts and they easily relate the mathematics learnt to what they already know from their daily life activities (Krishna, 2017; Mattuvarkuzhali, 2012; Rains, Kelly & Durham, 2008). Using a multisensory approach also compels teachers not to dwell on drilling the learners. This study found that teachers in Busiro and Luuka rarely drilled learners but rather did more of practice and consolidation of the skills that learners had encountered during the lesson.

The study found it worth to note that very few teachers in Busiro and Luuka had learners who received a warm midmorning meal provided by the school. In the other schools, either the learners bought themselves a snack which was most likely not warm or went without anything to eat or drink during the school's midmorning break. Some of these schools have a service provider who manages a canteen within the school compound; others have a service provider bringing the snacks to school at break time while in other cases, learners move out of the school compound to buy a snack from a kiosk within the vicinity of the school. This possibly happens largely because parents fail to cooperate with the school administrators in providing for the learners the much needed warm midmorning meal. This is in spite of reports that having a meal at school plays a very important role in getting children into school and keeping them there, increasing enrolment and reducing absenteeism, and improving mathematics tests' scores (World Food Programme [WFP], 2019). The implication of this finding is that learners may not be able to concentrate fully at school, their mental performance and memory may be compromised when they are hungry and as a result, they cannot attain their optimal mathematics competence.

A good proportion of teachers in Busiro and Luuka were found to use a modified seating arrangement or physical design of the classrooms in terms of the teacher and learners' desks and chairs. Teachers placed their desks either at the back of the classroom or in the sides unlike in the traditional mode where the teacher's desk is at the front of the classroom. The learners' desks were commonly arranged in an inverted T layout with all learners seated facing the chalkboard. In the traditional mode which is believed to be teacher-centred, all the learners' desks are arranged in rows facing the chalkboard at the front of the classroom. There is evidence that when learners sit in rows, it is difficult for those seated at the back of the classroom to be engaged in class discussions, there is minimal collaborative work among learners, and the design consumes the most physical space in the classroom (Simmons, Carpenter, Crenshaw & Hinton, 2015).

Teachers in Busiro and Luuka could have chosen the inverted T layout for the learners' desks because they believe it is learner-centred and creates a much more conducive learning environment compared to the traditional rows arrangement. This could happen by having this seating arrangement increase learner-to-learner and teacher-to-learner interaction, make it easier for the teacher to move around the classroom to check on what the learners are doing, increase both visibility of the teacher by the learners, and visibility of the learners by the teacher and also improve the learners' discipline. This finding is supported by Sanders (2014) who reported that teachers who used a horse-shoe seating arrangement for the learners said they found it easy to walk around the classroom, view the learners' work and ensure that the learners were on task. These teachers noted that when learners were seated in rows, the learners at the edges of the classroom would be far away making it difficult for the teacher to access them.

Relationship Between Teachers' Expectations and Learners' Competence in Mathematics

This study investigated teachers' expectations of the learners' competence in mathematics at the class level with the aim of establishing the association between teacher expectations and the overall learners' competence. In particular, the study sought to establish whether P.1 learners who were taught by high expectation teachers (teachers who had high expectations for their learners as an entire class in relation to the learners' competence) attained competence scores that were significantly higher compared to learners who were taught by low expectation teachers (teachers who had low expectations for their learners as an entire class in relation to the learners' competence).

Wang, Rubie-Davies and Meissel (2019) categorized the association between teachers' expectations and the learners' previous performance into two depending on what happens to the learners' future performance. According to them, if the learners maintain the same level of performance, the association results in self-maintaining expectation effects. If on the other hand the teachers' expectations cause learners to perform at higher or lower levels from their previous performance the learners experience self-fulfilling prophecy effects (Wang, Rubie-Davies & Meissel, 2019). Teachers normally communicate their expectations to the learners through what they say or do as they interact with the learners during the lessons (Peterson, Rubie-Davies, Osborne & Sibley, 2016). The learners get to know about their teachers' expectations of them from the teachers' differential behaviours towards them.

This study hypothesized that when teachers have high expectations, the end result is higher or better learner scores. This implies that a strong positive relationship between teachers' expectations and learners' competence was anticipated. Findings in the study reflect an observed strong positive correlation between the Busiro teacher expectations and the learners' scores. This means that these teachers' expectations were a strong predictor of their learners' competence. Learners in Busiro performed well in the mathematics competence test with the majority of them able to answer correctly more than half of all the items except for subtraction. One possible explanation which concurs with the results of studies by Williams (2012) and Zhang (2014) is that teacher expectations signal to the learners' messages about their capabilities to learn to the extent that the learners internalize these messages and their academic attainment reflects the beliefs of the teacher. In this way, teacher expectation effects are mediated by the learners' perceptions of competence.

Consequently, teachers expect learners to continue to perform according to previously established patterns and may disregard any contradictory evidence of change (Zhang, 2014). Research has also indicated that teacher expectations can be biased by stereotypes, staffroom discussions, learners' demographic characteristics and education labels (Wang, Rubie-Davies & Meissel, 2019). Consequently, if there are some learners who feel that the teacher has low expectations of them because the teacher cares, engages, supports, responds and interacts with them less often when compared to their classmates these learners could become withdrawn , put little effort in their work and end performing poorly. De Boer, Timmermans and Van Der Werf (2018) concur that teacher expectations influence the teachers' verbal and non-verbal behaviours, and the subsequent performance of the learners. Teachers have been reported to show a positive bias when assessing the work of those learners for whom they have high expectations. They do this by providing them with more opportunities to respond to questions, giving them more challenging instructions, more praise, and interacting with them in ways that are more supportive and caring (Rubie-Davies, 2007; 2008). Yet teachers have been observed to praise low-achievers when they succeed in simple tasks while withholding blame for failure (Tsiplakides & Keramida, 2010).

The association between the teachers' expectations and learners' competence for Luuka was positive and moderate. This means the Luuka teachers' expectations were a moderate predictor of their learners' competence in mathematics. So as the teachers' expectations became higher, there were moderate increases in the learners' competence. This implies that there were instances when the teacher expectations were high but the level of the learners' competence was not correspondingly high or in other instances, the teacher expectations were low but the level of the learners' competence was not accordingly low. The teachers might have relayed their expectations to the learners in subtle and unintended ways (Tsiplakides & Keramida, 2010) but consequently, the learners' competence was affected either positively with better competence levels or negatively with poorer competence levels.

In the curriculum content areas of applying addition to familiar social contexts or the solving of word problems; and in multiplication of numbers by 2, the majority of teachers (more than 80%) had high expectations of their learners' ability. However, only 4.7 % demonstrated competence in applying addition and 3.4% were competent in multiplication. It is possible that the learners had been taught these mathematical concepts but they had not yet acquired the required mastery of them as expected by their teachers. But whereas none of the teachers expressed low expectations of their learners' ability to add 1-digit numbers, the findings had 39.2% of the learners failing to do more than one addition correctly. One explanation for this could be that teachers had biased expectations based on learners' characteristics like previous competence levels (De Boer, et al., 2018). These teachers had the belief that all the children would learn and develop mathematically and could have denied the learners opportunities to make improvement from their previous records. This could be the reason why the learners' competence scores were contrary to their teachers' expectations.

This study was based on the premise that higher teacher expectation results in higher or better learner performance. This means that a strong positive correlation was expected. Findings in the study reflect the observed strong correlation for Busiro, but a moderate positive relationship for Luuka. This finding is in line with that of Rubie-Davies (2010) who observed that teachers make a big difference in learners' performance depending on their expectations, and Timmermans, Rubie-Davies and Rjosk (2018)'s observation that teachers are relatively accurate in their expectations. There were areas that teachers had expressed low expectations. However, instead of learners performing poorly in those areas, children did better in some of them, dispelling the earlier view that learner performance is strictly guided by the level of teacher expectation. This tendency may be explained by the fact that sometimes teachers give simpler learning activities that are below the level of children if they have lower expectations for the children and vice versa (Timmermans et al., 2018). On the other hand, if teachers teach according to their expectations of the learners' competence, there is a risk that P.1 learners in these two counties experience very different learning opportunities with different competence levels by the end of their P.1 (Sunde & Sayers, 2017).

Given that research has given evidence of a well-established correlation between early numeracy skills and proficiency and later achievement in mathematics (Aunio, Korhonen, Ragpot, Tormanen, Mononen & Henning ,2019), differences in Busiro teacher expectations and Luuka teacher expectations may be cause for concern in the quantity and quality of mathematics content the learners receive. Likewise, as Atuhurra and Alinda (2018) reported, there may be cause for concern in the differences in these teachers' focus on either procedural understanding (the 'how' of mathematics only or rote learning) or conceptual knowledge acquisition (the how and why of mathematics). This could also be reason why findings of this study on these P.1 teachers' instructional practices have reported that whereas in general the teachers rarely ask learners "why" questions that are aimed at developing conceptual understanding, more teachers in Busiro than in Luuka implore learners to explain their mathematical ideas to the teacher and to their classmates.

The teachers in Busiro have also been reported to have higher expectations of their learners' mathematics competence than the teachers in Luuka. It has been reported that differences in teacher expectations may have direct effects on learning and consequently widen the gap between relatively low and high –achieving learners since learners who are given more opportunities to learn, more clues, and who are called on more frequently should learn more than learners who are given fewer such opportunities (Sunde & Sayers, 2017).

Similarly, the findings of this study reported a statistically significant difference in the scores on the mathematics competence assessment test in favour of the learners from Busiro. However, some teachers in Busiro North County expressed low expectations for their learners' ability to recognise and write the numbers 0 to 9. This could be because these teachers had learners with visual or speech disabilities or any other developmental delays and the teachers had difficulties in teaching such learners (Verhulp et al., 2019). However, if teachers have low expectations for some learners' mathematical abilities, some few learners might think that their teachers are underestimating their abilities (Williams, 2012). These learners could work diligently to show that they can achieve more than what the teacher expects of them when given any mathematics tasks with the hope of winning more recognition from the teacher (Archambault, Janosz & Chouinard, 2012). Consequently, the majority of such learners could react by placing less effort into their tasks because they would have realized that even when they put the least effort in doing the set tasks, they receive their teacher's approval (Rubie-Davies, 2010).

Regardless of the case, the learners' reactions to their teachers' expectations will affect their effort, performance, competence and, in turn, their attitude towards their teacher and towards mathematics (Rubie-Davies, 2010). It is important that teachers express high expectations for all learners irrespective of whether the expressions are verbal or nonverbal, because if a teacher believes that some children cannot learn, the children might actually not learn anything (De Boer et al., 2018).

Conclusion

This study has investigated the teachers' expectations, their instructional practices and how these two aspects affect the learners' mathematics ability in the Ugandan context. Basing on the study findings, the following conclusions have been made.

Teachers in Busiro had higher expectations of the learners' competence in mathematics than the teachers in Luuka. In both study areas, the teachers' most prevalent high expectations were for the learners' ability to recognise, count, match and write the numbers 0 to 9.

The study hypothesized that there was a statistically significant difference between the competences in mathematics of the P.1 learners in the two study areas. From the analysis of the assessment test scores it is concluded that learners in Busiro had significantly higher competence in mathematics than those in Luuka, except for addition in which the learners' competence was at par and subtraction in which learners in Luuka exhibited higher competence than the learners in Busiro. The learners were most competent in working with the numbers from 0 to 9.

The third premise on which this study was based was that when high expectation teachers employ effective instructional practices, the learners' competence in mathematics is enhanced. It is concluded from the outcomes of the lesson observations that teachers in Busiro used peculiar practices that were promotive of the learners' competence in mathematics such as pair work; gallery walks; visual prompts; keeping the learners' writing materials within the classroom; and a special needs education (SNE) co-teacher; while those in Luuka used low or no cost (re-used) plastic and rubber learning materials and also gave learners opportunities to write in the air or in soil. With pair work, learners had opportunities to use a classmate's opinion to develop their own, and they had chances to increase one' conceptual understanding and clarify ideas in the process of problem solving. This was a step towards discovering and working within a learner's ZPD as each member of a pair offered the appropriate scaffolding required by the other and also when necessary, by the teacher. In addition, pair work and gallery walks set a foundation for group work and inculcate in the learners the principles and practices of formal cooperative learning (FCL) advanced in the Social Interdependency Theory.

However, teachers in both counties rarely gave learners opportunities to explain their mathematics ideas and choice of procedure for handling a task, especially for oral tasks and those worked out on the chalkboard. In this learners missed the opportunities to interact with both oral and written mathematics which is essential for the development of skills of communicating mathematically throughout their lives, connecting mathematics to everyday language and solidifying their understanding of mathematical concepts. In addition, some teachers employed practices that demote a learner's competence such as ignoring learners' who laugh at classmate's (expected to have low ability) response; teacher calling on another learner when one (expected to have low ability) fails, teacher writing correct answer besides learner's incorrect one and teacher repeatedly sending the same learner on non-academic errands outside the classroom. The hypothesis for the fourth objective of this study was that higher teachers' expectations would result in higher learners' competence in mathematics. A higher positive correlation was found between the Busiro teachers' expectations and the learners' test scores compared to the correlation for Luuka. Basing on this finding, it is concluded that teachers' expectations have an influence on the level of the learners' competence in mathematics. This is explained by the fact that the teachers, depending on their perceptions of the learners, may select learning activities that are either of a higher or a lower ability level for the learners. The teachers communicate their expectations to the learners directly or indirectly through their verbal and nonverbal (facial expressions or body language) behaviours and practices. The teachers' practices present the learners with either benefits or disadvantages of the socio-emotional interactions induced by the teacher. This indicates the importance of teachers having high and achievable expectations for all their learners. More so, this affirms the Pygmalion effect in the study population.

The study's contribution to knowledge

The researcher is convinced that the information presented in this dissertation represents the reality about Primary One teachers' expectations and instructional practices; and how the interplay between these two teacher factors influence the learners' competence in mathematics, not only in Busiro North and Luuka North Counties, but in many other primary schools in Uganda. This is because primary schools in Uganda possess very similar and almost identical educational, socioeconomic and cultural experiences. This is in addition to P.1 teachers undergoing the same professional training in the teacher education institutions and related exposure in the course of their career through seminars, workshops, conferences or other continuous professional development opportunities. Specifically, the findings have provided information on P.1 teachers' expectations as a key component in the learners' mathematics competence, with lower teacher expectations resulting into lower learners' competence. Furthermore, the findings have highlighted both promotive instructional practices and those that demote the learners' mathematics competence. This study is the first one of its kind in Uganda.

The mixed methods research design adopted by this study and carrying out the research on teachers' expectations of the learners as a class, not as individuals was peculiar. Using both quantitative and qualitative research methods in one study enabled the researcher to provide answers to the different research questions and hypotheses that called for the collection and analysis of different data types, and therefore different research approaches. Using a variety of research instruments further increased the internal validity of the data.

The information generated in this dissertation has in general contributed to the body of knowledge in two major ways. First, it has largely concurred with the findings of other researchers on the relationship between teacher expectations, teacher instructional practices and learners' mathematics performance as discussed in Chapter Two. This is important because it shows that teachers' expectations and instructional practices; and how they reciprocate to impact the learners' mathematics competence is similar for a wide geographical scope and irrespective of class level, ethnicity and socioeconomic disparities. Secondly, as discussed in Chapter Five, the findings of this study have shown that even with a slight difference in teacher expectations, the difference in the learners' mathematics competence is statistically significant. This highlights the need for all P.1 teachers to hold high and achievable expectations for all learners, and employ effective instructional practices that cater for the needs of each learner's mathematics achievement.

All in all, the outcomes of this study on teachers' expectations; the association between teacher's expectations and the learners performance; and the instructional practices teachers use to enhance the learners' mathematics competence offer a novel direction for research on these aspects in Uganda both at the classroom level and at individual learner levels.

Recommendations

Based on the findings, the study has the following recommendations to be effected by the different stakeholders in mathematics education in order to improve the teaching and learning of mathematics particularly in P.1.

The study has established that teachers in Busiro had higher expectations of the learners' competence in mathematics than their counterparts in Luuka. It is recommended that centre coordinating tutors (CCTs) in Luuka routinely sensitize in-service teachers on the importance of having high expectations of all learners, and educate them on the ways in which their expectations are passed on to their learners. In line with this, the District Education Officer (DEO) ought to consider orienting all P.1 teachers to have high expectations of the learners' abilities and to be positive about teaching mathematics.

A comparison of the test scores showed that learners from Busiro performed significantly better than the learners from Luuka, while learners from Luuka were more competent in subtraction. The study recommends that DEOs and Headteachers organize workshops to sensitize teachers in Luuka on the influence teachers' expectations have on learners' mathematics competence, and parents on importance of high expectations and mathematically stimulating environments for the children. With regard to the learners' competence in subtraction, it is recommended that teachers in Busiro include in their mathematics lessons more real life and practical activities involving buying and selling, cooking and paying transport fares in order to develop lasting and applicable life skills in the learners.

The study has reported that teachers in Busiro used promotive instructional practices like pair work, gallery walks, visual prompts, a warm midmorning meal, storing the learners' exercise books and pencils at school and SNE co- teachers that helped learners raise their competence. It is recommended that Luuka teachers consider adopting these promotive practices and apply them consistently in all lessons in order to enhance their learners' competence in mathematics.

Promotive practices which enhance the learners' mathematics competence have been reported as being used by small proportions of teachers in both study areas. It is recommended that the Ministry of Education and Sports (MoES) and DEOs of Wakiso District and Luuka District organise workshops to train teachers in both counties in these promotive practices so as to improve the learners' competence in mathematics.

A strong positive correlation was found between the Busiro teachers' expectations and their learners' competence in mathematics, while the correlation in the case of Luuka was moderate. The study recommends that teacher training institutions (TTIs) include in their course units content that informs pre-service teachers about teachers' expectations and their influence on the learners' development of competence in mathematics. A good understanding of the influence teachers' expectations have on their learners' competence should be a starting point for teachers to make use of the available research findings to improve the teaching and learning of mathematics in the P.1 class.

In line with the foregoing recommendations, the study has come up with a P.1 learners' mathematics competence development profile. The profile aligns the different competences the learners are expected to attain with the appropriate instructional practices the teachers ought to apply.

Primary One Learners' Mathematics Competence Development Profile

Competences	Instructional Practice
Recognise, count, match, write numbers 0 -99	Build on learners' prior mathematical knowledge which they come with to P.1. Have learners count familiar objects like sticks, stones, seeds, leaves, eyes, legs, fingers. Give learners time to work in pairs. Avail opportunities for learners to practice writing number symbols in soil, sand; trace numbers on charts and use air-writing. Use mathematical games, songs, chants and rhymes. Make use of low or no cost plastic and rubber materials to make counters, number symbols and number charts. Give learners timely feedback and support them to do their corrections.
Use basic number operations: addition and subtraction of numbers up to 99; multiplication by 2, 3 and 10	Practice the basic number operations including number bonds and multiplication facts orally, practically and through written exercises. Give learners sufficient time to explore and practice the basic numeracy skills. Let learners talk about and explain their mathematical ideas to classmates and to the teacher. Make use of low or no cost plastic and rubber materials to make number bonds up to 99 for addition; and addition, subtraction and multiplication number facts. Give learners timely feedback and support them to do their corrections.
Apply addition and subtraction	Plenty of practice using "more than", "less than". Let learners verbalize their mathematical thinking and procedures for finding solutions. Pose word problems within the learners' real life experiences and familiar social contexts. Regularly extend and complement learning mathematics concepts in other learning areas like English, physical education, music, religion. Consistently help and support learners transfer their mathematical understanding and skills to familiar social contexts. Give learners timely feedback and support them to do their corrections.

Recommendations for Further Research

This study explored teacher expectations for the whole class. Further research is needed to explore teacher expectations for individual learners and how the expectations influence individual performance. It is possible that learners' mathematics competences are also influenced by their parents' expectations. This is another area that requires to be researched into.

Assessment of the learners' mathematics competence was done once. Where possible, it is recommended that learners are assessed and followed up for an entire school year. A longitudinal study for about three years from beginning of P.1 to end of P.3 could reveal more information about the learners' competence, their teachers' expectations and teachers' instructional practices. An experimental approach to teachers' instructional practices with a possibility of teachers being observed with and without using certain practices would give better distinctions of which practices should be prioritised by teachers during the P.1 mathematics lessons.

References

Alber, R. (2014, January 24). 6 Scaffolding strategies to use with your students [Blog post]. Retrieved from https://www.edutopia.org

Adams, C. (2019). 11 Essential strategies in teaching math. [Blog post]. Retrieved from https://www.weareteachers.com

Afthina, H., Mardiyana & Pramudya, I. (2017). Think pair share using realistic mathematics education approach in geometry learning. *Journal of Physics: Conference Series, 895* (2017), 1 – 6. DOI: 10.1088/1742-6596/895/1/012025

Ahimbisibwe, P. (2017, January 12). UNEB withholds PLE results for 1886 candidates. *The Monitor*. Retrieved from www.monitor.co.ug

Ahmad, S. O. (2012). *Questionnaires and types*. Retrieved from https://www.researchgate.net

Alenezi, D. F. (2008). *A study of learning mathematics related to some cognitive factors and to attitudes* (Doctoral thesis), University of Glasgow. Retrieved from http://theses.gla.ac.uk

Almalki, S. (2016). Integrating quantitative and qualitative data in mixed methods research – Challenges and benefits. *Journal of Education and Learning, 5* (3), 288 – 296. https://dx.doi.org/10.5539/jel.v5n3p288

Altinyelken, H. K. (2010).Pedagogical renewal in sub-Saharan Africa: The case of Uganda. *Comparative Education, 46*(2), 151- 171. DOI: 10.1080/03050061003775454

Amin, M. E. (2005). *Social science research: Conception, methodology and analysis*. Kampala, Uganda: Makerere University.

Ampurire, P. (2017, January 12). *UNEB releases 2016 PLE results, citing high female completion.* Retrieved from http://chimpreports.com

An, S., Capraro, M. M., & Tillman, D. A. (2013). Elementary teachers integrate music activities into regular mathematics lessons: Effects on students' mathematical abilities. *Journal for Learning Through the Arts, 9* (1), 1-19. Retrieved from http://escholarship.org/uc/item/0js732gf. DOI: 10.21977/D99112867

Anthony, G. & Walshaw, M. (2009). *Effective pedagogy in mathematics*. Retrieved from www.ibe.unesco.org /publications

Archambault, I., Janosz, M., Chouinard, R. (2012). Teacher beliefs as predictors of adolescents' cognitive engagement and achievement in Mathematics. *Journal of Educational Research*, 105(5), 319–328. doi:10.1080/00220671.2011.629694

Asikin, M. (2017). *Building discourse communities in realistic mathematics education setting*. Retrieved from https://www.researchgate.net

Atuhurra J. F. (2014). *An empirical analysis of the impacts of the universal primary education policies on educational performances in East Africa: A comparative study of Uganda's UPE and Kenya's FPE*. Doctoral dissertation, National Graduate Institute for Policy Studies (GRIPS). Retrieved from https://www.grips.ac.jp

Atuhurra, J., & Alinda, V. (2018). *Basic education curriculum effectiveness in East Africa: A descriptive analysis of primary mathematics in Uganda* *using the 'Surveys of Enacted Curriculum'*. Retrieved from https://mrpa.ub.uni-muenchen.de/87583/1/MPRA_paper_87583.pdf

Aunio, P., Korhonen, J., Ragpot, L., Tormanen, M., Mononen, R., & Henning, E. (2019). Multi-factorial approach to early numeracy – The effects of cognitive skills, language factors and kindergarten attendance on early numeracy performance of South African first graders. *International Journal of Educational Research*, *97* (2019), 65 – 67. https://doi.org/10.1016/j.ijer.2019.06.011

Aunio, P. & Niemivirta, M. (2010). Predicting children's mathematical performance in grade one by early numeracy. *Learning and individual differences*, *20* (2010), 427 – 435. DOI: 10.1016/j.lindif.2010.06.003

Aunio,P., Heiskari, P., Van Luit, J. E. H., & Viorio, J.M. (2015). The development of early numeracy skills in kindergarten in low-, average- and high- performance groups. *Journal of early childhood research*, *13* (10), 3-16. doi: 10.1177/1476718X14538722

Australian Association of Mathematics Teachers (2008). *The practice of assessing mathematics learning*. Retrieved from www.aamt.edu.au

Baroody, A. J. (2010). *Fostering early numeracy in pre-school and kindergarten*. Retrieved from http://www.child-encyclopedia.com

Bee, S .N. K. & Kaur, B. (2014). Using enhanced feedback to improve the learning of mathematics. *The Mathematics Educator 15, (2), 101-119.* Retrieved from www.scholar.google.com

Belbase, S. (2010). *A reflective journey through theory and research in mathematical learning and development.* Retrieved from https://eric.ed.gov

Beswick, K. (2019). The role of knowledge and beliefs in helping learners to progress their mathematical understanding. *Journal of Mathematics Teacher Education, 2019* (22), 125–128. https://doi.org/10.1007/s10857-019-09432-5

Black, S. E., Devereux, P. J & Salvanes, K. G. (2008). *Too young to leave the nest? The effects of school starting age*. Retrieved from https://www.iza.org

Bolarinwa, O. A. (2016). Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. *The Nigerian Postgraduate Medical Journal, 22*(4), 195-201. DOI: 10.4103/1117-1936.173959

Bold, T., Filmer, D., Martin, G., Molina, E., Stacy, B., Rockmore, C., Svensson, J. & Wane, W. (2017). Enrollment without learning: teacher effort, knowledge and skill in primary schools in Africa. *The Journal of Economic Perspectives, 31* (4), 185-204. Retrieved from www.sagepublications.com

Borovik, A. & Gardiner, T. (2006). *Mathematical abilities and mathematical skills*. Retrieved from http://manchester.ac.uk/mims/eprints

Borrego, M., Douglas, E. P. & Amelink, C. T. (2009). Quantitative, qualitative and mixed research methods in engineering education. *Journal of Engineering Education, 98* (1), 53 – 66. Retrieved from http://www.asee.org/publications/jee/index.cfm

Bose, K. & Seetso, G. (2016). Science and mathematics teaching through local games in preschools of Botswana. *South African Journal of Childhood Education*, 6 (2), 1 -9. Retrieved from http://www.scielo.org.za/pdf/sajce/v6n2/04.pdf

Bradshaw, Z. & Hazell, A. (2017). *Developing problem-solving skills in mathematics: A lesson study*. https://doi.org/10.1108/IJLLS-09-2016-0032

Brodhagen, E. M. & Gettinger, M. (2012). Academic learning time.In Seel, N. M. (Ed.), *Encyclopedia of the Sciences of Learning*. DOI: https://doi.org/10.1007/978-1-4419-1428-6

Brodie, K. (2007). Teaching with Conversations: Beginnings and Endings. *For the learning of Mathematics, 27* (1), 17- 23. Retrieved from https://flm-journals.org

Brookhart, S. M. (2008). *How to give effective feedback to your students*. [e-book]. Retrieved from http://www.perinopbworks.com/f/Effective+Feedback.pdf

Brunette, T., Crouch, L., Cummiskey, C., Dick, A. W., Henny, C., Jordan, R. ... & Weatherholt, T. (2017). *Repetition of primary 1 and pre-primary education in Uganda*. Retrieved from https://www.rti.org

Budget Monitoring and Audit Unit. (2016). *Quality pre-primary education in Uganda: How can universal success be achieved?* Retrieved from http://www.finance.go.ug

Businge, C. (2010, January 20). Best schools in Kampala, Wakiso. *New Vision*. Retrieved from https://www.newvision.co.ug

Cairns, E. (2015). *Every child is capable of learning maths*. Retrieved from https://www.britishcoucil.org/voice-magazine.

Campbell, L. & Campbell, B. (2009). *Beginning with what students know: The role of prior knowledge in learning.* Retrieved from https://www.corwin.com/sites/default/files/upm-binaries/25914-081222-Campbell-chl-excerpt.pdf

Carroll, H. C. M. T. (2010). The effect of pupil absenteeism on literacy and numeracy in the primary school. *School Psychology International*, *31*(2), 115–130. DOI: 10.1177/0143034310361674

Cattaneo, M.A., Oggenfuss, C. & Wolter, S. C. (2016). *The more, the better? The impact of instructional time on student performance.* Retrieved from https://papers.ssrn-id2766221.pdf

Center for Teaching Innovation, (2020). *Assessing prior knowledge*. Retrieved from https://teaching.cornell.edu

Chahine, I. C. (2013). Delineating the epistemological trajectory of learning theories: Implications for mathematics teaching and learning. *Mathitudes*, *1*(1), 1 – 18.Retrieved from https://www.fau.edu

Chang, D. F. & Demyan, A. L. (2007). Teachers' stereotypes of Asian, Black, and White students. *School Psychology Quarterly*, *22*(2), 91–114. DOI: 10.1037/1045-3830.22.2.91

Chang, S. H., Lee, N. H. & Koay, P. l. (2017). Teaching and learning with concrete-pictorial-abstract sequence: a proposed model. *The Mathematics Educator*, 1791), 1 – 28. Retrieved from https://www.semanticscholar,org

Chapin, S. H. and O'Connor, C. (2007). Academically Productive talk: Supporting Students' Learning in Mathematics. In Martin, W. G., Strutchens, M. E. and Elliott, P. C. (Eds.), *The Learning of Mathematics: Sixty Ninth Yearbook*, National Council of Teachers of Mathematics (NCTM), 113 – 128. Retrieved from scholar.google.com

Choppin, J. (2007). Engaging Students in Collaborative Discussions: Developing Teachers' Expertise. In Martin, W. G., Strutchens, M. E. and Elliott, P. C. (Eds.), *The Learning of Mathematics: Sixty Ninth Yearbook*, Reston, National Council of Teachers of Mathematics (NCTM), 129 - 139. Retrieved fromhttps://urresearch.rochester.edu

Chowdhury, S. R. (2017). *Why children do well in street maths but not in the classroom: Researchers fault teaching methods*. Retrieved from https://www.scroll.in

Civil, M. D. (2007). *Using music to improve learning in mathematics (*Master's Thesis). The College at Brockport: State University of New York, USA. Retrieved from https://digitalcommons.brockport.edu

Clements, D. H. & Samara, J. (2005). Math play: How young children approach math. Retrieved from https://www.researchgate.net/publication/258933013

Clements, D. H. & Sarama, J. (2007). *Early childhood mathematics learning*. Retrieved from https://www.researchgate.net

Clements, D. H., Sarama, J., Spitler, M. E., Lange, A. A. & Wolfe, C. B. (2011). Mathematics Learned by Young Children in an Intervention Based on Learning Trajectories: A Large-Scale Cluster Randomized

Trial. *Journal for Research in Mathematics Education, 42* (2), 127-166. Retrieved from https://www.jstor.org/stable/10.5951/jresematheduc

Conway, P. F. & Sloane, F. C. (2005). *International trends in post-primary mathematics education: Perspectives on learning, teaching and assessment*. Dublin, Ireland: National Council for Curriculum and Assessment.

Costello, A.B., & Osborne, J.W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research and Evaluation, 10* (7), 1-9. DOI: 10.7275/JYJ1-4868

Cowan, R., Donlan, C., Shepherd, D. L., Cole-Fletcher, R., Saxton, M. & Hurry, J. (2011). *Basic calculation proficiency and mathematics achievement in elementary school children*. Retrieved from https://www.researcghgate.net/

Crawford, A., Saul, E.W., Mathews, S.R. & Makinster, J. (2005). *Teaching and learning strategies for the thinking classroom* [e-book]. Retrieved from www.pdfdrive.net

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). London, United Kingdom: Sage.

Creswell, J. W. (2012). *Educational research: Planning , conducting and evaluating quantitative and qualitative research* (4th ed.). London, United Kingdom: Sage.

Creswell, J. W. , Klassen, A. C., Plano Clark, V. L. & Smith, K. C. (2011). *Best Practices for mixed methods research in the health sciences*. Retrieved from https://www2.jabson.hawaii.edu

Crouch, L., & Montoya, S. (2017, January 12). Measuring functional literacy and numeracy for lifelong learning [Blog post]. Retrieved from www.globalpartnership.org

Darling-Hammond, L., & Cook-Harvey, C. M. (2018). *Educating the whole child: Improving school climate to support student success.* Retrieved from https://learningpolicyinstitute.org/product/educating-whole-child

De Boer, H., Timmermans, A. C. & van der Werf, M. P. C. (2018). The effects of teacher expectation interventions on teachers' expectations and student achievement: narrative review and meta-analysis, *Educational Research and Evaluation*, *24*(3-5), 180-200. DOI: 10.1080/13803611.2018.1550834.

Dee, T. S. (2005). A teacher like me: Does race, ethnicity, or gender matter? *The American Economic Review, 95*(2), 158-165. Retrieved from https://www.jstor.org/stable/4132809

Denhere, C., Chinyoka, K. & Mambeu, J. (2013). *Vygotsky's zone of proximal development theory.* DOI: 10.15580/GJSS.2013.7.052213632

Dhuey, E. (2016*). Age at school entry: how old is old enough?* Retrieved from pdfs.semanticscholar.org doi: 10.15185/izawol.247

Diamond, J. B., Randolph, A. & Spillane, J. P. (2004). Teachers' expectations and sense of responsibility for student learning: The importance of race, class, and organizational habitus. *Anthropology & Education Quarterly*, 35(1), 75–98. doi:10.1525/aeq.2004.35.1.75

DiDomenico, J. (2017). Effective integration of music in the elementary school classroom. *Inquiry in Education, 9* (2), 1 -17. Retrieved from: https://digitalcommons.nl.edu/ie/vol9/iss2/4

Dinc, A. P. (2015). Preschool children's skills in solving mathematical word problems. *Educational Research and Reviews, 10* (18), 2539 -2549. DOI: 10.5897/ERR2015.2431

Domazet, M., Baranovic, B., & Matic, J. (20150. *Mathematics competence and international mathematics testing: Croatioan starting point*. DOI: 10.5673/sip.51.1.6

Domitrovich, C. E., Gest, S. D., Gill, S., Bierman, K. L., Welsh, J. A. & Jones, D. (2009). Fostering high-quality teaching with an enriched curriculum and professional development support: The Head Start REDI Program. *American Educational Research Journal*, 46 (20), 567 – 597. Retrieved from www.ncbi.nlm.nih.gov

Donald, B. (2011). *Mathematics in the early years: How can we provide effective support to develop children's concepts for learning in mathematics in partnership with their parents?* Unpublished research report, University of North Carolina, USA. Retrieved from http://workforcesolutions.sssc.uk.com

DoodleMaths Team. (2016, June 9). More on rote learning vs mathematical reasoning vs problem solving [Blog post].Retrieved from http://doodlemaths.com

Dooley, T. (2011). Telling matters in mathematics teaching and learning. In T. Dooley, D. Corcoran & M. Ryan (Eds.), *Mathematics teaching matters*. Fourth Conference proceedings on research in mathematics education (pp.19-38). Dublin, Ireland.

Dunphy, E. (2011). Rethinking approaches to the learning and teaching of mathematics for 3 – 6 year-old children in early education settings in Ireland. In T. Dooley, D. Corcoran & M. Ryan (Eds.), *Mathematics teaching matters*. Fourth Conference proceedings on Research in mathematics education (pp.143-154). Dublin, Ireland.

Early Education. (2012). *Development matters in the early years foundation stage (EYFS).* Retrieved from http://www.foundationyears.org.uk/files/2012/03/Development-Matters-FINAL-Print-AMENDED.pdf

Early Years. (2018). *Maths through play*. Retrieved from http://www.cheetam.manchester.sch.uk/wp-content/uploads/2018/04

Echazzara, A. & Radinger, T. (2019). *Learning in rural schools: Insights from PISA, TALIS and the literature.* Retrieved from https://www.oecd.org/edu/workingpapers

Education Policy and Data Centre. (2014). *Education policy and data centre national education profile 2014 update: Uganda*. Author. Retrieved from https://www.epdc.org

Education Review Office. (2016). *A guide to children's early mathematics learning*. Retrieved from https://www.ero.govt.nz/publications

Estrella, E. (2018, April 9). *Exciting and innovative lesson plans that pair music and math*. Retrieved from https://www.liveabout.com

Fatima, R. (2015). *Role of mathematics in the development of society*. Retrieved from www.ncert.nic.in.pdf_files

Field, A. (2009). *Discovering Statistics using SPSS*. Sage: London. Retrieved from https://books.google.com

Fink, A. (2010). Survey research methods. *International Encyclopaedia of Education, 3*(2010), 152 -160. DOI: 10.1016/B978-0.08-0448947.00296-7

Fisher, D. (2009). The use of instructional time in the typical high school classroom. *The Educational Forum*, *73*(2), 168-176. DOI: 10.1080/00131720902739650.

Fleer, M. & Raban, B. (2015). *Early childhood literacy and numeracy: Building good practice.* Retrieved from http://www.dss.gov.au/sites/default/files/documents/05-2015/edf13-0077_ec_literacy_and_numeracy_building_good_practice_resources_booklet_acc.pdf

Flores, A.H. (2010). Learning Mathematics, doing mathematics: A learner centered teaching model. *Educ. Matem. Peoq, Sao Paulo*, *12* (1), 75-87. Retrieved from https://revistas.pucsp.br

Frye, D., Baroody, A. J., Burchinal, M., Carver, S. M., Jordan, N. C. & McDowell, J. (2013). *Teaching math to young children: A practice guide (NCEE 2011-4005).* Washington, DC: National Center for Education Evaluation and Regional Assistance. Retrieved from http://whatworks.ed.gov

Gahagan, K. (2009). *Teaching Math not a Simple Equation*. Retrieved from http://www.rapidcityjournal.com/news/article-06f820b2-dla4-11de-ad2f-001cc4c03286.html.

Garrett, T. (2008). Student-centered and teacher-centered classroom management: A case study of three elementary teachers. *Journal of Classroom Interaction, 43* (1), 34-47. Retrieved from https://files.eric.ed.gov

Gatens, B. (2020 April, 13). How Teachers Should Manage Expectations of Students, Parents and Communities [Blog post]. Retrieved from https://sharetolearn.com

Gee, J. (2012, January 20). *Importance of prior knowledge to learning*. Retrieved from https://illinoisstate.edu

Gentrup, S., Lorenz, G., Kristen, C. & Kogan, I. (2020). Self-fulfilling prophecies in the classroom: Teacher expectations, teacher feedback and student achievement. *Learning and Instruction, (2020)*66, 1-17. https://doi.org/10.1016/j.learninstruc.2019.1012969

Gervasoni, A. (2016). Longitudinal progress of Australian six-year-old students who participated in a mathematics intervention program. In Lindenskov, L. (Ed.)*, Special needs in mathematics education (15 – 34)*. Aarhus University: Denmark. Retrieved from https://research.monash.edu

Gifford, S. (2016). *Mathematical problem solving in the early years: Developing opportunities, strategies and confidence*. Retrieved from https://nrich.maths.org/12166

Giganti , P.(2013). How to teach your children to do mental math. *ComMuniCator, 37* (3), 1-3. Retrieved from https://www.lexingtonma.org

Gillian, D., Karachiwalla, N., Kasirye, I., Lucas, A. & Neal, D. (2018). *Educator incentives and educational triage in rural primary schools (S-89237-UGA-1).* Retrieved from www.theigc.org http://dx.doi.org/10.1016/j.lindif.2016.07.014

Ginty A.T. (2013) Construct Validity. In: Gellman M.D., Turner J.R. (eds) Encyclopaedia of Behavioral Medicine. Springer, New York, NY. https://doi.org/10.1007/978-1-4419-1005-9_861

Goldsmith, J. (2009). Pacing and time allocation at the micro- and meso-level within the class hour: Why pacing is important, how to study it, and what it implies for individual lesson planning. *Bellaterra: Journal of Teaching & Learning Language & Literature, 1*(1), 30-48. Retrieved from https://www.researchgate.net/publication/47446874

Gonser, S. (2018). *How to boost maths skills in the early grades*. Retrieved from www.hetchingerreport.org

Goos, M. (2004). Learning Mathematics in a Classroom Community of Inquiry. *Journal for Research in Mathematics Education, 35* (4), 258-291. Retrieved from http://www.jstor.org/stable/30034810

Gordon, R. (2006). Managing group work. In Arthur, J., Grainger, T., & Wray, D.(Eds.), *Learning to teaching in the primary school* (pp. 118-135). [e-book]. Retrieved from www.pdfdrive.net

Grogan, L. (2008). Universal Primary Education and School Entry in Uganda. *Journal of African Economies, 18*(2), 183–211. doi:10.1093/jae/ejn015

Grouws, D. A., Tarr, J. E., Sears, R., & Ross, D. J. (2010). *Mathematics teachers' use of instructional time and relationships to textbook content organization and class period format.* Retrieved from https://www.semanticsscholar.org

Guloba M, M., Wokadala, J. & Bategeka, L. (2010). *Does teaching methods and availability of teaching resources influence pupils' performance: evidence from four districts in Uganda?* Retrieved from https://www.researchgate.net

Gulteke, M.,Tomul, E. & Korur,F. (2013). *Mathematics special content competences of elementary school teachers*. http://dx. doi.org/10.4236/ce2013.412A2001

Hailikari, T., Katajavuori, N. & Lindblom-Y, S. (2008). The relevance of prior knowledge in learning and instructional design. *American Journal of Pharmaceutical Education 2008, 72* (5), 1 – 8. DOI: 10.5688/aj7205113.

Halcom, E.J. & Hickman, L. (2015). Mixed methods research. *Nursing Standard: Promoting Excellence in Nursing Care, 29* (32), 41 – 47. Retrieved from https://ro.uow.edu.au

Hansson, S. O. (2019). Technology and mathematics. *Philosophy & Technology (2020) 33,* 117 – 139. https://doi.org/10.1007/s13347-019-00348-9.

Hassinger-Das, B., Zosh, J. M, Hirsh-Pasek, K. & Golinkoff, R. M. (2018). Playing to Learn Mathematics. In: Tremblay RE, Boivin M, Peters RDeV, eds. Pyle A, topic ed. *Encyclopedia on Early Development* [online]. http://www.child-encyclopedia.com/play-based-learning/according-experts/playing-learn-mathematics.

Hattie, J. & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 2007* (77), 81- 112.doi: 10.3102/003465430298487.

Heale, R. & Twycross, A. (2015). Validity and reliability in quantitative studies. *Evidence Based Nursing, 18*(3), 66-67. DOI: 10.1136/eb-2015-102129

Hinnant, J. B., O'Brien, M., Ghazarian, S. R. (2009). The longitudinal relations of teacher expectations to achievement in the early school years. *Journal of Educational Psychology*, 101(3), 662–670. doi:10.1037/a0014306

Huebener, M., Kuger, S. & Marcus, J. (2016). *Increased instruction hours and the widening gap in student performance.* Retrieved from http://www.diw.de/discussionpapers

Hughes, J. N., Gleason, K. A., & Zhang, D. (2005). Relationship influences on teachers' perceptions of academic competence in academically at-risk minority and majority first grade students. *Journal of School Psychology*, 43, 303–320. doi:10.1016/j.jsp.2005.07.001

Igbo, J. N. & Omeje, J. C. (2014). *Perceived efficacy of teacher-made instructional materials in promoting learning among mathematics-*

disabled children. DOI: 10.1177/2158244014538431 Retrieved from www. sgo.sagepub.com

Ipatenco, S. (2017). *How to teach children to write numbers*. Retrieved from https://sciencing.com

Iyanda, T. (2017). *Importance of mathematics in national development*. Retrieved from www.afripaf.com

Jez, S. J. A. & Wassmer, R. W. (2011). *The Impact of Learning Time on Academic Achievement.* Retrieved from http:// creativecommons.org

Johns, E., Beverly, H. Crowley, P. & Guetzloe, E. (2008). Engaged time in the classroom. *Focus on Exceptional Children, 41* (4),1. Retrieved from https://eric,ed.gov

Johnson, A. (2017). How I combined music and mathematics in my elementary classroom [Blog post]. Retrieved from https://study.com/blog

Johnson, D. M. & Shoulders, C. W. (2019).Beyond magic words and symbols: Rethinking common practices in quantitative research. *Journal of Agricultural Education*, 60(3), 291 – 303. https://doi.org/10.5032/jae.2019.03291

Johnson, D.W. & Johnson, R.T. (2005). New developments in social interdependence theory. [Monograph], *Genetic, social and general psychology*, 131 (4), 285-358. DOI: 10.3200/MONO.131.4.285-358. Retrieved from https://www.semanticscholar.org

Johnston, O., Wildy, H. & Shand, J. (2019). A decade of teacher expectations research 2008–2018: Historical foundations, new developments, and future pathways. *Australian Journal of Education, 63*(1) 44–73. https://doi.org/10.1177/0004944118824420

Jones, A.M. (2012). *Mathematics teacher time allocation* (Master's thesis, Brigham Young University, Utah, USA). Retrieved from https://scholarsarchive.byu.edu/etd

Jones, C. A. (2005). *Assessment for learning*. Retrieved from www.LSDA.org.uk

Jussim, L., & Harber, K. D. (2005). Teacher expectations and self-fulfilling prophecies: Knowns and unknowns, resolved and unresolved controversies. *Personality and Social Psychology Review, 9*, 131–155. DOI: 10.1207/s15327957pspr0902_3

Kan, S. & Klasen, S. (2020). Evaluating universal primary education in Uganda: school fees abolition and educational outcomes. *Review of Development Economics, 25*(1), 116-147. https://doi.org/10.1111/rode.12725

Kaplan, L. S. & Owings, W. A. (2013). *Culture re-boot: Teacher expectations* [Excerpt]. Retrieved from https://www.academia.edu

Kaushik, V. & Walsh, C. A. (2019). *Pragmatism as a research paradigm and its implications for social work research.* Retrieved from https://www.mdpi.com

Kenny, M. (2014). Informed policy-making: *The contribution of comparative research in education.* Retrieved from http://www.nuim.ie

Killian, S. (2016). *Top 10 evidence-based teaching strategies*. Retrieved from https://www.unl.edu/

Kimbowa, J. (2015, January 18). *PLE: How newest districts stumbled*. Retrieved from https://observer.ug

Kirya, D. (2010). Uganda: *Poor education blamed on child labour in Busoga*. Retrieved from www.newvision.co.ug

Klute, M., Apthorp, H., Harlacher, J., & Reale, M. (2017). *Formative assessment and elementary school student academic achievement: A review of the evidence* (REL 2017–259). Retrieved from http://ies.ed.gov/ncee/edlabs.

Kocabas, A. (2009). Using songs in mathematics instruction: Results from pilot application. *Procedia Social and Behavioral Sciences, 1* (2009), 538–543. doi:10.1016/j.sbspro.2009.01.097

Krauss, S. E. (2005). Research Paradigms and Meaning Making: A Primer. *The Qualitative Report*, *10*(4), 758-770. https://doi.org/10.46743/2160-3715/2005.1831

Krishna, P. R. (2017). Effect of Multisensory teaching strategy in learning selected Mathematical Concepts among Students with Hearing Impairment. *International Journal of Research Culture Society, 1* (x), 107 – 112. Retrieved from www.ijrcs.org

Kroll, T. & Neri, M. (2009). Designs for mixed methods research, in Andrew, S. & Halcomb, E. J. (Eds). *Mixed Methods Research for Nursing and Health Sciences,* 31 -49. https://doi.org/10.1002/9781444316490.ch3.

Kroll, T. & Neri, M. (2009). Designs for mixed methods research, in Andrew, S. & Halcomb, E. J. (Eds). *Mixed Methods Research for Nursing and Health Sciences,* 31 -49. https://doi.org/10.1002/9781444316490.ch3.

Kullberg, A., Björklund, C., Brkovic, I. & Kempe, U. R. (2020). Effects of learning addition and subtraction in preschool by making the first ten numbers and their relations visible with finger patterns. *Educational Studies in Mathematics, 103*, 157–172. DOI: 10.1007/s40841-015-0004-1

Kumar, R. (2011). *Research methodology: A step- by- step guide for beginners* (3rd ed.). [e- book]. Retrieved from www.sagepublications.com

Kwok, A. P. & Lau, A. (2015). An Exploratory Study on Using the Think-Pair-Share Cooperative Learning Strategy. *Journal of Mathematical Sciences, 2* (2015), 22-28. Retrieved from https://www.researchgate.net

Lavy, V. (2009).*The effect of instructional time on achievements in math, science and reading: Evidence from developed and developing countries*. Retrieved from https://ww.researchgate.net

Lawson, T. M., (2012). I*mpact of school feeding programs on educational, nutritional, and agricultural development goals: A systematic review of literature* (Master's Thesis), Michigan State University, DOI: 10.22004/ag.econ.142466

Leader in Me. (2018, December 6). *Learning theories: Understanding 4 major ones for the classroom*. Retrieved from www.leaderinme.org

Lee, C., Li, H. & Shahrill, M. (2018). Utilising the think-pair-share technique in the learning of probability. *International Journal on Emerging Mathematics Education (IJEME), 2* (1), 49-64 DOI: http://dx.doi.org/10.12928/ijeme.v2i1.8218

Lee, J. & Son, J. (2015). *Two teacher educators' approaches to developing preservice elementary teachers' mathematics assessment literacy:*

Intentions, outcomes and new learning. Retrieved from http://www.jstor.org/stable/10.2979/teacherlearninqu.3.1.37

Leech, N. L. (2012). Writing Mixed Research Reports. American Behavioral Scientist, 56(6), 866-881. https://doi.org/10.1177/0002764211433800

Lent, R. C. (2012). Background Knowledge: The Glue That Makes Learning Stick, *Chapter in Overcoming Textbook Fatigue e-book.* Retrieved from http://www.ascd.

Levers, M. D. (2013). *Philosophical paradigms, grounded theory and perspectives on emergence.* doi: 10.1177/2158244013517243

Levine, S. C., Suriyakhan, L. W., Rowe, M. L., Huttenlochen, J., & Gunderson, E. A. (2010). What counts in the development of young children's number knowledge? *Developmental Psychology, 46* (5), 1309 – 1319. https://doi.org/10.1037/a0019671

Luuka District Local Government. (2015). *Luuka District five year development plan II financial year 2015/2016 to 2019/2020*. Author.

Lynch, M. (2016 November 19). Social constructivism in education [Blog post]. Retrieved from https://www.theedadvocate.org

MacGregor, D. (2013). *Developing mathematical proficiency practices*. Retrieved from https://www.epsbooks.com

Mahofa, E. (2014). *Code switching in the learning of mathematics word problems in grade 10* (Master's Thesis). Cape Peninsula University of technology, South Africa. Retrieved from etd.cput.ac.za

Makuma, R., & Mukama, R. (2012, February 10). *Born to fail PLE*. Retrieved from www.independent.co.ug

Mallows, D., & Litster, J. (2016). *How can we motivate adults to engage in literacy and numeracy learning?* Retrieved from dera.ioe.ac.uk

Manjunath, D. (2008). *Mathematics Laboratory-an Alternative Method of Instruction*. Retrieved from http://www.articlesbase.com/k-12education-articles/mathematics-laboratory-an-alternative-method-of-instruction

Markusic, M. (2009). *Instructional Paradigms: Learner-Centred versus Teacher-Centred*. Retrieved from http://www.uoregon.edu/~tip/resources/newteach/c-syllabus

Martinez, F., Martinez, S. & Mizala, A. (2015). *Pre-service elementary school teachers' expectations about student performance: How their beliefs are affected by their mathematics anxiety and student' gender*. Retrieved from https://www.semanticscholar.org

Mattuvarkuzhali, C. (2012). Remedial teaching in mathematics through multisensory strategies. *IOSR Journal of Mathematics (IOSRJM), 1,* (5), 1 – 4. Retrieved from www.iosrjournals.org

Mayanja, R. (2018). *Kampala, Wakiso shine as rural schools post dismal performance*. Retrieved from http://www.pmldaily.com/categort/investigations/special-reports.

Mazarin, J. (2018). *Self-fulfilling prophecy in education: Definition, theory and examples*. Retrieved from https://study.com/academy/self-fulfilling-prophecy

McCombs, J. S., Augustine, C. H. , Schwartz, H. L. , Bodilly, S. J., Mcinnis, B., Lichter, D. S. & Cross, A. B. (2011). *Making summer count: How summer programs can boost children's learning*. [e-book]. Retrieved from http://www.jstor.org

McFadzien, N. (2015). Why is effective feedback so critical in teaching and learning? *Journal of Initial Teacher Inquiry (2015) 1*, 16 – 18. Retrieved from http://.creativecommons.org

McLennan, D. P. (2014). *Making math meaningful for young children*. Retrieved from https://www.naeyc.org/resources/pubs/tyc

Melesse, S. & Molla, S. (2018). The contribution of school culture to students' academic achievement: The case of secondary and preparatory schools of Assoza zone, Benshangul Gumuz regional state, Ethiopia. *Research in Pedagogy, 8*(2), 190 – 203. DOI: 10.17810/2015.83

Meroni, E. C. & Battistin, E. (2016). Should we increase instruction time in low achieving schools? Evidence from Southern Italy. *Economics of Education Review, 55*, 39- 96. https://doi.org/10/1016/j.econedurey.2016.08.003

Milgram, R. J. (2010). *What is mathematical proficiency*? DOI: 1017/CBO9780511755378.007

Ministry of Education and Sports. (2014). *Teacher initiative in Sub-Saharan Africa (TISSA) Uganda: Teacher issues in Uganda- A shared vision for an effective teachers' policy*. Dakar, Senegal: UNESCO. Retrieved from https://unesdoc.unesco.org

Ministry of Education and Sports . (2017). *Education Abstract 2017*. Kampala, Uganda, Author. Retrieved from www.education.go.ug

Minnoni, E., Tomei, N. & Collini, M. (2017). The value of feedback in the learning process. *Teaching and Learning Together in Higher Education*, *20 (2017),* 1 - 6. Retrieved from http://repository.brynmawr.edu/tlthe/vol1/iss20/8

Morgan, C. (2013 November 05). A few tensions in maths education [Blog post]. Retrieved from https://www.britishcouncil.org/voices-magazine

Morgan, D. L. (2013). Pragmatism as a paradigm for social research. *Qualitative Inquiry, XX* (X), 1-9. DOI: 10.1177/1077800413513733.

Mubiru, I. (2020, January 18). *Ranking: Best, Worst districts in 2019 PLE results*. Retrieved from www.watchdoguganda.com

Muñoz, J. E. & Mora, Y. F. (2006). Functions of Code-Switching: Tools for Learning and Communicating in English Classes. *HOW*, *13* (1), 31-45. Retrieved from http://www.redalyc.org

Musoke, R. (2015, January 16). UNEB releases 2014 PLE results. *The Independent*. Retrieved from https://www.independent.co.ug

Mwesigye, S. (2009, January 19). 2008 PLE results out. *The Observer*. Retrieved from https://www.observer.co.ug

Nakajima, N., Hasan, A., Jung, H., Brinkman, S. , Pradhan, M. & Kinnell, A. (2016). *Investing in school readiness: An analysis of the cost-effectiveness of early childhood education pathways in rural Indonesia*. Retrieved from http://documents1.worldbank.org

Nakato, T. (2017, July 14). *Luuka pupils abandon school to work on sugarcane plantations*. Retrieved from https://www.monitor.co.ug

Namukwaya, V. A. & Kibirige, I. (2014). Effect of government interventions on primary school pupils' enrolment and retention in Kotido District, Uganda. *Mediterranean Journal of Social Sciences, 5*(8), 354 – 363. DOI: 10.5901/mjss.2014v5n8p.354

Naroth, C. (2010). *Constructive teacher feedback for enhanced learner performance in mathematics* (Master's dissertation). University of Free State, Bloemfontein, South Africa). Retrieved from http://www.scholar.ufs.ac.za8080/xm/ui/bitstream/handle/11660/1189/NarothC.pdf

National Assessment of Performance in Education. (2015). *The achievement of primary school pupils and teachers in Uganda in numeracy and literacy in English: A summary of 2015 NAPE report*. Kampala, Uganda: Uganda National Examinations Board. Retrieved from https://uneb.ac.ug.

National Assessment of Performance in Education. (2018). *The achievement of primary school learners and teachers in Uganda in numeracy and literacy in English: NAPE 2018 report*. Kampala, Uganda: Uganda National Examinations Board. Retrieved from https://uneb.ac.ug

National Association for the Education of Young Children. (2010). *Early childhood mathematics: Promoting good beginnings*. Retrieved from www.naeyc.org

National Curriculum Development Centre. (2006). *The national primary school curriculum for Uganda: Teacher's guide primary one*. Kampala, Uganda: Author.

National Curriculum Development Centre. (2013). *Basic education curriculum framework for Uganda*. Kampala, Uganda: Author.

National Planning Authority. (2015). Access, cost, quality and relevance: The case for pre-primary and primary education in Uganda. Retrieved from http://npa.go.ug

National Planning Authority . (2018). *Comprehensive evaluation of the universal primary education (UPE) policy thematic report 2: Efficacy of the primary school curriculum in supporting the realization of UPE.* Kampala, Uganda, Author.

National Research Council. (2010). *Comparing maths education in China and the United States*. DOI: 10.17226/12874. Washington DC: The National Academies Press.

Ndiung, S. & Nendi, F. (2018). *Mathematics connection ability and students mathematics learning achievement at elementary school*. Retrieved from https://www.shs-conferences.org, https://doi.org/10.1051/shsconf/20184200009

Neal, D. (2007). *Using appropriate resources to assist in developing mathematical ideas*. Retrieved from www.aamt.edu.au

NicMhuiri, S. (2011). Look who's talking now – the role of talk in relation to mathematical thinking and problem solving. In Dooley, T., Corcoran,

D. & Ryan, M. (Eds.), *Mathematics Teaching matters*. Proceedings of the 4th Conference on Research in Mathematics Education (pp.320-332). Dublin, Ireland.

Norlin, S. (2014). The importance of feedback. *Journal of Best Teaching Practices*, *April 2014*, 11 – 12. Retrieved from http://teachingonpurpose.org/wp-content/uploads/2015/03/Norlin-S.-2014

Obaid, M. A. S. (2013). The impact of using multi-sensory approach for teaching students with learning disabilities. *Journal of International Education Research, 9* (1), 75-82. Retrieved from http://www.cluteinstitute.com

Ogan, G. C. (2015). Mathematics as a tool for achieving the Vision 2020 goal of national transformation. *International Journal of Education, Learning and Development*, *3* (8), 57- 61. Retrieved from www.eajournals.org

Ojose, B. (2008). Applying Piaget's theory of cognitive development to mathematics instruction. *The Mathematics Educator*, *18*(1), 26-30. Retrieved from https://files.eric.ed.gov

O'Leary, Z. (2007). *Research credibility (Post-Positivist*). Retrieved from https://dx.doi.org/10.4135/9780857020147.n115

Onwuegbuzie, A. J. & Collins, K. M. T. (2007) A typology of mixed methods sampling designs in social science research. *The Qualitative Report, 12*(2), 281 – 316. https://doi.org/10.46743/2160-3715/2007.1638

Onwuegbuzie, A. J. & Leech, N. (2007). *A typology of mixed methods research design*. Retrieved from https://www.springer.net

Owaja, S. A. (2007). *The influence of teacher expectations on black and white students academic achievement: A hierarchical linear modeling analysis* (Master's thesis). Western Michigan University, Michigan, USA.

Owens, S. A. (2013). We teach how we've been taught: Expeditionary learning unshackling sustainability education in U.S. public schools. *Journal of Sustainability Education*, 5. 1 – 9. Retrieved from http://www.susted.org/

Palmer, H. & van Bommel, J. (2018). Problem solving in early mathematics teaching – a way to promote creativity? *Creative Education*, *09* (12), 1775 – 1793. DOI: 10.4236/ce.2018.912129.

Papageorge, N. W., Gershenson, S., Kang, K. (2016). *Teacher expectations matter*. IZA discussion paper No. 10165. Retrieved from https://www.ftp.iza.org

Pekron, R., Cusack, A., Murayama, K., Elliot, A. J. & Thomas, K. (2014). The power of anticipated feedback: Effects on students' achievement goals and achievement emotion. *Learning and Instruction*, *29* (2014), 115 – 124. https://doi.org/10.1016/j.learninstruc.2013.09.002

Perkins, K. A. (2015). *Middle school teachers' perceptions of students' ability as predictors of high school honors course enrolment among African American youth* (Master's thesis). University of North Carolina, USA. Retrieved from https://.cdr.lib.unc.edu

Peterson, E.R., C. Rubie-Davies, C.M., Osborne, D.& Sibley, C.(2016). Teachers' explicit expectations and implicit prejudiced attitudes to educational achievement: Relations with student achievement and the ethnic achievement gap. *Learning and Instruction*, 42 (2016) 123-140. Retrieved from www.elsevier.com/locate/learninstruc

Phonapichat, P., Wongwanich, S & Sujiva, S. (2014). An analysis of elementary school students' difficulties in mathematical problem solving. *Procedia – Social and Behavioral Sciences, 116*, 3169 – 3174. https://doi.org/10.1016/j.sbspro.2014.01.728

Pipkorn, D. (2015). *What makes a mathematically proficient student*? Retrieved from https://www.uen.instructure.com

Pritchard, D. E., Lee, Y. & Bao, L. (2008). *Mathematical learning models that depend on prior knowledge and instructional strategies*. Retrieved from http://relate.mit.edu/wp-content/uploads/2012/02/cpLearningModel_Published.pdf

Qudsyi, H. (2013). *Parental Involvement and mathematical ability in elementary students*. Paper presented at the first international conference of psychology, health, educational, social and organizational settings, Surabaya, Indonesia. Retrieved from https://www.researcghgate.net/publication/296837616

Rains, J.R., Kelly, C. A. & Durham, R. L. (2008). Multi-sensory teaching techniques in elementary mathematics: Theory and practice. *Journal of Theory and Practice in Education, 4*, 239–252. Retrieved from https://www.researchgate.net

Ramirez, G., Hooper, S.Y., Kersting, N. B., Ferguson, R. & Yeager, D. (2018). *Teacher math anxiety relates to adolescent student math achievement*. Retrieved from http://journals.sagepub.com https://doi.org/10.1177/2332858418756052

Reed, K. & Andrews, N. (2016). *Fostering understanding of early numeracy development*. Retrieved from www.acer.edu.au

Riegle-Crumb, C. & Humphries, M. (2012). Exploring bias in math teachers' perceptions of students' ability by gender and race/ethnicity. *Gender and Society*, 26(2), 290–322. Retrieved from www.journals.sagepub.com

Rivikin, S. G. & Schiman, J. C. (2013). *Instruction time, classroom quality, and academic achievement.* Retrieved from www.nber.org

Roschelle, J., Feng, M., Murphy R. F., & Mason, C.A. (2016). Online Mathematics Homework Increases Student Achievement. *AERA Open, 2*, (4) 1–12. DOI: 10.1177/2332858416673968.

Ross, J. A. (2008). Explanation giving and receiving in cooperative learning groups. In Gillies, R. M., Ashman, A. & Terwel, J. (Eds.). *The teacher's role in implementing cooperative learning in the classroom* (pp. 222 – 237). New York, USA: Springer Science + Business Media, LLC.

Rubie-Davies, C. M. (2006). Teacher expectations and student self-perceptions: Exploring relationships. *Psychology in the Schools, 43(5),* 537-552. https:// doi.org/10.1002/pits.20169

Rubie-Davies, C.M. (2007). Classroom interactions: Exploring the practices of high- and low-expectation teachers. *British Journal of Educational Psychology, 77*(2), 289-306. https://doi.org/10.1348/000709906X101601

Rubie-Davies, C. M. (2010). Teacher expectations and perceptions of student attributes: Is there a relationship? *British Journal of Educational Psychology, 2010* (80), 121 – 135. DOI: 10.1348/000709909X466334

Rubie-Davies, C. M., Flint, A. & McDonald, L. G. (2011). Teacher beliefs, teacher characteristics and school contextual factors: What are the relationships? *British Journal of Educational Psychology, (2011),* 82, 1 – 19. DOI: 10.1111/j.2044-8279.2011.02025x

Rubie-Davies, C., Hattie, J. & Hamilton, R. (2006). Expecting the best for New Zealand students: Teacher expectations and academic outcomes. *British Journal of Educational Psychology (2006),* 76, 429–444. DOI: 10.1348/000709905X53589

Rubie-Davies, C. M., Peterson, E., Irving, E., Widdowson, D. & Dixon, R. (2010). Expectations of achievement: student teacher and parent perceptions. *Research in Education, 83* (1), 36-53. https://doi.org/10.7227/RIE.83.4

Rubie-Davies, C. M., Peterson, E. R., Sibley, C. G. & Rosenthal, R. (2014). A teacher expectation intervention: Modeling the practice of high expectation teachers. *Contemporary Education Psychology, 40*, 72 - 85. https://dx.doi.org/10.1016/j.cedpsych.2014.03.003

Rubie-Davies, C. M. & Rosenthal, R. (2016). Intervening in teachers' expectations: A random effects meta-analytic approach to examining the effectiveness of an intervention. *Learning and Individual Differences, 50* (2016), 83–92. https://doi.org/10.1016/j.lindif.2016.07.014

Rubie-Davies, C. M., Weinstein, R. S., Huang, F. L., Gregory, A., Cowan, P. A. & Cowan, C. P. (2014). Successive teacher expectation effects across the early school years. *Journal of Applied Developmental Psychology, 35* (2014), 181–191. http://dx.doi.org/10.1016/j.appdev.2014.03.006

Sæbø, G. I. & Midtsundstad J. H. (2018). Teachers' responsibility and expectations: Dependent on the school organisation? *Improving Schools, 21*(3), 285– 295. DOI: 10.1177/1365480218783796

Samuelsson, J. (2010). The impact of teaching approaches on students' mathematical proficiency in Sweden. *International Electronic Journal of Mathematics Education, 5* (2), 61 – 78. Retrieved from https://www.iejme.com

Sanders, L. K. (2014). *Classroom arrangement in the elementary classroom*. Retrieved from https://pdfs.semanticscholar.org

Sarnecka, B. W. & Carey, S. (2008). How counting represents number: What children must learn and when they learn it. *Cognition, 108* (2008), 662–674. doi:10.1016/j.cognition.2008.05.007

Schenke, K., Rutherford, T., Lam, A. C. & Bailey, D. H. (2016). Construct confounding among predictors of mathematics achievement. *AERA Open*, *2*, (2) 1–16. DOI: 10.1177/2332858416648930.

Schwartz, K. (2017, April 12). Why giving effective feedback is trickier than it seems [Blog post]. Retrieved from https://ww2.kqed.org/mindshift

Science Education Institute (2011). *Mathematics framework for Philippines basic education*. Manila: Philippines, Author. Retrieved from https://www.seidost.gov.ph

Sen, N. K. (2011). *Code switching in primary mathematics classrooms(* PhD dissertation). Universiti Sains Malaysia. Retrieved from www. core.ac.uk

Serio, M. (2014). *Engaging students in mathematical communication: Teaching for understanding* (Master's Thesis). University of Toronto: Canada. Retrieved from http://.creativecommons.org

Shanley, L., Clarke, B., Doabler, C. T., Kurtz-Nelson, E. & Fien, H. (2017). Early Number Skills Gains and Mathematics Achievement: Intervening to Establish Successful Early Mathematics Trajectories. *The Journal of Special Education 51*(3), 177-188. DOI: 10.1177/0022466917720455

Sharples, J., Slavin, R., Chambers, B. & Sharp, C. (2011). *Effective classroom strategies for closing the gap in educational attainment for children and young people living in poverty, including white working-class boys*. London, Great Britain: Centre for Excellence and Outcomes in Children and Young People's Services. Retrieved from www.bestevidence.org.uk

Shindler, J. (2008). *Intentionally Promoting Clear and Shared Classroom Expectations: The Cornerstone of the Effective Classroom*. Retrieved from www.calstatela.edu/faculty/jshindl/cm/index.htm

Siagian, M. V., Saragih, S. & Sinaga, B. (2019). Development of learning materials oriented on problem-based learning model to improve students' mathematical problem solving ability and metacognition ability. *International Electric Journal of Mathematics Education, 14* (2), 331 - 340. https://doi.org/10.29333/iejme/5717

Simmons, K., Carpenter, L., Crenshaw, S. & Hinton, V. M. (2015). Exploration of Classroom Seating Arrangement and Student Behavior in a Second Grade Classroom. *Georgia Educational Researcher, 12* (1), 51 – 68. Retrieved from https://digitalcommons.georgiasouthern.edu/gerjournal/vol12/iss1/3. DOI: 10.20429/ger.2015.120103

Siyepu, S. (2013). The zone of proximal development in the learning of mathematics. *South African Journal of Education, 33* (2), 1-13. Retrieved from www.sajournalofeducation.co.za. DOI: 10.15700/saje.v33n2a714

Sodeman, S. (2007). *Accessing background knowledge to build mathematical vocabulary in Mathematics, Science, and Technology Education.* Retrieved from http://fisherpub.sjfc.edu/mathcs_etd_masters/27

Spencer, P. (2013). *iPads: Improving numeracy learning in the early years*. Retrieved from www.merga.edu.au

Speybroeck, S., Kuppens, S., Damme, J. V., Petegem, P. V., Lamote, C., Boonen, T. & de Bilde, J. (2012). The role of teachers' expectations in association between children's SES and performance in kindergarten: A moderated mediation analysis. *Public Library of Science*, 2012, 7, (4), 1-36. Retrieved from https://journals.plos.org. https://doi.org/10.1371/journal.pone.0034502

Ssebwami, J. (2020, January 18). *PLE 2019 results: Best, Worst performing districts*. Retrieved from www.pmldaily.com

Ssenkabirwa, A. (2013, January 21). PLE results show improvement in performance. *The Monitor*. Retrieved from https://www.monitor.co.ug

Strauss,V. (2014). *What setting high expectations for all students really means*. Retrieved from www.washingtonpost.com

Sullivan, G. M. (2011). A primer on the validity of assessment instruments. *Journal of Graduate Medical Education, 3* (2), 119 – 120. Retrieved from https://www.ncbi.nim.nih.gov

Sunde, P. B. & Sayers, J. (2017). *Danish teachers' expectations of year one pupils' additive competence.* A paper presented at the NORMA 17 conference, May 2017. Stockholm. Retrieved from https://www.researchgate.net/publication/319357795

Svanes, I. K. & Klette, K. (2018). Teachers' instructional practices during pupils' individual seatwork in Norwegian Language arts, *Education Inquiry*, 9:3, 247-266, DOI: 10.1080/20004508.2017.1380485

Sydney, P. G. & Alibali, M.W. (2015). Making connections in math: Activating a prior knowledge analogue matters for learning. *Journal of Cognition and Development, 16*(1),160–185. DOI: 10.1080/15248372.2013.792091

Taljaard, J. (2016). A review of multi-sensory technologies in a Science, Technology, Engineering, Arts and Mathematics (STEAM) classroom. *Journal of Learning Design*, 9(2), 46 – 55. Retrieved from https://files.eric.ed.gov

Tanika, C. & Rajshri, J. (2016). *School feeding and learning achievement: evidence from India's midday meal program.* Retrieved from https://www.iza.org

Tanujaya, B. & Mumu, J. (2019). Implementation of think –pair – share to mathematics instruction. *Journal of Education and Learning (EduLearn), 13* (4), 510 – 517. DOI: 10.1159/edulearn.v13i4.14353

Taylor, H. P. (2014). *How children learn mathematics and the implications for teaching.* Retrieved from https://www.semanticsscholar.org DOI:10.4135/9781526401601.n1

Paper presented at the Hawaii International Conference on Education in Honolulu, HI on January 7, 2010.

Taylor, P.C., & Medina, M.N.D. (2013). Educational research paradigms: From positivism to multiparadigmatic. *Journal for Meaning-Centered Education, 1,* 1-16. Retrieved from http://www.meaningcentered.org/journal/volume-01/educational-research-paradigms-from-positivism-tomultiparadigmatic/

The Education Hub. (2018). *How to develop high expectations teaching*. Retrieved from www.theeducationhub.org.nz

The Practice of Learning Theories/Constructivism in Math. (2009). In Wikipedia. Retrieved from http://en.wikibooks.org/wiki/The_Practice_of_Learning_Theories/Constructivism_in_Math

ThinkingKap Learning Solutions. (2015). *The secret to instructional design*. Retrieved from www.ThinkingKaplearning.com

Thomas, L., Warren, E. A. & De Vries, E. (2011). Play-based learning and intentional teaching in early childhood contexts. *Australasian Journal of Early Childhood*, *36* (4), 69 -75. https://doi.org/10.1177/183693911103600410

Timmermans, A. C., de Boer, H. & van der Werf , M. P. C. (2016). An investigation of the relationship between teachers' expectations and teachers' perceptions of student attributes. *Social Psychology of Education* , *19*, 217–240. Retrieved from https://link.springer.com/article/10.1007/s11218-015-9326-6

Timmermans, A. C., Rubie-Davies, C. M., & Rjosk, C. (2018). Pygmalion's 50th anniversary: the state of the art in teacher expectation research. *Educational Research and Evaluation*. *24* (3-5), 91-98. DOI: 10.1080/13803611.2018.1548785.

Tint, S. S. & Nyunt, E.E. (2015). Collaborative learning with think -pair - Share technique. *Computer Applications: An International Journal (CAIJ), 2*, (1), 1 – 11. DOI: 10.5121/caij.2015.2101

Todd, J. (2019, November 7). FUN music and math lesson plan for Grades 1–6 [Blog post]. Retrieved from http://www.sadlier.com/school/sadlier-math-blog

Trang, K. T. & Hansen, D. M. (2020). The roles of teacher expectations and school composition on teacher–child relationship quality. *Journal of Teacher Education, 72*(49), 152-167. https://doi.org/10.1177/0022487120902404

Tsiplakides, I. & Keramida, A. (2010). The relationship between teacher expectations and student achievement in the teaching of English as a foreign language. *English Language Teaching, 3* (2), 22 – 26. Retrieved from www.ccsenet.org/elt

Tucker, C. (2019. August 30). Assessing Prior Knowledge: What Do Your Students Already Know? [Blog post]. Retrieved from https://catlintucker.com/2019/08/assessing-prior-knowledge

Tunner, H., Rubie-Davies, C. M. & Webber, M. (2015).Teacher expectations, ethnicity and the achievement gap. *New Zealand Journal of Educational Studies, 50* (1), 55-69.

Turner, J. C., Warzon, K. B. & Christensen, A. (2011). Motivating mathematics learning: Changes in teachers' practices and beliefs during a nine-month collaboration. *American Educational Research Journal, 48* (3), 718 – 762. https://doi.org/10.3102/0002831210385103.

Turner, R. (2010). *Exploring mathematical competencies*. Retrieved from www.acer.edu.au/conference

Uganda Bureau of Statistics. (2016). *National population and housing census 2014: Main report.* Kampala, Uganda: Author. Retrieved from www.ubos.org

Uganda Bureau of Statistics. (2017a). *Education: A means for population transformation.* Kampala: Uganda .Author. Retrieved from www.ubos.org

Uganda Bureau of Statistics. (2017b). *The national population and housing census 2014: Area specific profiles series*. Kampala, Uganda: Author. Retrieved from www.ubos.org

Uganda Bureau of Statistics. (2020). *2020 Statistical Abstract*. Kampala, Uganda: Author. Retrieved from www.ubos.org

UNESCO –UIS. (2013). *Uganda: Age distribution and school attendance of girls aged 9-13 years*. Retrieved from http://www.uis.unesco.org/Education

UNICEF. (2015). *Uganda: Quality of basic education*. Retrieved from http://www.unicef.org

University of Manchester. (2012). *Traditional teaching methods still dominant in maths classrooms*. Retrieved from https://phys.org

Uwadiae, I. (2017). *Mathematics remains indispensable to national development*. Retrieved from www. thechronicleofeducation.com

Uwezo. (2012). *Are our children learning? : Annual learning assessment report*. Retrieved from http://www.twaweza.org/go/uwezo-reports

Uwezo. (2015). *Are our children learning*? : *Five stories on the state of education in Uganda in 2015 and beyond*. Kampala, Uganda: Twaweza East Africa.

Retrieved from http://www.twaweza.org/go/uwezo-reports

Uwezo. (2016). Are our children learning? : *Uwezo Uganda sixth learning assessment report*. Kampala, Uganda: Twaweza East Africa. Retrieved from http://www.twaweza.org/go/uwezo-reports

Uwezo. (2019). Are our children learning? : *Uwezo Uganda eighth learning assessment report*. Kampala, Uganda: Twaweza East Africa. Retrieved from http://www.twaweza.org/go/uwezo-reports

Vasagar, J. (2016). *Why Singapore children are so good at maths*. Retrieved from https://www.ft.com

Van Geel, M., Keuning, T. Visscher, A. J. & Fox, J. P. (2016). Assessing the effects of a school-wide data-based decision-making intervention on student achievement growth in primary schools. *American Educational Research Journal,* 53: 2, 360-394, DOI: 10.3102/0002831216637346 Retrieved from http://aerj.aera.net

Verhulp, E. E., Stevens, G. W. J. M., Thijs, J., Pels,T. V. M. & Vollebergh,W. A. M. (2019). Ethnic differences in teacher–student relationship quality and associations with teachers’ informal help for adolescents’ internalizing problems. *Journal of Emotional and Behavioral Disorders, 27*(2), 101– 109. DOI: 10.1177/1063426618763117

Vermeulen, R. (2013). *The quality of public primary education in rural Uganda: An assessment using a capability approach* (Master's thesis). Utrecht University. Retrieved from https://educationanddevelopment.files.wordpress.com

Verschaffel, L., Torbeyns, J. & Smedt, B. (2017). *Young children's early mathematical competence: Analysis and Simulations.* Retrieved from https://hal.archives-ouvertes.fr

Vygotsky, L. S. (1978). *Mind and Society*. Cambridge: Harvard University Press

Wakiso District Local Government. (2009). *Wakiso District statistical abstracts 2008/9*. Wakiso, Uganda: Author.

Walberg, H. J. (2010). *Improving Student Learning: Action Principles for Families, Classrooms, Schools, Districts, and States*. Retrieved from www.adi.org

Wamala, R., Omala, S. K. & Jjemba, E. (2013). Academic achievement of Ugandan sixth grade students: Influence of parents' education levels. *Contemporary Issues In Education Research, 6*(1), 133-142. Retrieved from http://www.cluteinstitute.com/

Wang, S., Rubie-Davies, C. M. & Meissel, K. (2019). Instructional practices and classroom interactions of high and low expectation teachers in China. *Social Psychology of Education, 22* (2019), 841 – 886. https://doi.org/10.1007/s11218-019-09507-4

Wei, M. H., & Dzeng, H. (2014). A comparison study of math education and math performance between Asian countries and the US. *Journal of Socialomics, 3*(2), 2167-0358. DOI: 10.4172/2167-0358.1000111.

Wen, P. (2018). Application of Bruner's Learning Theory in Mathematics Studies. *Advances in Social Science, Education and Humanities Research, 283.* 234 – 237. Retrieved from http://creativecommons.org

Wickham, R. E. & Knee, C. R. (2012). Interdependence Theory and the Actor–Partner Interdependence Model: Where Theory and Method Converge. *Personality and Social Psychology Review 16*(4), 375– 393. DOI: 10.1177/1088868312447897

Widiastuti IAM (2018). *Teachers' classroom assessment and grading practices*. Retrieved from https://www.researchgate.net. DOI: 10.1051/shsconf/20184200052

Williams, A. R. (2012). *The Effect of Teachers' Expectations and Perceptions on Student Achievement in Reading for Third and Fifth Grade Students* (PhD Dissertation). University of Southern Mississippi. Retrieved from https://aquila.usm.edu/dissertations/762

Wilson, W. S. (2009). *Elementary School Mathematics Priorities*. Retrieved from www.math.jhu.edu

Windisch, H. C. (2015). *Adults with low literacy and numeracy skills: A literature review on policy intervention – OECD iLibrary*. Retrieved from https://www.oecd-ilibrary.org

Woods, D. M., Geller, L. K. & Basaraba, D. (2017). Number sense on the number line. *Intervention in School and Clinic,* · 2017, 1-8. DOI: 10.1177/1053451217712971

World Food Programme. (2019). *The impact of school feeding programmes*. Retrieved from https://www.wfp.org

Wray, D. (2006). From learning to teaching. In Arthur, J., Grainger, T., & Wray, D. (Eds.), *Learning to teach in the primary school* (pp. 57-68). [e-book]. Retrieved from www.pdfdrive.net

Yan, L. (2009). *Math teachers: What influences their teaching methods?* (Senior Theses). Trinity college, Hatford. Retrieved from http://digitalrepository.trincoll/edu/theses/34

Yeh,C. Y. C., Chang, H. N. H, Cheng, Z., Liao, C. C. Y. & Chan, T. (2019). Enhancing achievement and interest in mathematics learning through Math-Island. *Research and Practice in Technology Enhanced Learning, 14* (5), 1 – 19. https://doi.org/10/1186/s41039-019-0100-9

Yolisigira, Y. (2014, November 12). Luuka education sector in sorry state. *The Monitor*. Retrieved from www.monitor.co.ug

Young-Loveridge, J. & Mills, J. (2011). *Teachers' interactions with students learning in "equal additions" strategy: Discourse patterns*. Retrieved from https://www.merga.net.au/documents/RP_YOUNG-LOVERIDGE&MILLS_MERGA34-AAMT.pdf

Yu, X. & Khazanchi, D. (2017). *Using embedded mixed methods in studying IS phenomenon: Risks and practical remedies with an illustration*. Retrieved from https://digitalcommons.unomaha.edu/isqafacpub/70

Zhang, Y. (2014). *Educational expectations, school experiences and academic achievements: A longitudinal examination.* Retrieved from http://repository.upenn.edu/gansu_papers/22

Zhou, M. & Brown, D. (Eds). (2017). *Educational learning theories*. Retrieved from www.oer.galileo.usg.edu

Zoltan Dienes' six-stage theory (2020). *Zoltan Dienes' six-stage theory of learning mathematics*. Retrieved from https://www.zoltandienes.com

Appendix I: Questionnaire for P.1 Teachers on Their Expectations of the Learners' Competence in Mathematics

I am Kisa Sarah, a PhD in Education student, Kyambogo University. I am conducting research entitled **"Teachers' Expectations, Instructional Practices and Mathematics Competence of Primary one Learners: A Case of Busiro and Luuka North Counties, Uganda"**.

On this questionnaire you are kindly requested to give the extent to which you think P.1 learners' competence in mathematics is influenced by their background, the mathematics curriculum content and their teacher's instructional practices. The study is purely for academic purposes and rest assured that all the information given will be handed with utmost confidentiality and anonymity.

Section A: Teacher's Background Information

Please tick the box that applies to you

1.	**Gender**	Male		Female		
2.	**Age bracket in years**	18 – 27	28 – 37	38 – 47	48 – 57	58 and above
3.	**Length of teaching service in years**	1 – 5			. 6 – 10	11 and above
4.	**Highest academic qualification**	Bachelor's degree		Diploma	GIII certificate	S.4

Section B: Teacher's Expectations of Learners' Mathematics Competence

Please refer to the given scale and tick in the box for the option that best represents your expectation of a primary one learner's mathematics competence.

Strongly Disagree (SD) = 1; Disagree (D) = 2; Undecided (U) = 3; Agree (A) = 4; Strongly Agree (SA) = 5

P.1Learners'mathematics competence in relation to their background		**1 (SD)**	**2 (D)**	**3 (U)**	**4 (A)**	**5 (SA)**
5.	Learners who are 7 years and older have higher mathematics competence than those who are younger					
6.	Boys have higher mathematics competence than girls					
7.	Girls have higher mathematics competence than boys					
8.	Learners who attended nursery school have higher mathematics competence than those who did not					
9.	Learners who are taught in a local language have higher mathematics competence than those who are not					

10.	Learners who are taught in a English language have higher mathematics competence than those who are not					
11.	Learners who come from a high Social Economic Status (SES) background have higher mathematics competence than those who do not					
12.	Learners whose parents are educated to S.4 and beyond have higher mathematics competence than those whose parents are not					
13.	Majority of P.1 learners can recognize the numbers from 0 to 9					
14.	Majority of P.1 learners can count and match objects symbolizing the numbers from 0 to 9					
15.	Majority of P.1 learners can recognize the numbers from 10 to 99					
16.	Majority of P.1 learners struggle learning to count the numbers from 10 to 99					
17.	Majority of P.1 learners can add 1-digit numbers					
18.	Majority of P.1 learners can subtract 1-digit numbers					
19.	Majority of P.1 learners can add 2-digit numbers that do not require carrying					
20.	Majority of P.1 learners can subtract 2-digit numbers that do not require borrowing					
21.	Majority P.1 learners can multiply 1-digit numbers by 2					
22.	Majority of P.1 learners can multiply 1-digit numbers by 3					
23.	Majority of P.1 learners can multiply 1-digit numbers by 10					
24.	Majority of P.1 learners can apply addition to familiar social contexts					
25.	Majority of P.1 learners can apply subtraction to familiar social contexts					
26.	Majority of P.1 learners have appropriate prior mathematical					

	knowledge for the curriculum content					
27.	Majority of P.1 learners can explain their mathematical ideas to their peers					
28.	Majority of P.1 learners can explain their mathematical ideas to the teacher					
29.	Majority of P.1 learners complete written exercises within the given time					
30.	Majority of P.1 learners complete oral exercises within the given time					
31.	Majority of P.1 learners complete practical exercises within the given time					
32.	Majority of P.1 learners can use feedback from their peers to correct their mistakes					
33.	Majority of P.1 learners can use feedback from the teacher to correct their mistakes					
34.	Majority of P.1 learners can follow an example worked out by the teacher to do an exercise correctly					
35.	Majority learners benefit from drilling by the teacher					
36.	Majority learners need extra tutoring after school					

Thank you very much for your time and cooperation, may the Almighty God mightily bless you

Appendix II: Lesson Observation Tool

MATHEMATICS LESSON OBSERVATION TOOL FOR P.1 TEACHERS' INSTRUCTIONAL PRACTICES (IPs)

District…………… County ………………School Code ……………
Date…………………………Time……………………

Instructional Practice Tally (/) if IP is used, Cross (×) if not used	0 - 5th minute	5th - 10th minute	10th - 15th minute	15th - 20th minute	20th - 25th minute	25th - 30th minute	Number of times IP used	Category for IP use in lesson (0 =Never; 1 , 2 =Rarely; 3, 4 = Sometimes and 5 ,6 =Consistently)
IP1: Builds on learners' existing knowledge related to daily life activities -Asks learners open ended questions with more than one answer -Gives cues -Misconceptions dealt with immediately								
IP2: Models tasks -Works out, explains lots of examples, provides many opportunities for practice -Demonstrates practical work -Gives oral, visual, practical prompts/hints								
IP3: Allows for explanations -Re-voices, restates, clarifies, prompts for further explanation, reasoning or justification (explain-build-go beyond, more than just talk) -Learners have opportunities to connect concepts to real life -Emphasises use of correct mathematical vocabulary								
IP4: Allots sufficient time for tasks: oral, written, practical -Provides learners time to think, become patient problem solvers; -Observes to see if learners are on task -Appropriate pace of lesson -Effective transition between portions of lesson/activity								
IP5: Gives supportive feedback -timely, on-spot feedback, also learners provide feedback to each other; -indicates how to do corrections, mistakes are opportunities to learn -attends to precision, speed, accuracy (procedural skills & fluency); -effective, distributed summarising								

throughout lesson								
IP6: Drills learners -Recites information; -Dominates talking; -Does not interact with learners-is on phone, moves out to speak to colleagues								
IP7: Uses assessment for grading; -Does not check learners' work; -Only collects books for marking at end of lesson; -Calls on other learners till correct answer is given								
IP8: Other practices observed								

OBSERVATION NOTES - *overleaf*

Appendix III: **Primary One Mathematics Teachers' Interview Guide**

Date ---------------- Time----------------- School Code ----------------

Teacher's background information

Age - -- years Gender: M/F Qualification: Degree/Diploma/Cert/Other

Years in service: 1 -5; 6- 10; 11 -15; Above 16

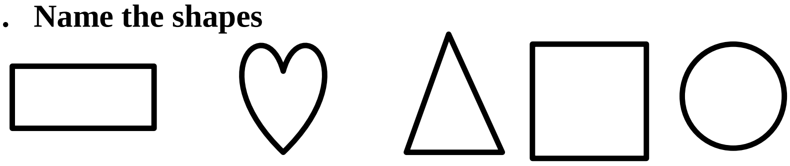
1. Do you have very high expectations for each learner's ability to succeed in maths or are there some learners who can never make it in maths?
2. Comment on your learners' mathematics competence. What proportion is: above average, average, below average?
3. What instructional practices do you use to help your learners become competent in mathematics?
4. Which provisions do you have in place to meet the individual needs of each of your learners?
5. How do you encourage learners to apply mathematics to their everyday life?
6. How do you pace mathematics lessons? –according to fast, average or slow learners?
7. What forms of feedback do you give to the learners?
8. Do you allow learners to explain mathematics to each other and to you?

Appendix IV: Assessment Test for Mathematics Competence of Primary One Learners

School---

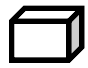
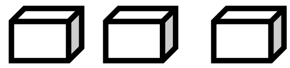
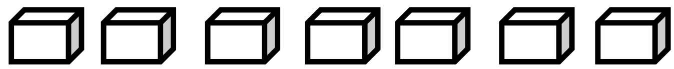
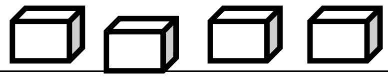
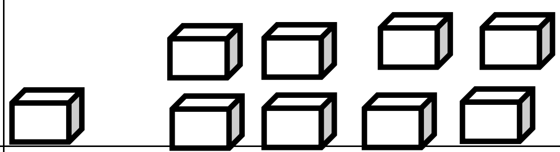
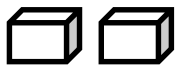
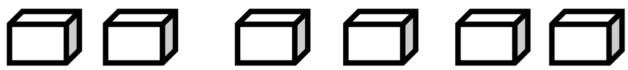
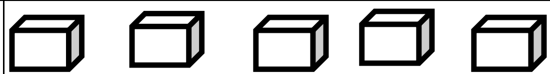
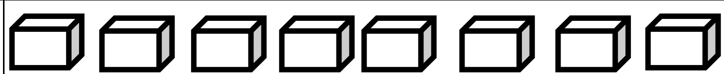
Age -------------- years (5, 6, 7, 8, 9, 10) I am a --------------- (girl, boy)

1. Name the shapes



(Oval, Square, Circle, Rectangle, Star, Heart, Triangle, Zig zag, Cone)

2. Count and Match (Write the number)

2	
4	
6	
7	
3	
8	
1	
9	
0	
5	

3. Find the sum

3 + 4 =

0 + 2 =

5 + 5 =

4. Take Away

8 - 3 =

9 - 5 =

4 - 4 =

5. Find the sum

$$\begin{array}{r} 35 \\ \underline{+\ 4} \\ \text{-----------} \end{array} \qquad \begin{array}{r} 75 \\ \underline{+21} \\ \text{----------} \end{array}$$

6. Fill in the number words

Six, --------------------, eight, -----------------

Three, four, ------------------, six

Eight, nine, -------------------, eleven

Zero, ------------------, two, ------------------, four

7. Circle the big number

2, 6   7, 12   20, 10   18, 28   33, 30

8. Read and write the answers

Peter has 8 mangoes. Fatuma has 3 mangoes.
Who has more mangoes? ---------------------------

Who has less mangoes? ----------------------------

How many mangoes do Peter and Fatuma have altogether? --------

9. Multiply

1 × 10 = -----------   3 × 3 = --------   6 × 2 = ---

Appendix V: Gulu University Research Ethics Committee (GUREC) Approval Notice

GULU UNIVERSITY

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RESEARCH ETHICS COMMITTEE

December 02, 2019

APPROVAL NOTICE

Ms Sarah Kisa,
Kyambogo University
Uganda

Re: Application No. GUREC-104-19

Type of review:
[X] Initial review
[ ] Amendment
[ ] Continuing review
[ ] Termination of study
[ ] SAEs
[ ] Other, Specify:______________

Title of Proposal: **"Teachers' Expectations, Instructional Practices and Mathematics Competence of Primary One Learners: Comparative Study of Busiro and Luuka North Counties, Uganda"**

I am pleased to inform you that at the 57th convened meeting on 17th October 2019, the Gulu University Research Ethics Committee (**GUREC**) voted to approve the above referenced application.

Approval of the research is for the period of **17th October 2019 to 16th October 2020**

As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.

2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the **GUREC** for re-review and approval prior to the activation of the changes. The **GUREC** application number assigned to the research should be cited in any correspondence.

GULU UNIVERSITY
INSTITUTIONAL REVIEW COMMITTEE
APPROVED
02 DEC 2019
FACULTY OF MEDICINE

3. Any unanticipated problems involving risks to participants must be promptly reported to the **GUREC**. New information that becomes available which could change the risk: benefit ratio must be submitted promptly for the **GUREC** review.

4. Only approved and stamped consent forms are to be used in the enrollment of participants. All consent forms signed by participants and/or witnesses should be retained on file. The **GUREC** may conduct audits of all study records, and consent documentation may be part of such audits.

5. Regulations require review of an approved study not less than once per 12-month period. Therefore, a continuing review application must be submitted to the **GUREC** eight (**8**) weeks prior to the above expiration **date of 16th October 2020** in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely manner may result in suspension or termination of the study, at which point new participants may not be enrolled and currently enrolled participants must be taken off the study.

6. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

The following documents have been approved in this application by the **GUREC:**

	Document	**Language**	**Version**	**Version Date**
1	Protocol	English	Version 3.0	18th November 2019
2	Data Collection Tools	English	Version 3.0	18th November 2019
3	Informed ~~consent~~ Document	English	Version 3.0	18th November 2019

GULU UNIVERSITY
INSTITUTIONAL REVIEW COMMITTEE
APPROVED
02 DEC 2019
FACULTY OF MEDICINE
P. O. Box 166, Gulu

Signed,

Dr. Gerald Obai
Chairperson
Gulu University Research Ethics Committee

Appendix VI: Uganda National Council for Science and Technology (UNCST) Research Approval

Uganda National Council for Science and Technology

(Established by Act of Parliament of the Republic of Uganda)

UNCST

Our Ref: SS 5199 **25th February 2020**

Ms. Sarah Kisa
Principal Investigator
Kyambogo University
Kampala

Dear Ms. Kisa,

Re: Research Approval: Teachers' Expectations, Instructional Practices and Mathematics Competence of Primary One Learners: Comparative Study of Busiro and Luuka North Counties, Uganda

I am pleased to inform you that on **11/02/2020**, the Uganda National Council for Science and Technology (UNCST) approved the above referenced research project. The Approval of the research project is for the period of **11/02/2020** to **11/02/2023.**

Your research registration number with the UNCST is **SS 5199.** Please, cite this number in all your future correspondences with UNCST in respect of the above research project. As the Principal Investigator of the research project, you are responsible for fulfilling the following requirements of approval:

1. Keeping all co-investigators informed of the status of the research.
2. Submitting all changes, amendments, and addenda to the research protocol or the consent form (where applicable) to the designated Research Ethics Committee (REC) or Lead Agency for re-review and approval **prior** to the activation of the changes. UNCST must be notified of the approved changes within five working days.
3. For clinical trials, all serious adverse events must be reported promptly to the designated local REC for review with copies to the National Drug Authority and a notification to the UNCST.
4. Unanticipated problems involving risks to research participants or other must be reported promptly to the UNCST. New information that becomes available which could change the risk/benefit ratio must be submitted promptly for UNCST notification after review by the REC.

LOCATION/CORRESPONDENCE
Plot 6 Kimera Road, Ntinda

COMMUNICATION
TEL: (256) 414 705500

Uganda National Council for Science and Technology

(Established by Act of Parliament of the Republic of Uganda)

UNCST

5. Only approved study procedures are to be implemented. The UNCST may conduct impromptu audits of all study records.
6. An annual progress report and approval letter of continuation from the REC must be submitted electronically to UNCST. Failure to do so may result in termination of the research project.

Please note that this approval includes all study related tools submitted as part of the application as shown below:

No.	Document Title	Language	Version Number	Version Date
1.	Research proposal	English	N/A	November 2019
2.	Questionnaire for P.1 teachers on their expectations of the learners' Mathematics competence	English	3.0	November 2019
3.	Lesson observation tool	English	3.0	November 2019
4.	Primary one Mathematics teachers' interview guide	English	3.0	November 2019
5.	Assessment test for Mathematics competence of primary one learners	English	3.0	November 2019
6.	Record sheet for P.1 learners' Mathematics competence	English	3.0	November 2019
7.	Informed consent documents	English	3.0	November 2019
8.	Assent form for primary one learners	English	3.0	November 2019

ISAAC MAKHUWA

For: Executive Secretary

UGANDA NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Copied: Chair, Gulu University, Research Ethics Committee