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TEACHERS' ASSESSMENT OF EARLY GRADE NUMERACY IN THE EFFUTU MUNICIPALITY

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DECLARATION

Student's Declaration

I, Bithiah Saba Adzifome, declare that this thesis, with the exception of quotations and references contained in published works which have been identified and duly acknowledged, is entirely my own work, and it has not been submitted either in part or whole for another degree elsewhere.

Signature……..... **Date**……

Supervisors' Declaration

We hereby declare that the preparation and presentation of this study was supervised in accordance with the guidelines for supervision of Thesis as laid down by the University of Education, Winneba.

Supervisor: ……

Signature…….. Date……..

DEDICATION

To work is dedicated to my lovely family.

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I owe allegiance to God the Almighty for the source of strength and wisdom given me in the preparation of this work. I duly render to Him from the depth of my heart all praises and thanks.

I acknowledge with appreciation, the unflagging effort of my supervisor for the patience and time she had in examining and making valuable suggestions and corrections which made this work to meet the required standard.

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ABSTRACT

The study sought to find out teachers' assessment of early grade numeracy in the Effutu Municipality of the Central Region. It is rooted on the sociocultural constructivist theory. The research design for the study was embedded mixed method. The target population was 100 early grade teachers from public basic schools in the Effutu Municipality. Out of this number, sixty (60) early grade teachers from public basic school in the Effutu Municipality were sampled for the study. Questionnaire and observation checklist were used to collect data to answer the research questions. Frequencies, percentages, means, standard deviation were used to analyze the quantitative data and the qualitative data were reported based on observed indicators. The findings revealed that teachers have positive perception about assessment of early grade numeracy. Test, class exercises and homework as assessment techniques for assessing early grade numeracy were most often used. Also, most teachers provided enough tasks for pupils and also assessed pupils frequently. Based on the findings, it was recommended that teachers should as a matter of urgency, shift from the traditional test, class exercise and homework as the sole means of assessing early grade numeracy. Furthermore, teacher should assess pupils in groups, assessment tasks should elicit the conceptual understanding of pupils. They should use multiple assessment techniques to assess and assessment should cater for individual differences in the classroom.

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

Education is perceived across the world as perhaps the most vital public service of all. As Asare (2011) succinctly puts it, "A sound education structure leads to an enlightened society and manpower development, which is able to lead a crusade for social transformation and economic progress" (p. 43). To indicate the importance of education, Tefera (2014) also asserted that the main objective of education is to cultivate the individual capacity for problem-solving and adaptability to the environment by developing the necessary knowledge, ability and attitude. The implication of these statements is that, education is at the forefront as far as the development of a nation is concerned. This probably accounts for nations and parents worldwide investing huge sums of money and other resources into the education of its citizenry and wards respectively.

At the basic level in Ghana, mathematics aims at developing the numeracy skills of the students. It is as a result of this aim that the standards based mathematics curriculum is based on the notion that an appropriate mathematics learning results from a series of critical decisions about three inseparable linked components: content, instruction and assessment. This means that the content, instruction and assessment work in tandem to ensure the desired outcome. If one fails to work properly, then the entire system will be faulty and the aspirations of the nation in terms of mathematics will suffer. It is assessment that determines whether the aims of mathematics is been achieved or not. Invariably, assessment tells whether the content was properly taught and learnt or not.

To Tefera (2014), just as education and development never separate from each other, quality education also go in line with assessment.

Assessment is a process of collecting and evaluating information about learners and using the information to make decisions to improve their learning (NaCCA, 2019). The teacher employs assessment for learning to seek and interpret evidence which serves as timely feedback to refine their teaching strategies and improve learners' performance. Learners become actively involved in the learning process and gain confidence in what they are expected to learn.

Classroom assessment has been found to be a critical factor in promoting quality education and as such has become the pivot of various educational improvement efforts (Oduro, 2015). This is because assessment results provide information on pupils' achievement, identify learning problems, and indicate the remedial actions that need to be taken (Black, Harrison, Lee, Marshall & Wiliam, 2004). To ensure that the national aims of numeracy are achieved, the syllabus provides an assessment procedure through which what is taught and learnt can be determined and the appropriate action taken to remedy any unrealized aim. It is expected that if these procedures are followed to the latter, then it should reflect in the performance of students even in standardized examinations and the general application of mathematical ideas in the daily activities of the basic school graduate.

As to whether these procedures of assessment are being followed by teachers is an issue that needs further studies. It is worthy to note that, assessment score in itself is not enough to validate the performance of a pupil in mathematics but the assessment procedure adopted by assessor also counts. Teachers adopt several assessment practices that can positively or negatively affect the performance of pupils. These practices if

appropriate will help validate the performance of pupils in order to accurately interpret the performance of pupils.

Assessment, thus, plays a crucial role in the education system, providing valuable information about students' learning progress and informing instructional decisions. In the context of early grade numeracy, assessment is particularly important as it helps identify students' mathematical abilities and guides teachers in designing targeted interventions to support their development. Effective assessment practices in early grade numeracy are essential for ensuring that students acquire the necessary foundational skills for future mathematical success.

Early grade numeracy refers to the fundamental mathematical concepts and skills taught in the early years of formal education, typically from kindergarten to grade three. It encompasses basic number sense, counting, operations, measurement, and spatial reasoning. Proficiency in early grade numeracy sets the foundation for students' future mathematical understanding and problem-solving abilities (Estyn, 2011).

While the significance of assessing early grade numeracy is widely recognized, there are several challenges and complexities involved. According to Anderson (2013), teachers face various issues in effectively assessing early grade numeracy skills, such as selecting appropriate assessment methods, administering assessments, interpreting and analyzing assessment data, and using the results to inform instructional decisions. Additionally, teachers must consider the diverse learning needs and backgrounds of their students to ensure fair and equitable assessments.

The existing literature on early grade numeracy assessment highlights the importance of adopting a balanced assessment approach that incorporates both formative and summative assessment strategies. Formative assessment practices, such as ongoing

observations, questioning, and feedback, provide valuable insights into students' thinking processes and inform instructional adjustments in real-time. Summative assessments, such as quizzes, tests, and standardized assessments, offer a comprehensive evaluation of students' numeracy skills and provide benchmark data for comparing student performance (Gross et al., 2009).

However, there is a need for further research on teachers' assessment practices of early grade numeracy to address the existing gaps and challenges. The literature lacks a comprehensive understanding of the specific techniques, tools, and strategies employed by teachers in assessing early grade numeracy. Furthermore, the literature may not sufficiently capture the perspectives and experiences of teachers in different educational contexts and cultural settings.

By conducting a comprehensive study on the assessment of early grade numeracy, it is possible to gain insights into teachers' assessment practices, identify areas of improvement, and develop evidence-based strategies to enhance assessment effectiveness. Against this backdrop, this study investigates teachers' perceptions, techniques, practices, and challenges related to the assessment of early grade numeracy.

1.2 Statement of the Problem

Numeracy is the capacity, confidence and disposition to use mathematics in daily life (Allen et al., 2013). Children bring new mathematical understandings through engaging in problem-solving. The mathematical ideas with which young children interact must be relevant and meaningful in the context of their current lives. To achieve this milestone, assessment of early grade numeracy plays a vital role in measuring students' mathematical skills and informing instructional practices (Allen et al., 2013). It is therefore crucial for teachers to effectively assess students' numeracy abilities to

provide targeted support and promote their learning. There is therefore a direct link exists between the quality of classroom assessment practices and the level of attainment in the classroom (Dixon, 2011).

Despite the importance of early grade numeracy assessment, there is a lack of comprehensive literature on early grade teachers' assessment of numeracy. Existing studies often focus on specific aspects of assessment. Most studies researchers (Alkharusi, Aldhafri, Alnabhani, and Alkalbani, 2014; Allen, et al. 2013) have concentrated on finding out the impact of assessment on students' performance and these studies have provided educators with the requisite knowledge and skills needed to better understand the impact of classroom assessment practices on students' learning and progress.

Due to limited availability of literature on teachers' assessment of early grade numeracy, teachers' perception about assessment of early grade numeracy, the range of assessment techniques employed by teachers in assessing early grade numeracy, teachers' assessment practices in early grade numeracy and the challenges teachers encounter in assessing early grade numeracy is yet to be known in the Effutu Municipality.

Meanwhile understanding teachers' perception, instruction techniques, practices, and challenges is crucial for developing effective assessment strategies to support teachers in their assessment practices and learners outcome (Hattori & Saba, 2008; Nabie, Akayuure & Sofo 2013). For instance, teachers' perceptions, practices and challenges in assessment practices can have a direct impact on students' learning outcomes. Effective assessment practices that align with learning goals and provide constructive

feedback can enhance student motivation, engagement, and achievement (Hattie & Timperley, 2007). Conversely, poorly designed or misaligned assessments, driven by teachers' negative perceptions or external pressures, may result in limited learning gains and hinder student progress (Klenowski, 2009). Also, if teachers believe that assessment should focus on rote memorization or compliance rather than deeper understanding and critical thinking, their assessment practices may reflect those beliefs (Dixon, 2011). A research on teachers' assessment of early grade numeracy will provide insights into teachers' perception of assessment practices in early grade numeracy, shed light on alternative assessment methods, highlight the challenges faced by teachers, and propose recommendations to improve assessment practices in the Effutu Municipality.

1.3 Purpose of the Study

The purpose of the study was to find out the teachers' assessment of early grade numeracy in the Effutu Municipality of the Central Region.

1.4 Objectives of the Study

The objectives of the study were to:

1. Find out the perceptions of teachers about assessment of early grade numeracy in the Effutu Municipality.

2. Determine techniques teachers use to assess early grade numeracy in the Effutu Municipality.

3. Ascertain teachers' assessment practices of early grade numeracy in the Effutu Municipality.

4. Find out challenges teachers face in assessing early grade numeracy in the Effutu Municipality.

1.5 Research Questions

The research questions of the study were:

1. What are the perceptions of teachers about assessment of early grade numeracy in the Effutu Municipality?

2. What techniques are used by teachers to assess early grade numeracy in the Effutu Municipality?

3. What are the teachers' assessment practices of early grade numeracy in the Effutu Municipality?

4. What challenges do teachers face in assessing early grade numeracy in the Effutu Municipality?

1.6 Significance of the Study

The outcome of the study will enlighten teachers and redirect their attention on the need to effectively use the profile dimensions for numeracy as a guide in the teaching and learning process and more especially assessment procedures. Again, the outcome of the study will provide evidence to support the need for the Ghana Education Service to organize In-Service Training and workshops for early childhood mathematics teachers on proper assessment practices in numeracy. It will also provide data and information to the Ghana Education Service on the state of assessment in numeracy in the Effutu Municipality in order to prepare teachers to adequately teach and assess numeracy. The outcome of the study will also serve as a reminder to circuit supervisors to put emphasis

on what teachers do rather than relying on what teachers say they do. The outcome of the study will give the researcher more insight into the assessment practices of teachers that promote effective teaching and learning of numeracy. This will enhance the researcher's assessment practices in the classroom. Finally, the outcome of the study will add to literature which will provide valuable information for researchers who might want to undertake a study in a related topic.

1.7 Delimitations of the Study

The study was delimited to early childhood teachers in the Effutu Municipality. The study focused on investigating the assessment of early grade numeracy in public primary schools.

2.8 Limitations of the Study

One limitation of a study on teachers' assessment of early grade numeracy in the Effutu Municipality could be the potential for sample bias. Since the study is conducted in a specific geographic area, the findings may not be representative of the assessment practices of all teachers in the Central Region. The results may only reflect the assessment practices of teachers in the Effutu Municipality, and it may not be possible to generalize the findings to other areas or educational contexts.

Also, the limitation of the study could be the possibility of social desirability bias, where teachers may respond in a way they think is expected of them, rather than accurately reflecting their assessment practices. Also, the study may not be able to capture challenges teachers encounter in assessing early grade numeracy. This may impact teachers' assessment practices but may not be directly measured by the study.

1.9 Operational Definition of Terms

Numeracy: Numeracy is the ability to understand, reason with, and to apply simple numerical concepts.

Assessment: Assessment is the gathering and analysis of data in order to identify the amount to which objectives have been met so that successful decisions may be made.

Assessment of Numeracy: Numeracy assessment refers to the process of obtaining information regarding a student's knowledge of, ability to utilise, and disposition toward mathematics, and drawing inferences from that evidence for a number of reasons.

Assessment Practices: Assessment practices in teaching mathematics refer to the strategies, methods, and techniques used by educators to evaluate students' mathematical knowledge, skills, and understanding.

1.10 Organization of the Study

The study was organized in five chapters. Chapter one presents the background to the study, the statement of the problem, the purpose of the study, research objectives, research questions, and the significance of the study, delimitations of the study, limitation of the study, definition of terms and the organization of the study. Chapter two reviewed literature related to the study, theoretical framework, conceptual reviews and empirical studies. Chapter three discussed the methodology which consists of research design, settings, population of the study, sample and sampling procedure, research instrument, validity and reliability, ethical consideration, data collection procedure and data analysis procedure while Chapter four presents the results of the

data analysed in the study and the interpretation of results. The study ends with Chapter five, where the summary, conclusions and recommendations were presented.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Overview

This chapter reviews literature that relates to teachers' assessment of early grade numeracy. It captures issues including the rationales for teaching and learning numeracy, teachers' perception about assessment in mathematics and teachers' assessment practices in mathematics.

2.1 Theoretical Framework

The study is rooted on the sociocultural constructivist theory. The sociocultural constructivist view of learning and assessment borrows ideas from the cognitivist, constructivist and sociocultural theories about how children learn mathematics and can be assessed to ensure improved learning (Heritage, 2010; Shepard, 2000). Proponents of the socio-cultural constructivists postulate that many current approaches to classroom assessment have shifted from a view of assessment as a series of events that objectively measure the acquisition of knowledge toward a view of assessment as a social practice that provides continual insights and information to support student learning and influence teacher practice (Suurtamm, Koch and Arden, 2010).

From this theoretical perspective, learners are seen as actively constructing knowledge and understanding through cognitive processes (Piaget, 1954) within a social and cultural context (Greenfield, 2009 and Vygotsky, 1978); as building new knowledge on what they already know (Bransford, Brown, & Cocking, 2000); and as developing the metacognitive skills necessary to regulate their own learning (Bruner, 1985; Vygotsky,

1978). These understandings about learning and development have implications for the use of formative assessment in classroom instruction.

The work of Vygotsky (1978) forms the sociocultural aspects of this theory. This theory emphasises the importance of the social context in the construction of knowledge. To Vygotsky, students develop knowledge and understanding in a domain over time in an interactive social context under the guide of a more experienced individual like the teachers. Ash and Levitt (2003) elaborated the views of Vygotsky by arguing that learners learn best not only as individuals but in a collaborative manner with teachers in a social setting.

In this wise, teachers and students are working jointly to ensure that the learning goal is accomplished (Ash & Levitt, 2003). The role of the teachers in this direction is a mediator between the student and the learning goal, providing learning support to aid attainment of the goal (Black & Wiliam, 2009; Walqui & van Lier, 2010). This means for a given task, the child can do it independently to some extent before needing the assistance of a more experienced person to complete. This creates a gap in the child's process of learning a particular skill. This particular developmental gap between what the child can do independently and what he can do with assistance from a more competent person is what Vygotsky (1978) refers to as "zone of proximal development" (ZPD). This concept has been invoked by formative assessment theorists as useful for understanding the gap between a student's actual understanding and the student's targeted or potential learning. In this process, the teacher uses classroom assessment information to give feedback to the student and/or modify instruction so as to improve the performance of the pupils. This makes the teachers assessment in the classroom imbedded in the instructional process. This will put teacher in a position where he/she

can quickly remedy any misconception about a particular concept. It also makes assessment an interactive activity where the child can also ask questions and answer questions during the instructional process.

The sociocultural constructivist theory believes that intelligent thoughts involve metacognition or self-monitoring of learning and thinking and as such assessment should provide an opportunity for pupils to develop these metacognitive skills (Shepard, 2000). To this end, Heritage (2010) advocated for a classroom where teachers and students share responsibility for learning thereby becoming a community of learners. This theory has therefore been considered because of the role they play in ensuring effective learning and improved performance of pupils through assessment in contemporary society. As a result, the theory will provide a framework for teachers' assessment of early grade numeracy in the Effutu Municipality especially early grade numeracy.

2.2 Assessment in Early Childhood Numeracy

Early childhood is described as the time frame beginning at the age of two and a length that ends around the age of seven or eight. It is integral to keep in mind that toddlerhood from one to three years historic (Barker, 2001; Leiberman, 1993). In a similar vein, most people agree that early childhood encompasses the dynamic time from early childhood until the age of eight (Slentz, 2008). This segment is critical to the due to the fact it is an extraordinary time in the child's life. In early childhood education, assessment is an important part of teaching and learning. Early childhood assessment is defined as the process of collecting information on children from a variety of sources, organising and interpreting that data (McAfee, Leong and Bodrova, 2004; McLean, Wolery and Bailey, 2004). Early childhood assessment, according to

Bredekamp and Rosegrant (2002), is "the process of observing, recording, and otherwise documenting the work children do and how they do it, as a basis for a variety of educational decisions that affect the child" (p. 22); Bagnato and Neisworth (2001) state that "early childhood assessment is a flexible, collaborative decision-making process in which teams of parents and professionals repeatedly revise their judgments and m These definitions imply that early childhood assessment is a dynamic, continuing process that can only be effective when parents and early childhood professionals work together.

Assessment is critical to the success or failure of both teachers and students. The use of assessment to both inform and guide instruction is critical for teachers (Rahim, Venville & Chapman, 2009). When it comes to classroom assessment, the teacher is faced with a variety of tasks, decisions, and challenges. According to Hyde (2013), a teacher can identify which teaching tactics are effective and which need to be improved by using a range of assessment instruments. This means that assessment can be utilised to improve classroom practise and curriculum planning. Similarly, assessment gives learners, parents, and administrators with information about their performance (Brown & Hirschfeld, 2008). Teachers use a variety of assessment tools and methods to determine how the kid is approaching the learning targets. According to studies, the most common methods of assessing student performance in mathematics courses around the world are testing and grading (Van de Walle, 2001; Lissitz & Schafer, 2002). Tests and quizzes are the most commonly utilised assessment tools by teachers (Senk, Beckmann, & Thompson 1997); Susuwele-Banda ,2005). Teachers' test items, on the other hand, were found to be low-order thinking questions that required little reasoning. Meanwhile, Oduro (2015) claims that higher order questions have the

ability to increase students' thinking skills, leading to an improvement in their performance.

Teachers have also been observed to use both written and oral questions in order to elicit how students think mathematically. However, in a study of the literature, Oduro (2015) discovered that there are differing perspectives on how oral versus written questioning assesses students' thinking skills. While Stiggins, Frisbie, and Griswold (2007) discovered that oral and written questioning in mathematics differed in terms of the thinking skills measured. According to Chitsonga (2010), there were no variations in the cognitive skills necessary for responding oral and written questions in mathematics lessons. The same low order thinking skills were examined in both the oral and written tasks, which required recollection of factual information and participation in normal operations.

Traditional modes of assessment should be replaced by alternative types of assessment, according to Buhagiar (2007), in order to give every student with the optimal learning opportunity. The constructivism concept underpins alternative assessment. Students should develop and supply replies rather than picking or choosing them, according to Piaget and Vygotsky (Dogan, 2011). "The theoretical framework for using alternative assessment in the classroom includes considering learners as constructors of knowledge; finding authenticity in materials and activities; employing dynamic, ongoing assessment tools; and empowering students," Janisch, Liu, and Akrofi (2007) wrote in explaining the importance of using alternative assessment methods in the classroom. Individual traits of initiative, choice, vision, self-discipline, compassion, trust, and spontaneity can be cultivated in students by putting these ideals into practise" (p.221). Traditional assessments, according to Berenson and Carter

(2005), have contributed to pupils pursuing grades rather than learning. They propose that extending the system to include alternative assessments that allow students to develop conceptual connections and reflect on their understanding can refocus students on their learning goals.

2.3 Teachers' Perceptions about Assessment of Early Grade Numeracy

Teachers' perception about assessment refers to the level of understanding of, appreciation for, and judgment of assessment. The perception of teachers about the assessment of early grade numeracy is an important factor in ensuring the accuracy and validity of assessments. Several studies have explored the perceptions of teachers in different contexts about the importance and challenges of assessing early grade numeracy.

Barmby et al. (2009) asserted that teachers had a positive attitude towards the use of assessments, but that they faced several challenges in conducting accurate and valid assessments. These challenges included a lack of assessment tools and resources, a lack of training and support in assessment methods and techniques, and a lack of time to conduct assessments and analyze results. While teachers recognized the importance of numeracy assessment for improving student learning outcomes, they faced several challenges in conducting accurate and valid assessments (Akyeampong et al., 2013). Supporting Akyeampong et al., (2013), Khoza and Sikhwari (2015) found that teachers had a positive attitude towards the use of assessments, but that they faced several challenges in conducting accurate and valid assessments. A study by Lam (2019) also found that teachers were concerned about the potential negative consequences of assessment, such as increased workload and a focus on testing rather than learning. According to Susuwele-Banda, Chester and Quilter believed that studying teachers'

perceptions of assessment is important in the sense that it provides an indication of how different forms of assessment are being used or misused and what could be done to improve the situation.

Evidence exists to suggest that teachers' perceptions differ from society to society in that, perceptions tend to be consistent with the policies and cultural practices of a particular area of jurisdiction (Brown and Harris, 2009; Brown, Lake & Matters, 2009). Remesal (2011) argues that, teacher perception about assessment hinder innovation and affect pedagogical practices. It is to end that the need to investigate the perception and practices of teachers in mathematics is necessary. Pacheco (2007) investigated primary teachers' assessment perceptions in Brazil and found that, although the participants are still implementing assessment for summative purposes, they recognise the importance of formative assessment and the use of diverse instruments and procedures to assess their students. It must be noted that these two researchers used respondents from different backgrounds.

Pryor and Crossouard (2008) have also pointed out mathematics teachers perceive assessment as measurement. Measurement connotes assigning numbers to traits displayed by students. Assessment rather incorporates measurement where the assigned number informs the assessor the level of performance of the pupil and the appropriate decision to take about the performance of pupils. Morgan and Watson (2002) reported that most teachers view classroom assessment as an added requirement to their teaching job and not as a tool to improve their teaching.

In addition, Jane (2013) found that most Teachers perceive the use of assessment for learning strategies as an onerous task and added responsibility to their teaching assignment. This has serious implications for the way some teachers' perceived practice classroom assessment and how assessment is carried out in the

classroom. For this reason, it is believed that teachers' perceived practice on classroom assessment strategies are deeply rooted in their cultural, religious, sociological, and political perspectives on education (Lambert & Lines, 2000). This feature is evident in the way classroom assessment practices are carried out by most practitioners in the classroom.

Igbalajobi (1983) evaluated the educational and training needs of elementary school teachers and found that training is needed for teachers in the area of classroom assessment practices. Such training will assist teachers in evaluating the skills that are needed in order to help students achieve their stated targets. Teachers also perceive assessment as useful as it improves teaching and learning. In this view, assessment is a range of techniques, including informal teacher-based intuitive judgement of capability as well as formal assessment tools, designed to identify the manner of student learning, including impediments to learning and unexpected strengths.

Consequently, the improvement view tends to reject formal testing if it simply means more multiple-choice tests of lower order cognitive skills, such as recall or knowledge of discrete facts. It has also been argued that improvement assessment is linked to a constructivist view of teaching which is inherently concerned with the teacher's modelling of how individual pupils are thinking and understanding.

2.4 Techniques Teachers Use to assess Early Grade Numeracy

Assessing early grade numeracy involves using a variety of techniques to gather information about students' mathematical abilities and progress. When engaging in classroom assessment, the teacher is confronted with many tasks, choices, and dilemmas. Hyde (2013) posits that, using a wide variety of assessment tools allows a teacher to determine which instructional strategies are effective and which need to be

modified. The implication of this is that, assessment can be used to improve classroom practice and plan curriculum. Similarly, assessment also provides information about performance to learners, parents, and administrators (Brown and Hirschfeld, 2008). In order to determine how the child is approximating the learning targets, teachers adopt several assessment tools and method. Studies have revealed that most mathematics classrooms in the world use testing and grading most frequently to assess the performance of pupils (Rahim, Venville & Chapman, 2009; Van de Walle, 2001; Lissitz & Schafer, 2002).

Observations: Teachers frequently observe students during math activities, such as group work or problem-solving tasks. Observations allow teachers to assess students' understanding, strategies, and mathematical thinking (Clements & Sarama, 2011).

Informal Conversations: Teachers engage in informal conversations with students to assess their mathematical understanding. These conversations provide insights into students' thought processes and help identify any misconceptions or areas that require further instruction (Clarke & Clarke, 2016).

Work Samples/Portfolios: Teachers collect and review students' work samples or portfolios to assess their numeracy skills over time. Work samples can include worksheets, math journals, or completed projects, providing evidence of students' problem-solving abilities and mathematical reasoning (NCTM, 2014).

Performance-Based Tasks: Performance-based tasks require students to apply their numeracy skills in real-world contexts or authentic scenarios. These tasks assess students' ability to use math concepts and procedures in practical situations (Smith, 2006).

Written Assessments: Teachers use written assessments, such as quizzes, tests, or worksheets, to assess students' knowledge of specific mathematical concepts and

procedures. Written assessments provide a snapshot of students' understanding and help track their progress (Brookhart, 2017).

Individual Conferences: Teachers conduct one-on-one conferences with students to assess their numeracy skills and provide targeted feedback. Conferences allow teachers to address individual needs, clarify misconceptions, and provide tailored instruction (Bramlett & Wright, 2016).

Self-Assessment and Reflection: Teachers encourage students to engage in self-assessment and reflection, where students assess their own learning and set goals for improvement. This process fosters metacognition and helps students take ownership of their numeracy development (Heritage, 2010).

Meanwhile Oduro (2015) argues that it is the higher order questions that have the potential to improve pupils thinking skills with a subsequent improvement in the performance of the pupils. It has also been reported that teachers employ both written and oral questioning in their attempt to elicit how pupils think mathematically. However, in a review of literature Oduro (2015) found divergent views about how different oral questioning assesses the thinking skills of pupils from written. Chitsonga's (2010) found no differences in the thinking skills required for answering between oral items and written questions that the teachers used in mathematics lessons. Both oral and written items assessed the same low order thinking skills which requires recall of factual information and engagement in routine procedures. Dandis (2013) in a study reported that, the methods adopted by mathematics teachers to assess their pupils are either traditional and/or alternative method. The traditional method is basically centered on paper and pencil tests in which students must demonstrate their mastery of facts, skills and definitions which are the most basic and simple

mathematical knowledge. A lot of studies on the methods that mathematics teachers employ in assessing their pupils seem to suggest that most teachers using the traditional method of examination with few teachers incorporating the alternative forms of assessment (Dandis, 2013).

2.5 Teachers Assessment Practices of Early Grade Numeracy

Teachers' assessment practices in early grade numeracy play a vital role in monitoring students' mathematical development, identifying their strengths and weaknesses, and guiding instructional decisions. Hattori and Saba (2008) undertook a comparative study on the assessment practices of Ghanaian Junior High School teachers with their Japanese counterpart based on the National Council of Teachers of Mathematics (NCTM) assessment standards. Hattori and Saba (2008) also reported that, Ghanaian mathematics teachers' assessment practices do not let children to construct their own knowledge but rather are made to be passive recipients of knowledge. Also, most mathematics teachers in Ghana assess only on shallow content areas that requires little effort and less critical thinking from students. This scenario leads to rote learning where children cannot apply what they learn in new situations.

Formative assessment strategies are commonly used by teachers to gather ongoing information about students' progress and understanding (Krawec & Montague, 2019). This may include observations, questioning techniques, and classroom discussions to gauge students' mathematical thinking and provide immediate feedback. Teachers use assessment as a tool for supporting student learning. Gross et al. (2009) revealed that teachers create opportunities for students to reflect on their own progress, set goals, and take ownership of their learning. Through constructive feedback and self-assessment, students become active participants in their numeracy development.

Effective teachers employ a range of assessment techniques to gain a comprehensive understanding of students' numeracy skills (Anderson, 2013). These may include written assessments, oral presentations, hands-on activities, projects, and problem-solving tasks. By utilizing diverse assessment methods, teachers can capture different aspects of students' mathematical abilities. According Askew and brown (2003), teachers incorporate authentic and real-world tasks into assessments to make the learning relevant and meaningful for students. This can include practical applications of numeracy skills in everyday contexts, which help students see the value and purpose of their mathematical learning.

Teachers recognize the diverse needs and abilities of early grade students and adjust their assessments accordingly. They provide accommodations, modifications, and alternative assessments to ensure that all students have equal opportunities to demonstrate their numeracy skills and show progress.

As McAlpine (2002) mentioned teachers collect and analyze assessment data to gain insights into students' strengths, areas for improvement, and learning patterns. This information informs instructional decisions, allowing teachers to tailor their teaching approaches, provide targeted interventions, and track student progress over time. Teachers engage in collaborative practices and professional development opportunities to enhance their assessment practices in early grade numeracy. They participate in workshops, peer discussions, and educational networks to stay updated with the latest research and share effective assessment strategies (Oduro, 2015). Different methods of learner assessment are described by a variety of terminology. Although arbitrary, the use of these terminologies to denote dichotomous poles is useful (McAlpine, 2002).

Formative	<---------->	Summative
Informal	<---------->	Formal
Continuous	<---------->	Final
Process	<---------->	Product
Divergent	<---------->	Convergent

Formative vs. Summative Assessment

Formative assessment is intended to aid the learning process by providing feedback to the learner that may be utilised to identify strengths and weaknesses and, as a result, enhance future performance. When the results of formative assessment will be used internally by people participating in the learning process, it is the best choice (students, teachers, curriculum developers). Summative assessment is usually used to make grade decisions or judge readiness for advancement. Summative assessment occurs at the end of a learning activity and is used to evaluate a student's overall performance. Summative assessment is used to communicate students' ability to external stakeholders, such as administrators and employers, in addition to providing the basis for grade assignment (Darling-Hammond, 2006).

Informal vs. Formal Assessment

Informal assessment combines judgments with other duties, such as lecturer comments on a question's answer or preceptor feedback while doing a bedside operation. Formative feedback is frequently provided through informal assessment. As a result, it is less threatening to the learner and hence less stressful. Informal feedback, on the other hand, is prone to excessive subjectivity and bias. When students are aware

that the task, they are performing is for assessment reasons, such as a written examination, they are engaging in formal assessment. Most formal examinations are also summative in nature, which means they have a stronger motivational influence and are linked to higher stress levels. Formal assessments should be held to a higher standard of reliability and validity than informal assessments because of their importance in decision-making (McAlpine 2002).

Continuous vs. Final Assessment

Throughout a learning experience, continuous assessment takes place (intermittent is probably a more realistic term). When student and/or instructor information of progress or achievement is required to decide the next step or sequence of activities, continuous assessment is the best option (McAlpine 2002). Students and teachers benefit from continuous assessment because it gives them the information, they need to improve their teaching and learning. Continuous assessment, of course, necessitates additional work on the part of both the teacher and the student. A final (or terminal) assessment is one that occurs solely at the conclusion of a learning session. When learning can only be examined as a whole rather than in pieces, it is the most appropriate method. Final assessment is commonly used for summative decision-making. Final assessment cannot, obviously, be used for formative reasons due to its date (McAlpine 2002).

Process vs. Product Assessment

Process assessment is concerned with the stages or procedures that underpin a certain ability or task, such as the cognitive steps needed in performing a mathematical operation or the technique for testing a blood sample. Process assessment is most beneficial when a student is learning a new skill and providing formative feedback to

help them improve their performance because it gives more detailed 4 information (McAlpine 2002). The goal of product assessment is to assess the result or outcome of a procedure. Product assessment is best used to document mastery or competency in a certain skill, or for summative purposes. Product assessments are generally easier to develop than product assessments, as they simply require a specification of the finished product's attributes (McAlpine 2002).

Divergent vs. Convergent Assessment

Divergent assessments are those that allow for a variety of correct responses or solutions. Essay tests are an example. In measuring higher cognitive skills, divergent assessments are more authentic and acceptable. However, evaluating these types of assessments can take a long time, and the judgments that arise are frequently unreliable. There is just one correct response in a convergent assessment (per item). The best example is objective test items, which highlight the value of this approach in measuring knowledge. Convergent assessments are, without a doubt, easier to assess and score than divergent assessments. Unfortunately, this "easy of use" sometimes leads to widespread usage of this approach, even when it is incompatible with sound assessment practises. The Law of the Instrument Fallacy (moulding the assessment problem to fit the tool) and the Fallacy of False Quantification (the tendency to focus on what's easiest to measure) are two common assessment fallacies caused by the familiarity and ease with which convergent assessment tools can be applied (McAlpine 2002).

2.6 Challenges Teachers face in assessing Early Grade Numeracy

Assessing early grade numeracy is essential to ensure that young learners are equipped with the necessary skills and knowledge to succeed in higher levels of mathematics education. However, assessing early grade numeracy can be a challenging task for

teachers due to several factors, including limited assessment tools, time constraints, language barriers, different learning styles, and limited training. In this literature review, I will examine each of these challenges in detail and explore strategies that teachers can use to overcome them.

Limited Assessment Tools

One of the primary challenges that teachers face when assessing early grade numeracy is the limited availability of appropriate assessment tools. Many of the available assessment tools may not be suitable for young learners due to the complexity of the language and the difficulty of the tasks. According to Krawec and Montague (2019), assessment tools that are designed for older learners may not be appropriate for younger learners as they may not have the necessary language skills to understand the instructions and questions. Moreover, some assessment tools may be too challenging for young learners, leading to incorrect or incomplete responses, which can affect the accuracy of the assessment results. Akyeampong and Stephens (2018) note that assessment tools designed for the Ghanaian context may not be suitable for young learners due to the complexity of the language and the difficulty of the tasks. Moreover, some assessment tools may be too challenging for young learners, leading to incorrect or incomplete responses, which can affect the accuracy of the assessment results. To address this challenge, teachers need to have access to appropriate assessment tools that are designed specifically for young learners. Krawec and Montague (2019) suggest that teachers should use assessment tools that are age-appropriate, use simple language, and are aligned with the curriculum. Additionally, teachers should be trained in the use of appropriate assessment tools and strategies to ensure that they are administering the assessments accurately and interpreting the results correctly.

Time Constraints

Another challenge that teachers face when assessing early grade numeracy is time constraints. Teachers have limited time to administer and grade assessments, and this can be a challenge, especially when assessments need to be administered multiple times. According to Piper and Zuilkowski (2017), administering assessments takes time away from other instructional activities, which can negatively impact student learning. Additionally, grading assessments can be time-consuming, especially if teachers have a large number of students. Time can be a critical factor in the assessment of numeracy, as it can affect both the accuracy and reliability of assessment results. According to Musset et al. (2019), assessments that are too short may not provide enough information to accurately assess a student's numeracy skills, while assessments that are too long may be too burdensome for students and lead to fatigue, reducing the accuracy of responses. Additionally, time constraints can affect the ability of teachers to accurately assess students' numeracy skills. Teachers may not have enough time to administer assessments properly, or they may feel pressure to rush through assessments to complete them on time. This can lead to errors in administering assessments, such as skipping questions or failing to provide sufficient time for students to respond (McCrory, 2019).

To address these challenges, it is important for teachers to have access to appropriate assessment tools that are designed to be administered within a reasonable timeframe. Assessments should also be designed to provide enough information to accurately assess students' numeracy skills, while also being mindful of the potential burden on students. Furthermore, teachers should be given sufficient time to administer assessments properly, with appropriate training and support to ensure accurate

assessment administration (Musset et al., 2019). Piper and Zuilkowski (2017) suggest that teachers can use computer-based assessments that are automatically graded, saving them time and allowing them to focus on instructional activities. Additionally, teachers can use formative assessments, which are designed to provide ongoing feedback to students, reducing the need for summative assessments that require grading.

Language Barriers

Language barriers can affect the accuracy of assessment results, particularly if young learners are not proficient in the language of instruction. According to Wils and Ginsburg (2016), language barriers can affect the accuracy of assessment results as students may not understand the instructions or questions, leading to incorrect or incomplete responses. This can make it difficult for teachers to identify areas where their students may be struggling with numeracy skills. Similarly, Drah and Mavuso (2021) suggest that language barriers can affect the accuracy of assessment results, particularly if young learners are not proficient in the language of instruction. Students may not understand the instructions or questions, leading to incorrect or incomplete responses, which can make it difficult for teachers to identify areas where their students may be struggling with numeracy skills.

To address this challenge, teachers need to have access to appropriate assessment tools that are designed specifically for young learners in Ghana. Akyeampong and Stephens (2018) suggest that teachers should use assessment tools that are age-appropriate, use simple language, and are aligned with the Ghanaian curriculum. Additionally, teachers should be trained in the use of appropriate assessment tools and strategies to ensure that they are administering the assessments accurately and interpreting the results correctly. Teachers need to ensure that their students are proficient in the language of instruction.

This can involve providing additional language support to students who are struggling with the language or using assessment tools that are designed for students who are not proficient in the language of instruction. Additionally, teachers can use visual aids and manipulatives to help students understand mathematical concepts, reducing the reliance on language.

Different Learning Styles

Numeracy assessments can be affected by different learning styles, which refer to the various ways in which students learn and process information. Research suggests that students with different learning styles may perform differently on numeracy assessments, which can have implications for assessment accuracy and validity. For example, Williams and Crowe (2016) found that students who prefer visual learning styles tend to perform better on assessments that use visual cues or representations of numerical concepts, such as graphs and diagrams. In contrast, students who prefer auditory learning styles may struggle with these types of assessments and may perform better on assessments that use verbal instructions or explanations.

Similarly, Chiam and Ng (2018) found that students with different learning styles may require different types of assessment tasks to accurately assess their numeracy skills. For example, students who prefer hands-on learning may perform better on assessments that involve manipulatives or real-world scenarios, while students who prefer abstract or conceptual learning may perform better on assessments that involve mathematical concepts and formulas.

Young learners have different learning styles, and this can make it difficult for teachers to assess their numeracy skills accurately. According to Clements and Sarama (2017), teachers need to use a variety of assessment methods that cater to different learning styles. This can include visual aids, manipulatives, and other tools that can help students understand mathematical concepts. For example, visual aids, such as graphs and diagrams, can help visual learners understand mathematical concepts, while manipulatives, such as blocks and counters, can help kinesthetic learners understand mathematical concepts.

Teachers can use a variety of assessment strategies and tasks that are designed to be accessible to students with different learning styles. For example, assessments that use a combination of visual, auditory, and kinesthetic cues may be more effective in accurately assessing the numeracy skills of students with different learning styles. Additionally, teachers can provide targeted support and feedback to students based on their individual learning styles, to help them improve their numeracy skills (Williams & Crowe, 2016; Chiam & Ng, 2018). In general, understanding and accommodating for different learning styles can improve the accuracy and validity of numeracy assessments, and can help teachers to better support their students' learning needs.

Limited Training

The limited training of teachers can have significant effects on the assessment of numeracy, potentially leading to inaccurate or incomplete assessments. Several studies have highlighted the importance of adequate teacher training in administering and interpreting numeracy assessments. In a study by Njoroge and Orodho (2017), teachers in Kenya reported feeling ill-equipped to administer numeracy assessments due to a lack of training. This resulted in inconsistent assessment practices and inaccurate

assessment results. Similarly, a study by Koshy and Casey (2013) found that teachers in the United Kingdom who received limited training in numeracy assessment struggled to accurately assess students' numeracy skills and tended to rely on simplified assessments. These findings suggest that limited teacher training can lead to inaccurate or incomplete assessments, which can have implications for student learning outcomes and educational policy. Finally, teachers may not have the necessary training to administer and interpret numeracy assessments accurately. According to Krawec and Montague (2019), teachers need to be adequately trained to administer numeracy assessments to young learners. This can include training on the use of appropriate assessment tools, the interpretation of assessment results, and strategies for addressing the needs of students who are struggling with numeracy skills.

Moreover, teacher training programs should incorporate best practices in numeracy assessment, such as using a variety of assessment methods and incorporating student feedback in assessment design. In addition, ongoing professional development opportunities can help teachers to stay up-to-date on best practices and new developments in numeracy assessment. It is important for teachers to receive adequate training in numeracy assessment, including training in administering assessments, interpreting assessment results, and providing targeted support and feedback to students based on their assessment results.

2.7 Empirical Review

Teachers Assessment of Early Grade Numeracy

Several empirical studies have explored teachers' assessment of early grade numeracy. These studies have examined a range of factors that can affect the accuracy and validity of numeracy assessments, including teacher training, assessment tools, and

student learning styles. For instance, Awinyam (2018) conducted a study on the relationship between perceptions of mathematics teachers towards assessment and their assessment practices in the Binduri District. He conducted the study through the quantitative approach using descriptive survey research design with a sample size of 266 candidates. The findings of the research are that the study reveals the perceptions of most teachers do not conform to current thinking about assessment in mathematics as most of them do see assessment as being used to inform their teaching. They however have positive perceptions about what should assessed, how to assess and the feedback that should be given to students. They favour the traditional forms of assessment to alternative ones. They also perceived that assessment tasks for students should include both higher orders thinking skills and lower order thinking skills.

Borko et al. (2016) examined the impact of teacher training on the quality of numeracy assessments in early grades. The study found that teachers who received training in numeracy assessment were more likely to use valid and reliable assessment tools and to provide targeted feedback to students based on their assessment results. Additionally, teachers who received training were more likely to incorporate student feedback into their assessment practices, which improved the overall validity of assessments.

Another study by McLean et al. (2017) explored the use of different assessment tools for early grade numeracy. The study found that assessments that incorporated real-world scenarios and problem-solving tasks were more effective in accurately assessing students' numeracy skills than assessments that relied solely on rote memorization of mathematical formulas and concepts. The study also found that assessments that used

a combination of visual, auditory, and kinesthetic cues were more effective in accommodating different learning styles and accurately assessing the numeracy skills of a diverse student population.

Shirey and Scherer (2018) examined the effects of student learning styles on the accuracy of numeracy assessments. The study found that students with different learning styles performed differently on numeracy assessments, and that teachers who were aware of these differences were more likely to use assessment tools and strategies that accommodated different learning styles. This, in turn, improved the accuracy and validity of assessments and helped teachers to better support their students' learning needs.

Again, Loggenberg (2011), conducted a study on Assessment in Early Childhood Education in New Zealand. The study was conducted through the qualitative research approach using a sample size of 26 people randomly selected. The research data revealed mixed results regarding teacher confidence in assessment, the use of multiple assessment methods, the role of Early Childhood Education teachers in assessment, the assessment of all the necessary learning areas, the regularity of assessments, and the effectiveness of assessment methods used.

In addition, Suurtamm, Koch, and Arden (2010) examined Canadian Teachers' assessment practises in mathematics classrooms in the context of assessment reforms in Canada with the aim of highlighting the types of supports that teachers find most helpful and suggesting areas of implementation that might need more support. Their study revealed that teachers employ a number of assessment methods to enhance student learning, placing particular focus on the use of tests, homework assignments, and classroom activities to elicit students' knowledge. They said that Canadian teachers

used a variety of methods in addition to examinations, such as diaries, observation, questioning, self-assessment, and special kinds of "quizzes." They believed that assessments were ongoing processes used by teachers to understand their pupils' mathematical thinking rather than discrete events that took place during the specified teaching assignments. They claimed that evaluation activities were so tightly woven into instructional activities that it was sometimes difficult to tell them apart. In light of this, they came to the conclusion that teachers' assessment procedures were acceptable for ensuring that pupils had a thorough comprehension of mathematical topics.

Finally, Black, Harrison, Lee, Marshall, and William conducted a second study on the methods used by teachers to assess students' mathematical abilities (2004). They looked for ways to monitor and enhance students' learning via classroom evaluation. They conducted a qualitative study to investigate the assessment procedures of math and science teachers and, of course, to provide recommendations on how assessment may be utilised to enhance student learning. They discovered that many teachers do not organise and conduct classroom discourse in ways that would assist students learn through observation and interviews with teachers and students. Additionally, they stated that grades rather than comments predominate in teachers' feedback processes. They believed that using grades to evaluate student work instead of focusing on their individual strengths and flaws caused kids to compare their scores with those of other students. They claimed that this discourages students from using their evaluation findings to advance their learning because even those who receive poor grades or scores will feel disheartened. They came to the conclusion that pupils who receive feedback in the form of comments do better than those who receive grades.

Taken together, these studies suggest that teacher training, assessment tools, and an understanding of student learning styles are all important factors in the accurate assessment of early grade numeracy. Educators and policymakers should prioritize these factors in the design and implementation of numeracy assessments to ensure that assessments are valid, reliable, and effective tools for improving student learning outcomes.

CHAPTER THREE

METHODOLOGY

3.0 Overview

This chapter consists of research design, study population, the sample size and sampling procedure employed for the study. It also describes the research instruments, validity and reliability, procedures for data collection, procedure for data analyses, and ethical considerations.

3.1 Research Philosophy

Philosophical underpinning of the study falls under the pragmatism world of view. Babbie (2015) contends that, pragmatism is not committed to any one system of philosophy and reality, thus, makes it possible for researchers to draw from both quantitative and qualitative assumption. Additionally, Creswell and Creswell (2018) stated that pragmatists do not see the world as an absolute unity which is comparable to mixed method researchers looking to many approaches for collecting and analyzing data rather than subscribing to only one way. They go further to say that pragmatism brings to the forefront multiple methods, different worldviews, different assumptions as well as different forms of data collection and analysis. The combination of quantitative (survey) and qualitative methods (questionnaire and interview) which lends itself to a mixed method approach is underpinned by the pragmatic philosophical assumption about social reality.

The researcher considered the pragmatic paradigm to be relevant for this study. In its simplest terms, the pragmatic paradigm is committed to no single system of philosophy and reality. This approach to research applies to mixed methods research in that

researchers openly rely on both quantitative and qualitative premises when engaging in their research (Creswell, 2014). Pragmatism seeks to believe concepts such as truth and reality and instead focuses on what works as the truth to explore the research questions This study represents the pragmatic paradigm in that it utilizes both quantitative and qualitative methods to gather data and thus accepts the notion of non-singular facts that no single truth exists. This research is inbred to the pragmatic worldview as it is formulated around research questions with the intent of answering them in the various ways that were believed appropriate and utilized the results in various ways that could have positive consequences for the stakeholders benefiting from this research (Creswell & Creswell, 2018).

Pragmatism is also perceived as a means of bridging the gap between the empirical singular scientific approach to research and the newer "freewheeling" inquiry of qualitative research theories addressed by Amedahe and Asamoah (2018). It draws on many ideas, including the use of "what works," different approaches, and the assessment of both objective and subjective knowledge (Creswell, 2014). The pragmatism philosophy to argue that in a single study, quantitative and qualitative approaches can efficiently synchronise. The study is located in this philosophical stance as it applied different approaches in data gathering and analysis so as to achieve the purpose and objectives of the study.

3.2 Research Approach

This study adopted the mixed-method approach, that is to say, the mixture of qualitative and quantitative approaches. Mixed methods is a research design which focuses on collecting, analysing and combining quantitative and qualitative data in single research or series of researches. Its central assumption is that the interactive application of

quantitative and qualitative methods provides a better understanding of research issues than either approach alone (Creswell & Creswell, 2018).

The purpose of mixed methods research, according to Creswell (2014), is not to replace either qualitative or quantitative research, but to pull out the strengths and diminish the weaknesses in both approaches within a specific study. However, Cohen, Manion and Morrison (2018) point out that a principal challenge for mixed methods research is the clear explanation of several critical aspects such as classifying the main purposes of using a mixed design and clarifying the factors examined when determining the type of mixed design. Researchers should specify when implementing data collection, whether the mixed design is sequential or simultaneous.

The justification for mixing both types of methods and data is that neither quantitative nor qualitative method could adequately cover the scopes and depths of the "what", "how" and "why" questions about programme evaluation within themselves. When combining the two methods, quantitative and qualitative complement, each other provides a holistic and an in-depth view of the research problem, taking advantage of each one's strengths (Bryman, 2012). The mixed methods approach (both the qualitative and quantitative research approaches) was used because the quantitative approach helped to quantify the problem by way of generating numerical data or data from the field and transform them into useable statistics. Qualitative approach helped the researcher to study attitudes, opinions, behaviors and other defined variables of the population of the study. Hence, qualitative research approach would help to generate a rich understanding of a phenomenon as it exists in a real world. This is because it involves the collection of data in the actual situation or area of study.

In short, the strengths of one approach overcome the weaknesses of the other approach. Johnson and Onwuegbuzie (2004) who opined that multiple sources or methods of data

gathering increased the credibility and dependability of the data since the strengths of one source compensate for the potential weaknesses of the other confirm this. To add to the above, the study gathered data through triangulation of data collection methods. That is, the researcher used questionnaires, interview guide and observation guide form teachers as data collection instruments. This affirms what Creswell and Plano Clark (2017) posited that using multiple methods to collect data is likely to increase the credibility of the findings.

3.3 Research Design

The study employed embedded research design. The embedded design is a mixed method design in which one data set provides a supportive, secondary role in a study based primarily on the other data type (Creswell & Plano Clark, 2017). The premises of this design are that a single data set is not sufficient, that different questions need to be answered, and that each type of question requires different types of data. Researchers use this design when they need to include qualitative or quantitative data to answer a research question within a largely quantitative or qualitative study (Creswell, 2014). This design is particularly useful when a researcher needs to embed a qualitative component within a quantitative design. The design aims at collection of one type of data which is dominant, and the other is much smaller and is nested in the large, dominant set of data. In this study, qualitative data is nested in the larger quantitative data.

This study was designed as embedded mixed methods study (Creswell, 2014) in order to investigate teachers' assessment of early grade numeracy. Although the both quantitative and qualitative data were collected at the same time, the qualitative data is

embedded into the quantitative data and so the priority of the mixed method study was given to the quantitative phase.

Utilizing quantitative research questions were valuable in answering the research questions and testing hypotheses, which were developed based upon the related literature on creative pedagogic approaches. The observation data collected from teachers' classroom teaching were used in the qualitative phase in order to explain teachers' assessment practices of early grade numeracy. Using the embedded mixed method study provided a complete understanding of the teachers' assessment practices.

3.4 Study Area

The study was conducted in the Effutu Municipality of the Central Region of Ghana. Effutu Municipal District is one of the twenty-two districts in Central Region, Ghana. Originally it was formerly part of the then-larger Awutu/Effutu/Senya District in 1988, until the southwest part of the district was split off by a decree of President John Agyekum Kufuor on 29 February 2008 to create Awutu Senya District; thus the remaining part was elevated to municipal district assembly status to become Effutu Municipal District on that same year. The municipality is in the southeast part of Central Region and has Winneba as its capital town. The Effutu Municipality represents a specific geographic area with its unique characteristics, demographics, and educational context. Understanding how teachers assess early grade numeracy in this specific context can provide valuable insights into the challenges, strengths, and areas for improvement within the municipality's educational system. Conducting a study in the Effutu Municipality allows for a targeted examination of the assessment practices used by early grade teachers, which can help identify any potential disparities in early grade numeracy assessment and contribute to efforts to promote equitable education.

3.5 Population

According to Bryman (2012), population in research is the complete set of individuals (subjects), objects or events with common observable features for which a researcher is interested in studying. It is also regarded as the larger group from which individuals are selected to participate in a study. A population is also defined as a group of individuals or people with the same characteristics and in whom the researcher is interested.

3.5.1 Target Population

According to Amedahe and Asamoah (2018), the target population in research is the aggregate of cases about which the researcher would like to make generalizations. The target population was made up of 100 early grade teachers in public basic schools in the Effutu Municipality.

3.5.2 Accessible Population

Babbie (2015) assert that accessible population is the research participants who are available for participation in a given research. The Effutu Municipality has three (3) circuits. The accessible population of the study included early grade teachers who were available at the time of the study. The accessible population was eighty-seven (87) early grade teachers in the Efutu Municipality of the Central Region.

3.6 Sample and Sampling Technique

A sample can be defined as a group of relatively smaller number of people selected from a population for investigation purpose (Alvi, 2016, p.12). The sample for the study was sixty (60) early grade teachers from public basic school in the Effutu Municipality. The sample size represents % of the target population of the study. According to Orodho

(2009), a sample size of at least 10-20% or more of the target population is adequate for a study.

Bryman (2012) define sampling technique is a strategy employed in the process of selecting units from a population of interest so that we may fairly generalizes our results back to the population they were chosen. In this study, the researcher employed multiple sampling techniques which involved both the use of purposive sampling and simple random sampling techniques.

The early grade teachers were sampled using simple random sampling. Creswell and Creswell (2018) explains that simple random sample means that every case of the population has an equal probability of inclusion in sample. In this type of sampling each and every element of the population has an equal chance of being selected in the sample. According to Creswell and Plano-Clark (2017), purposive or judgmental sampling is a strategy in which particular settings, persons or events are selected deliberately in order to provide important information that cannot be obtained from other choices. The purposive sampling technique was used to sample five (5) teachers out of the early grade teachers selected for observation. In using purposive sampling technique, the researcher includes cases or participants in the sample because he/she believes that they deserve inclusion.

3.7 Instrumentation

The researcher collected primary data (both quantitative and qualitative) from the participants. The researcher used questionnaires (quantitative data technique), and observation checklist to gather data from the participants. The instruments for gathering data (Questionnaires and observation checklist) were adapted from NaCCA, GES numeracy curriculum.

3.7.1 Questionnaire

Questionnaire was used to collect data for this research. The survey questionnaire is adjudicated to be the most widely used methods of collecting data. Open-ended questions will mostly be used to help easy administration of questionnaire. The questionnaire was designed to aid the researcher answer the research questions (Creswell, 2014). It contains an arrangement of answers from which the respondent can choose. The shut finished inquiries have advantages like simple registration and information assembled from shut finished inquiries lend themselves to measurable investigation. The shut finished inquiries assisted the analysts with breaking down the data obtained without challenges utilizing a 5-point Likert scale (Creswell, 2014). Questionnaires are doubtless one of the primary sources of obtaining data in any research endeavor. However, the critical point is that when designing a questionnaire, the researcher should ensure that it is valid, reliable and unambiguous.

The questionnaire was divided into five (5) sections. Section A solicited information on the background of the respondents. Section B solicited information on teachers' perceptions about assessment of early grade numeracy. Assessment techniques of assessing early grade numeracy was solicited using items in section C. Section D solicited information on how frequently assessment techniques are used by early grade teachers and Section E solicited information on how teachers practice assessment of early grade numeracy.

3.7.2 Observation Checklist

Observation is a preplanned research tool which is carried out purposefully to serve research questions and objectives. It will be used as one of the techniques for collecting qualitative data during the study. When using this method, the researcher observes the

"classroom interactions and events, as they actually occur" (Burns, 1999, p. 80). Flick (2006, p. 219) also argues that observation "is an attempt to observe events as they naturally occur." Nation (1997, p. 276) contends that the researchers try to study the "representations of behaviour rather than the behavior itself." Observational data represent a firsthand picture of the events, is carried out in a natural field setting and enable the researcher to obtain contextual factors.

Zohrabi (2013) posits that in general terms, observation can take place through two methods: non-participant and participant. In non-participant observation, the observer only watches and records the classroom activities without any involvement. The researcher conducted non-participant observation to avoid interfering with the activities to be observed in the classroom and in order not to lose track of what to observe and record. Five lessons in all involving each of the 5 teachers and their learners were observed using an observation checklist. The researcher spent a maximum of 60 minutes in observing each lesson.

3.8 Pilot Test

The reliability and validity of the instruments were ensured by pre-testing them on 15 early grade teachers at public primary schools at Apam in the Central Region. The pilot test was conducted to find out whether the instrument would obtain the required responses and also to ensure that the instrument is devoid of ambiguity and that they were relevant to the purpose of the study. It was embarked upon to assess teachers response to the items, the clarity, appropriateness or otherwise of the items, the need to add or remove some items and the correct some mistakes that were not detected initially.

3.9 Validity and Reliability of Instruments

Validity is concerned with whether our research is believable and true and whether it is evaluating what it is supposed or purports to evaluate. It basically has to do with the appropriateness of the instruments for collecting as well as findings of the study. The principles underlying naturalistic and/or qualitative research are based on the fact that validity is a matter of trustworthiness, utility and dependability that the evaluator and the different stakeholders place into it (Babbie, 2015).

Joppe (2016) provides that validity determine whether the research truly measures that which it was intended to measure or how truthful the research results are. The questionnaire and tests were validated by the researcher's supervisor by checking the content validity. Content validity is a method of measuring or determining a consensus among experts with regards to the quality of a specific test item. Polit and Beck (2006) pointed out expert judgement is main approach to check whether a test has content validity.

Again, Joppe (2016) defines reliability as the extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable. The reliability of the questionnaire was obtained by calculating the Cronbach coefficient after the pilot test. The Cronbach Alpha for the instrument was 0.83. High alpha coefficients (above 0.7) are generally considered to indicate high internal consistency of the scores (Babbie, 2015). A Cronbach's Alpha value of 0.76 was obtained for the research questionnaire.

3.10 Data Collection Procedure

An introductory letter was obtained from the Department of Early Childhood Education introducing the researcher and the purpose of the research to the educational authorities in the Effutu Municipality. Before the administration of the questionnaire, the researcher made preliminary inquiries in the selected schools to obtain permission from head teachers and teachers to conduct the study. In each school, the selected respondents were group together and the purpose of the study was made known to them. The respondents were guided as to how to answer the questionnaire. In order not skip some of the response, respondents were encouraged to read the questionnaire before selecting the appropriate responses. Respondents were given the opportunity to ask any question that baffles them in order to complete the questionnaire. Also, time, place or venue and other relevant conditions for conducting the observation were ensured. The researcher was guided by the observation indicators on the observation checklist which allowed the researcher to record the presence or absence of a particular behavior observed.

3.11 Data Analysis Procedure

At the end of the whole data collection exercise, credible checks were carried out to edit and warrant error-free data. Thus, prior to coding and data processing, all incomplete and inconsistent questionnaires were taken out appropriately. The error-free data was then processed using Statistical Product for Service Solution (SPSS) version 20. Moreover, the quantitative data (research questions 1, 2 and 4) was analysed quantitatively using descriptive statistical tools such as percentage, frequencies, means, and standard deviations while the qualitative or observation data (research question 3) was analysed using frequency counts and percentages.

3.12 Ethical Consideration

According to Jack and Norman (2003), it is necessary in every research study to treat ethical issues with high degree of caution. As such ethical issues galvanizing the human subjects in the research was strictly adhered to. An introductory letter was obtained from the Department of Early Childhood Education. The names of teachers and schools were not included in the study. Again, the features of the questionnaires such as ease of completion and sensitivity of the questionnaires were considered. There were no biases towards any religion, race or culture. The consent of the respondents was sought before administering the test. The names of the subjects were not mentioned during the course of the data collection with anonymity and confidentiality highly assured. Also, all cited sources were fully acknowledged.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Overview

This chapter presents the results obtained and discusses the findings of the study. The results are presented, interpreted, and discussed in relation with relevant literature. The study sought to investigate teachers' assessment of early grade numeracy in the Effutu Municipality. The results are presented and analyzed in two sections; namely section A and section B. Section A deals with the analysis of the demographic data while the section B concerns the analysis of the main data.

4.1: Demographic Data of Respondents

This section shows the demographic data on the respondents' sex, age, academic qualification, professional qualification, and years of teaching experience. Tables 4.1 to 4.5 summarizes the socio-demographic data of the respondents.

Table 1: Sex of Respondents

Gender	Frequency	Percentage (%)
Male	47	78.3
Female	13	21.7
Total	**60**	**100.0**

Source: Field Data, (2022)

Table 4.1 presents results of the sex distribution of respondents. The results show that 47 (78.3%) of the respondents were female while 13 (21.7%) of them were males while 83 (83%) were females. This implies that majority of early grade teachers who participated in the study were females. This is not surprising as early childhood classrooms are dominated by female teachers.

Table 4.2: Age Distribution of Respondents

Age	Frequency	Percentage (%)
Below 20 years	0	0.0
20 -29 years	17	28.3
30 -39years	22	36.7
40-49 years	15	25.0
50-59 years	5	8.3
60 and above years	1	1.7
Total	**60**	**100.0**

Source: Field Data, (2022)

The results of the age distribution of respondents is shown in Table 4.2. The results show that none (0%) of the respondent was below 20 years, 17 (28.3%) of them were within the age range of 20-329 years and the respondents within the age range 30-39 years were 22 (36.7%). Also, 15(25%) of the respondents were within the age range 40t-49years, 5 (8.3%) of them were within the age range 50-59 years and just 1 (1.7%) was 60 and above years. This implies that majority of the teachers were between 30-39

years. Since a greater number of the respondents belong to the youthful section of the teaching profession, it is expected that they will bring their youthful exuberance to bare on their assessment practices in their classrooms. This, when done will improve the teaching and learning of numeracy in the Effutu Municipality.

Table 4.3: Academic/Professional Qualification of Respondents

Professional Qualification	**Frequency**	**Percentage (%)**
Cert 'A'	5	8.3
Diploma in Education	29	48.3
Bachelor of Education	19	31.7
M.Ed./Mphil (Education)	7	11.7
Total	**60**	**100.0**

Source: Field Data, (2022)

The result in Table 3 represents the professional qualifications of respondents. The results indicate that 5 (8.3%) of the teachers were Cert 'A' holders, 29 (48.3%) were Diploma in Education holders, 19 (31.7%) of them were Bachelor of Education holders and 7 (11.7%) were Master of Education of Master of Philosophy in Education holders. Even though all the respondents who participated in this study were professionally qualifies, the results revealed that majority of the early grade teachers were Diploma in Education holders.

Table 4.4: Years of Teaching Experience of Respondents

Years	Frequency	Percentage (%)
Less than 4 years	9	15
4-8 years	12	20
9-12 years	21	35
12-16 years	15	25
Above 16 years	3	5
Total	**60**	**100**

Source: Field Data, (2022)

Table 4.4 presents the result of years of teaching experience of the respondents. From Table, it can be seen that 9 (15%) of the respondents had less than 4 years teaching experience, 12 (20%) had 4-8 years teaching experience and 21 (35%) had 9-12 years of teaching experience. The number of respondents with 12-16 years of teaching experience stood at 15(25%) and 3 (5%) had above 16 years of teaching experience. The results imply that majority of the respondents had 8-12 years of teaching experience. This is a good news since the teaching experiences of these teachers will contribute significantly toward teachers' assessment practices in early grade classrooms in the Effutu Municipality.

4.2: Data Analysis

The analysis of data collected to achieve the study's objectives are presented in this section. These objectives are:

1. Find out the perceptions of teachers about assessment of early grade numeracy in the Effutu Municipality.

2. Determine techniques or strategies teachers use to assess early grade numeracy in the Effutu Municipality.

3. Ascertain teachers' assessment practices of early grade numeracy in the Effutu Municipality.

4. Find out challenges teachers face in assessing early grade numeracy in the Effutu Municipality.

The section presents the results and discusses the findings with relevant literature. The results are presented in accordance with the research questions in Tables 4.5, 4.6, 4.7 and 4.8.

Research Question 1: What are the perceptions of teachers about assessment of early grade numeracy in the Effutu Municipality?

This research question sought to ascertain the perceptions of teachers about assessment of early grade numeracy in the Effutu Municipality. The data was analysed using means and standard deviations with a standard/set mean of 3.0. For the purpose of analysis, strongly agree and disagree responses were combined as "agreement" and strongly

disagree and disagree were combined as "disagreement" while responses that are Neutral remains "Neutral". A mean score of 3.0 shows the uncertainty of respondents on the given item, a mean of above 3.0 indicate the agreement to the item or indicator and a mean score of 2.99 and below indicate disagreement to the given perception indicator. Also, a standard deviation of below 1.0 indicates the homogeneity (similarity) in responses while a standard deviation of 1.0 or above indicates the heterogeneity (difference) in responses. The results are presented on Table 4.5.

Table 4.5: Perception of Teachers about Assessment of Early Grade Numeracy

STATEMENT	N	D	SD
The assessment tasks should promotes metacognition	60	3.1	0.3
Assessment tasks in numeracy is focused on pupils' self-monitoring	60	3.4	0.7
Assessment tasks in numeracy is focused promoting self-directed learning among pupils.	60	3.3	1.3
Teachers' assessment tasks in numeracy should elicit pupils' problem solving skills during instruction	60	3.8	0.5
Assessment in class should focused on supporting pupils strengths and weaknesses for remediation	60	4.7	0.6
Assessment of numeracy supports pupils learning of concepts	60	4.3	0.6
Teachers' assessment of numeracy occurs at the end of instruction	60	4.1	0.4
Teachers' assessment should provide feedback to improve teaching method and approach	60	4.4	0.7
Teachers' assessment of numeracy instruction provides feedback to improve learning methods and approach	60	4.7	0.6
Mean of Means/Standard deviation		**4.0**	**0.6**

Source: Field Data, 2022

Table 4.5 shows the results of the data collected on the perception of teachers about assessment of early grade numeracy. The result revealed that majority of the respondents agreed (M = 3.1, SD = 0.3) that assessment tasks should promotes metacognition. The standard deviation of 0.3 shows that the responses were

homogeneous. Also, majority of the respondents agreed (M = 3.4, SD = 0.7) that assessment tasks in numeracy is focused on pupils' self-monitoring. The homogeneity of the responses was evident in the standard deviation of 0.7. Similarly, majority of the respondents agreed (M = 3.3, SD = 1.3) that assessment tasks in numeracy is focused promoting self-directed learning among pupils. The standard deviation of 1.3 indicates that the responses differ.

Responding to the statement, "Teachers' assessment tasks in numeracy should elicit pupils' problem solving skills during instruction", majority of the respondent agreed (M = 3.8, SD = 0.5). The responses were considered similar or homogeneous due to the standard deviation of less than 1.0 (SD = 0.5). Furthermore, majority of respondents agreed (M = 4.7, SD = 0.6) that assessment in class should focused on supporting pupils strengths and weaknesses for remediation. The homogeneity of responses was evident in the standard deviation of 0.6. The mean and standard deviation of the statement, "Assessment of numeracy supports pupils' learning of concepts" were 4.3 and 0.6 respectively. The standard deviation of 0.6 shows that the responses were similar. Similarly, majority of the respondents agreed (M = 4.1, SD = 0.4) that teachers' assessment of numeracy occurs at the end of instruction. The standard deviation of 0.4 shows that the responses were homogeneous. In addition, the respondents agreed (M = 4.4, SD = 0.7) that teachers' assessment should provide feedback to improve teaching method and approach. The homogeneity of the responses is evident in the standard deviation of 0.7. Finally, majority of the respondents agreed (M = 4.7, SD = 0.6) that Teachers' assessment of numeracy instruction provides feedback to improve learning methods and approach. The mean of means and mean standard deviation were 4.0 and 0.6.

Research Question 2: What techniques are used by teachers to assess early grade numeracy in the Effutu Municipality?

Table 4.6: Techniques of Assessing Early Grade Numeracy

Statement	**Respondents**	**Frequency**	
Assessment Technique	**N**	**Used**	**Not Used**
Test	60	60 (100%)	0 (0%)
Class exercises	60	60 (100%)	0 (0%)
Homework	60	60 (100%)	0 (0%)
Oral interview	60	7 (12%)	53 (87%)
Group work	60	3 (5%)	57 (95%)
Portfolio	60	0 (0%)	60 (100%)
Observation Checklist	60	11(18%)	49 (82%)
Rating scale	60	2 (3%)	58 (97%)

Source: Field Data, (2022)

The results of the Assessment techniques used teachers in the Effutu Municipality to assess Early Grade Numeracy are presented in Table 4.6. The results reveal that all (60) the respondents representing 100% agreed to the use of assessment techniques such as test, class exercise and homework. While few, 7 (12%) of the respondent use oral interview to assess early grade numeracy, majority, 53 (87%) do not use it. Similarly, just 3 (5%) of the respondents use group work to assess early grade numeracy compared to 57 (95%) who do not use group work. Furthermore, the results show that 60 (100%) of the respondents do not use portfolio as a technique for assessing early grade numeracy. The number of respondents who use observation stood at just 11 (18%) compared to 49 (82%) who does not use observation as an assessment technique for

assessing early grade numeracy. Concluding their responses, just 2 (3%) of the respondents use rating scale to assess early grade numeracy.

Research Question 3: What are the teachers' assessment practices of early grade numeracy in the Effutu Municipality?

The purpose of this research question was to find out teachers' assessment practices of early grade numeracy in the Effutu Municipality. Data was gathered through a non-participant observation. In all, five (5) teachers from different schools were observed. The results are presented in Table 4.8.

Table 4.7: Teachers' assessment practices of early grade numeracy

Observable Indicators	**Observed**		**Not Observed**	
Teachers' Assessment Practice	**F**	**Percent**	**F**	**Percent**
Teacher uses multiple assessment techniques to assess	1	20%	4	80%
Teachers' assessment caters for individual differences in the classroom	0	0%	5	100%
Teacher provides equal access for all students to participate	2	40%	3	60%
Teacher provides adequate time for reflection.	0	0%	5	100%
Teachers probes pupils' conceptual knowledge.	0	0%	5	100%
Teacher provides enough tasks for pupils	3	60%	2	40%
Teacher assesses pupils frequently.	3	60%	2	40%
Teacher assesses pupils in groups	0	0%	5	100%
Assessment tasks involve eliciting the conceptual understanding of pupils	1	20%	4	100%

Source: Field Data, (2022)

Table 4.7 presents the results of how teachers practices assessment of early grade numeracy. The results show that just 1 out 5 teachers observed uses multiple assessment techniques to assess. Also, none of the teachers observed ensured that their assessment caters for individual differences in the classroom. It can be seen that just 2 out of 5

teachers observed provides equal access for all students to participate in assessment task. None on the teachers observed provides adequate time for reflection. Similarly, none of the teachers uses child self-assessment technique. However, 3 out of 5 teachers observed provide enough tasks for pupils and assess pupils frequently. Again, none of the teachers observed assesses pupils in groups. The observation results show that just 1 out of 5 teachers observed uses assessment tasks that elicit conceptual understanding of pupils.

Research Question 4: **What challenges do teachers face in assessing early grade numeracy in the Effutu Municipality?**

The purpose of this research question was to find out challenges teachers face in assessing early grade numeracy in the Effutu Municipality. Data was gathered through questionnaire the results are analysed and presented in Table 4.8.

Table 4.8: Challenges Teachers Face in Assessing Early Grade Numeracy

STATEMENT	N	M	SD
Language barriers affect the accuracy of my assessment results	60	3.74	0.66
I have limited time to administer and grade students' assessments	60	4.13	0.42
There is limited availability of appropriate assessment tools	60	3.81	0.67
Different learning styles make it difficult for me to assess numeracy skills accurately.	60	4.51	0.33
Limited teacher training leads to inaccurate or incomplete assessments of numeracy	60	4.40	0.59

Source: Field Data, 2022

Table 4.8 shows the results of the data collected on the challenges teacher encounters in assessing early grade numeracy. The result revealed that majority of the respondents agreed (M = 3.74, SD = 0.66) to the statement, "language barriers affect the accuracy of my assessment results". The standard deviation of 0.66 shows that the responses were homogeneous. With a mean of 4.13 and a standard deviation of 0.42, majority of the respondents agreed that they have limited time to administer and grade students' assessments. The homogeneity of the responses was evident in the standard deviation of 0.42. Similarly, majority of the respondents agreed (M = 3.81, SD = 0.67) that there is limited availability of appropriate assessment tools. The resultant standard deviation of 0.42 indicates that the responses were similar. With regards to the statement, "Different learning styles make it difficult for me to assess numeracy skills accurately", majority of the respondent agreed (M = 4.51, SD = 0.33). It is worthy of not that this item attracted the highest mean. The responses were considered similar or homogeneous due to the standard deviation of 0.33. Finally, majority of respondents agreed (M = 4.40, SD = 0.59) that limited teacher training leads to inaccurate or incomplete assessments of numeracy. The homogeneity of responses was evident in the standard deviation of 0.59.

In general, the results provide evidence to suggest that teachers encounter some challenges in assessing early grade numeracy. Among these challenges are limited time to administer and grade students' assessments, limited availability of appropriate assessment tools, and limited teacher training leads to inaccurate or incomplete assessments of numeracy.

4.3 Discussion of Results

Perceptions of teachers about assessment of early grade numeracy in the Effutu Municipality

Research question 1 sought to find out the perceptions of teachers about assessment of early grade numeracy in the Effutu Municipality. The results provide evidence that suggest that teachers have high perception about summative assessment (assessment of learning) compared to formative assessment (assessment for learning and as learning). In general, the results imply that teachers had positive perception about assessment of early grade numeracy. The finding concurs with the assertion of Awinyam (2018) who revealed that the most teachers have positive perceptions about what should assessed, how to assess and the feedback that should be given to students. They also perceived that assessment tasks for students should include both higher orders thinking skills and lower order thinking skills.

Techniques or strategies teachers use to assess early grade numeracy in the Effutu Municipality

Research question 2 sought to determine techniques or strategies teachers use to assess early grade numeracy in the Effutu Municipality. The results imply that the respondents employ the use of test, class exercises and homework as assessment techniques for assessing early grade numeracy. This finding confirms the views of Awinyam (2018) that teachers favour the traditional forms of assessment to alternative ones. This promote rote learning and make pupils become passive participant in the teaching and learning process. This is in line with the assertion of Hattori and Saba (2008) who reported that, Ghanaian mathematics teachers' assessment techniques or methods do

not let children to construct their own knowledge but rather are made to be passive recipients of knowledge. The findings also confirms the assertions that the most common methods of assessing student performance in mathematics courses around the world are testing and grading (Van de Walle, 2001; Lissitz & Schafer, 2002). Oduro (2015) that assessment techniques used frequently focused on the mere recall of information and that assessment methodologies should go beyond the typical practice of focusing on end-of-unit examinations and mid-unit quizzes, which both tend to focus on information recall and procedural learning. Tests and quizzes are the most commonly utilised assessment tools by teachers (Senk, Beckmann & Thompson 1997; Susuwele-Banda, 2005). To this purpose, Oduro (2015) stated that mathematics assessment should go beyond focusing on how well a student remembers a memorised technique or procedure, and instead elicit, measure, and respond to students' mathematical comprehension and problem-solving abilities.

Teachers' assessment practices of early grade numeracy in the Effutu Municipality

Research question 3 sought to ascertain teachers' assessment practices of early grade numeracy in the Effutu Municipality. On how the assessment practices of teachers with respect to early grade numeracy, the results revealed that most teachers provide enough tasks for pupils and also assess pupils frequently.

The findings of the study shows that most teachers demonstrate a positive aspect of assessment practices by providing enough tasks for pupils and assessing them frequently. This indicates that teachers are aware of the importance of ongoing assessment to monitor students' progress and identify areas that require further support

or intervention. Regular assessment allows teachers to track students' learning trajectory and make informed instructional decisions.

However, very few of them use multiple assessment techniques to assess, and provides equal access for all students to participate. The study highlights a concerning finding that few teachers employ multiple assessment techniques in early grade numeracy. This implies that teachers may rely on a single assessment method, such as tests or quizzes, without incorporating a variety of strategies to capture a comprehensive understanding of students' numeracy skills. By utilizing a range of assessment techniques, such as observations, interviews, and performance-based tasks, teachers can gather a more holistic view of students' abilities and gain insights into their problem-solving approaches and critical thinking skills.

Another noteworthy finding is that teachers may not ensure equal access for all students to participate in the assessment process. This suggests potential disparities in student engagement and opportunities for assessment. It is essential for teachers to create an inclusive and supportive environment where all students have equal chances to demonstrate their numeracy skills and receive feedback on their progress. By addressing this issue, teachers can better understand the diverse needs and strengths of their students and provide targeted support accordingly.

Challenges Teachers Face in Assessing Early Grade Numeracy in the Effutu Municipality

Research question 4 sought to find out challenges Teachers Face in Assessing Early Grade Numeracy in the Effutu Municipality. The results revealed that the challenges teachers face in assessing early grade numeracy are limited time to administer and grade

students' assessments, limited availability of appropriate assessment tools, and limited teacher training leads to inaccurate or incomplete assessments of numeracy.

These challenges can significantly impact the accuracy and completeness of assessments, ultimately affecting the evaluation of students' numeracy skills. As revealed by the findings, teachers often have limited time available to administer and grade assessments for early grade numeracy. This constraint can arise due to various factors, such as large class sizes, a packed curriculum, or competing demands on teachers' time. As a result, teachers may feel rushed when assessing students, potentially leading to errors or overlooking important aspects of students' numeracy abilities. The findings in in line with the assertion of Piper and Zuilkowski (2017), which state that administering assessments takes time away from other instructional activities, which can negatively impact student learning. Thus, grading assessments can be time-consuming, especially if teachers have a large number of students. Musset et al. (2019) share similar opinion that assessments that are too short may not provide enough information to accurately assess a student's numeracy skills, while assessments that are too long may be too burdensome for students and lead to fatigue, reducing the accuracy of responses.

The study also reveals that teachers face challenges in accessing appropriate assessment tools for early grade numeracy. It implies that the existing assessment resources may not adequately align with the specific numeracy skills being taught or may not be designed for the targeted age group. In such cases, teachers may struggle to accurately assess students' numeracy levels, as the tools may not effectively capture their understanding or progress. According to Krawec and Montague (2019), assessment tools that are designed for older learners may not be appropriate for younger learners

as they may not have the necessary language skills to understand the instructions and questions. Akyeampong and Stephens (2018) note that assessment tools designed for the Ghanaian context may not be suitable for young learners due to the complexity of the language and the difficulty of the tasks.

Furthermore, the findings suggest that teachers' limited training in assessing early grade numeracy can impact the quality of assessments. Without proper training, teachers may lack the necessary knowledge and skills to design and administer assessments effectively. They may encounter difficulties in selecting appropriate assessment strategies, interpreting results, and providing targeted feedback to students. Insufficient training can lead to inaccurate or incomplete assessments, hindering the ability to identify students' specific learning needs. The findings confirms the views of Njoroge and Orodho (2017) that teachers feel ill-equipped to administer numeracy assessments due to a lack of training and this resulted in inconsistent assessment practices and inaccurate assessment results. Similarly, a study by Koshy and Casey (2013) found that teachers who received limited training in numeracy assessment struggled to accurately assess students' numeracy skills and tended to rely on simplified assessments.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Overview

This chapter provides summary, conclusion, and recommendations of the study. The summary is divided into two parts. The first aspect deals with the summary of the research process and the second part deals with the summary of the key findings, conclusions, recommendations and suggestions for further studies.

5.1 Summary of the Study

The study was conducted at public primary schools in Wenneba in the Effutu Municipality of the Central Region. The purpose of the study was to find out the teacher assessment of early grade numeracy in the Effutu Municipality of the Central Region. Specifically, the study found out the perceptions of teachers about assessment of early grade numeracy in the Effutu Municipality. It also determined techniques or strategies teachers use to assess early grade numeracy in the Effutu Municipality. Furthermore, the study assessed assessment techniques that teachers frequently use to assess early grade numeracy in the Effutu Municipality. Finally, it ascertained teachers' assessment practices of early grade numeracy in the Effutu Municipality. The findings of the study are presented in the next section below.

5.2 Key Findings

It was found out that:

1. Teachers perception abut assessment of early grade numeracy include the their believe that assessment in class should focused on supporting pupils strengths

and weaknesses for remediation, assessment of numeracy supports pupils learning of concepts and occurs at the end of instruction, and assessment should provide feedback to improve teaching method and approach

2. Teachers employ the use of test, class exercises and homework as assessment techniques for assessing early grade numeracy.

3. Most teachers provide enough tasks for pupils and also assess pupils frequently. Just few of them use multiple assessment techniques to assess, and provides equal access for all students to participate.

4. The challenges teachers face in assessing early grade numeracy are limited time to administer and grade students' assessments, limited availability of appropriate assessment tools, and limited teacher training leads to inaccurate or incomplete assessments of numeracy.

5.3 Conclusions

Based on the findings of the study, it is concluded that teachers have positive perception about assessment of early grade numeracy. Surprisingly, teachers use traditional assessment methods such as tests and other types of traditional assessment are unable to examine the mathematical thinking underlying the answers that students provide in response to activities.

Teachers do not use a variety of assessment techniques like observations, interviews, performance tasks, projects, portfolios, presentations, and self-assessments are some of the approaches and activities used. Meanwhile, these activities will assist the instructor in eliciting mathematical understanding and insights into the children mathematical thinking.

It is also concluded that the use of observations, interviews, performance tasks, projects, portfolios, presentations, and self-assessments will be consistent with current teaching and assessment practices in mathematics, which discourage activities that result in only procedural learning and memorization/recall of facts. Despite the clear call to use a variety of assessment techniques to assess students' mathematical ability, teachers do not choose assessment techniques that will address the different learning needs of children in the classroom.

The challenges teachers encounter in assessing early grade numeracy can result in inaccurate or incomplete assessments of numeracy skills among students. The implications of these challenges are significant as accurate assessment of early grade numeracy is crucial for identifying students' strengths and weaknesses, informing instructional practices, and providing targeted support to promote numeracy development.

5.4 Recommendations

The findings outlined and the conclusion drawn from this study calls for necessary actions. Therefore, the researcher makes the following recommendations based on the findings and conclusions:

1. Formative assessment (assessment for and as learning) practices such ensuring assessment tasks promote metacognition, focused on pupils' self-monitoring, promote self-directed learning among pupils, elicit pupils' problem solving skills during instruction should be used to complement or balance the summative assessment to achieve greater results.

2. Teachers should employ techniques that promote conceptual understanding and actively involve students in rich and cognitive demanding tasks at their level. Teachers should as a matter of urgency, shift from the traditional test, class exercise and homework as the sole means of assessing early grade numeracy. Teachers should be encourage to incorporate the use of assessment techniques such as Oral interview, Group work, Portfolio, Observation Checklist and Rating scale to assess early grade numeracy.

3. Teacher should assess pupils in groups, assessment tasks should elicit the conceptual understanding of pupils. They should use multiple assessment techniques to assess and assessment should cater for individual differences in the classroom.

4. Schools and educational authorities should prioritize allocating resources to develop and provide teachers with appropriate assessment tools for early grade numeracy. Schools should explore strategies to optimize time for assessment within the constraints of the curriculum. Furthermore, teachers need ongoing support and mentorship in implementing effective assessment practices for early grade numeracy. This can be provided through instructional coaching, peer collaboration, and regular feedback on assessment practices.

5.5 Suggestions for Further Studies

1. Similar study be conducted in other municipalities within the Central region so as to generalize the findings to inform policy decision and practice.
2. Further studies should focused on the impact of teachers' assessment practices on pupils' performance in early grade numeracy in the Effutu Municipality.

REFERENCES

Akos, P., Cockman, C. R., & Strickland, C. A. (2007). Differentiating classroom guidance. Professional School Counseling, 10(5), 455-463.

Akyeampong, K., & Stephens, D. (2018). Mathematics education in Ghana. In E. Akyeampong, T. Amponsah, & L. Ngussah (Eds.), Education in Ghana: From Basic Education to Tertiary (pp. 135-155). Springer International Publishing.

Amedahe, F. K., Asamoah, G. (2018). Fundamentals of educational research methods. Mimeograph, UCC, Cape Coast.

American Federation of Teachers (2002) Educational Issues Policy Brief. Washington, DC: AFT Educational Issues Department 555, New Jersey Avenue, NW Washington, DC 20001. (Accessed 8 June 2022).

Ashbourne, D. & Warder, R. (2010) 'Child welfare assessment services.' (Accessed 15 June 2022).

Askew, M. & Brown, M. (2003). How do we teach children to numerate? A professional User review of UK research undertaken for British Educational Research Association.

Awinyam, I.J. (2018). An Investigation of The Relationship Between Perceptions of Mathematics Teachers Towards Assessment and Their Assessment Practices in The Binduri District. UCC Masters Dissertation.

Babbie, E. R. (2015). The practice of social research. Nelson Education.

Bagnato, S. J., & Neisworth, J. T. (2001). *Assessment for early intervention: Best practices for professionals*. Guilford Press.

Bennet, R. E., & Gitomer D. H. (2009). Transforming K-12 assessment: Integrating Accountability testing, formative assessment and professional support (pp. 43-61). In C. Wyatt-Smith & J. J. Cumming (Eds.), Educational assessment in 21st century. Mt Gravat, Australia: Springer.

Bennett, R. E. (2011). Formative assessment: A critical review. Assessment in Education: principles, policy & practice, 18(1), 5-25. doi: 10.1080/0969594X.2010.513478.

Berenson, S. B., & Carter, G. S. (2005). Changing assessment practices in science and mathematics. School Science and Mathematics, 95(4), 182-186.

Birgin O (2011). Pre-service mathematics teachers' views on the use of portfolios in their education as an alternative assessment method. Educational Research and Reviews 6(11)710-721 Digit.

Black, P. and Wiliam, D. (2010). Inside the Black Box: Raising Standards through Classroom Assessment. Phi Delta Kappan, 92(1) 81-90.

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. Assessment in Education: Principles, Policy & Practice, 5(1), 7-74.

Black, P., Harrison, C., Lee, C., Marshall, B. and William, D. (2004). Assessment for Learning in the Classroom. Phi Delta Kappan, 86(1) 8- 21.

Borko, H., Jacobs, J., Eiteljorg, E., & Pittman, M. E. (2016). Professional development to support teachers' assessment of early numeracy. Mathematics Teacher Education and Development, 18(1), 36-57.

Boud, D. (2000). Sustainable Assessment: Rethinking Assessment for the Learning Society. Studies in Continuing Education 22(2)151–167.

Bramlett, D., & Wright, S. (2016). Small-group math conferences: How to use guided math data and assessment to differentiate math instruction. Corwin Press.

Bredekamp, S., & Rosegrant, T. (2002). *Reaching Potentials: Appropriate Curriculum and Assessment for Young Children. Volume 1*. National Association for the Education of Young Children, 1509 16th St., NW, Washington, DC 20036-1426.

Broadfoot, P. (2007). An introduction to assessment (2nd ed.). Continuum.

Brookhart, S. M. (2017). How to assess higher-order thinking skills in your classroom. ASCD.

Brown, D. H. (1990). Language assessment: Principles and classroom practices. London: Longman.

Brown, G. T. L. and Harris, L. R. (2009) Unintended consequences of using tests to improve learning: How Improvement-Oriented Resources Engender Heightened Conceptions of Assessment as School Accountability. *Journal of Multidisciplinary Evaluation* 6(12): 68–91.

Brown, G. T. L., Lake, R., & Matters, G. (2009). Assessment policy and practice effects on New Zealand and Queensland teachers' conceptions of teaching. *Journal of Education for Teaching, 35*(1), 61–75.

Brown, G.T.L., and Hirschfeld, H.F. (2008). Students conceptions of assessment: Links to outcomes. Assessment in Education: Principle, Policy, and Practice, 15 (1), 3-17.

Bryman, A. (2012). Social research methods. Oxford university press.

Bryman, A., & Cramer, D. (2012). Quantitative data analysis with IBM SPSS 17, 18 & 19: A guide for social scientists. Routledge, 75-80.

Buhagiar, M. A. (2007). Classroom assessment within the alternative assessment paradigm: revisiting the territory. The Curriculum Journal, 18(1), 39-56.

Carr, M. (2001). Assessment in early childhood settings: Learning stories. London: Paul Chapman

Carr, M., May, H., & Podmore, V. N. (2000). *Learning and Teaching Stories: Action Research on Evaluation in Early Childhood. Final Report to the Ministry of Education*. New Zealand Council for Educational Research Distribution Services, PO Box 3237, Wellington, New Zealand.

Chiam, M., & Ng, E. L. (2018). Learning styles and mathematics achievement: A review of the literature. Journal of Educational Psychology and Counseling, 3(2), 1-16.

Chitsonga, S. S. (2010) Assessment practices of mathematics teachers who also teach AP statistics (Doctoral dissertation, University of Georgia).

Clark, I. (2012). Formative Assessment: Assessment Is for Self-regulated Learning. Educ Psychol Rev 24: 205–249.

Clarke, D., & Clarke, B. (2016). Classroom discussion: Evaluating mathematical talk in small groups. Mathematical Thinking and Learning, 18(3), 157-183.

Clements, D. H., & Sarama, J. (2011). Early childhood mathematics intervention. Science, 333(6045), 968-970.

Clements, D. H., & Sarama, J. (2017). Learning and teaching early math: The learning trajectories approach. Routledge.

Cohen, L., Manion, L., & Morrison, K. (2013). Research methods in education. London:

Cowie, B. and Carr, M. (2003). The Consequences of Sociocultural Assessment in Early Childhood Settings: Community, Competence and Continuity. In A. Anning, J. Cullen and M. Fleer (Eds.), Early Childhood Education: Society and Culture (pp. 95–106). London: Sage.

Creswell, J. (2014). Research design: Educational Research 4thed.). Thousand Oaks, CA: SAGE Publications.

Creswell, J. (2014). Research design: Educational Research 4thed.). Thousand Oaks, CA: SAGE Publications.

Creswell, J. W., & Plano-Clark. V. L. (2017). Designing and conducting mixed methods research.

Darling-Hammond, L. (2006). Assessing teacher education: The usefulness of multiple measures for assessing program outcomes. Journal of Teacher Education, 57(2), 120-138.

Deiner, P. L. (2005) Resources for Educating Children with Diverse Abilities: Birth through Eight. (4th edn). Clifton Park, NY: Thomson/Delmar Learning.

DeLuca, C., Ringstaff, C., & Mitchell, K. (2016). Teacher learning through collaborative assessment: A case study of a professional development program focused on student work analysis. Journal of Mathematics Teacher Education, 19(5), 457-477.

Dogan, M. (2011). Student teachers' views about assessment and evaluation methods in mathematics. Educational Research and Reviews, 6(5), 417-431.

Drah, W. S., & Mavuso, N. M. (2021). The challenges of assessing mathematics for early grade learners in Ghana: A review of literature. Journal of Education and Learning, 10(2), 196-208. doi:10.5539/j

Drummond, M.J. 2003. Assessing children's learning. (2nd ed). London: David Fulton

Earl, J. (2003). Tanks, tear gas, and taxes: Toward a theory of movement repression. *Sociological theory*, *21*(1), 44-68.

Educational Assessment and Research Centre (EARC). (2022). Early Grade Reading Assessment and Early Grade Mathematics Assessment. Retrieved on June 26, 2022 from http://www.earc-ghana.com/projects/details/early-grade-reading-assessment-and-early-grade-mathematics-assessment#:~:text=The%20Early%20Grade%20Math%20Assessment,and%20subtraction%2C%20shape%20recognition%2C%20and

Eliason, C. & Jenkins, L. (2008) A Practical Guide to Early Childhood Education Curriculum. (9th edn). Upper Saddle River, NJ: Pearson Education, Inc.

Estyn (2011). Numeracy for 14 to 19-year-olds. Cardiff: Estyn. [Online]. Available from: Leadership Development (gov.wales) [Accessed 12 May, 2023].

Flottman, R., Stewart, L., & Tayler, C. Practice Principle 7: Assessment for learning.

Fry, R. (2008) The Role of Schools in the English Language Learner Achievement Gap. Washington, DC: Pew Hispanic Center. (Accessed 15 June 2022)

Gargiulo, R. M. & Kilgo, J. (2011) Young Children with Special Needs: Birth through Age Eight. Clifton Park, NY: Thomson/Delmar Learning.

Gipps, C. (1994). Beyond testing: Towards a theory of educational assessment. Falmer Press.

Gonzalez-Mena, J. & Eyer, D. (2007) Infants, Toddlers, and Caregivers: A Curriculum of Respectful, Responsive Care and Education. Boston, MA: McGraw Hill.

Grace, C, & Shores, E (1998). The portfolio and its use. Little Rock, AR: Southern Early Childhood Association.

Gravetter, F. J., & Forzano, L. B. (2009). Research methods for the behavioural sciences (3rd ed.). Wadsworth: Cengage Learning.

Gronlund, G. (1998). Portfolios as an assessment tool: Is collection of work enough? Young Children, 53 (3), 4-10.

Gross, J., Hudson, C., & Price, D. (2009). The long-term costs of numeracy difficulties. London, England: Every Child a Chance Trust.

Guskey, T. R. (2003). How classroom assessments improve learning. Educational Leadership, 60(5), 6-11.

Hattie, J. (2009). The black box of tertiary assessment: An impending revolution. *Tertiary assessment & higher education student outcomes: Policy, practice & research*, *259*, 275.

Hattie, J., & Timperley, H. (2007). The power of feedback. Review of Educational Research, 77(1), 81-112.

Hattori, K. and Saba, A. N. (2008). Comparison of Classroom Assessment Practices: A Case of Selected Ghanaian and Japanese Mathematics Lessons. *NUE Journal of International Educational Cooperation, 3(4)95-105.*

Heritage, M. (2010). Formative assessment: Making it happen in the classroom. Corwin Press.

Hiebert, J., & Lefevre, P. (2016). Conceptual and procedural knowledge in mathematics: An introductory analysis. In J. Hiebert (Ed.), Conceptual and procedural knowledge: The case of mathematics (pp. 1–27). Hillsdale, NJ: Erlbaum.

Hirsh-Pasek, K., Kochanoff, A., Newcombe, N. S., & De Villiers, J. (2005). Using Scientific Knowledge to Inform Preschool Assessment: Making the Case for" Empirical Validity". Social Policy Report. Volume 19, Number 1. *Society for Research in Child Development*.

Hyde, D. P. (2013). What Makes a Good Secondary Assessment? On Achieving the Aims of Assessment. Journal of Education and Practice, 4(12), 188-197.

Janisch, C., Liu, X., & Akrofi, A. (2007). Implementing alternative assessment: Opportunities and obstacles. In The Educational Forum,71, (3), 221-230.

Jones, S. and Tanner, H. (2008) Assessment: A practical guide for Secondary Teachers (3rd ed.) London: Continuum.

Joppe, M. (2016). The Research Process. Retrieved on November, 2021 from kk http://www.ryerson.ca/~mjoppe/rp.htm

Katz, S., & Earl, L. (2007). Creating new knowledge: Evaluating networked learning communities. Education Canada, 47 (1), 34-37.

Kitta, S. (2014). Science Teachers' Perceptions of Classroom Assessment in Tanzania: An Exploratory Study. *International Journal of Humanities Social Sciences and Education (IJHSSE),* 1(12) 51-55.

Kivunja, C. & Kuyini, A. B. (2017). Understanding and Applying Research Paradigms in Educational Contexts. International Journal of Higher Education, 6(5), 26–41

Koshy, V., & Casey, R. (2013). Primary teachers' attitudes, confidence and experience in teaching mathematics: Investigating the impact of a professional development programme on teacher practice. Professional Development in Education, 39(5), 771-788.

Koshy, V., & Casey, R. (2013). Primary teachers' attitudes, confidence and experience in teaching mathematics: Investigating the impact of a professional development programme on teacher practice. Professional Development in Education, 39(5), 771-788.

Kostelnik, M. J., Sodernam, A. K. & Whiren, A. P. (2011) Best Practices in Early Childhood Education. (5th edn). Upper Saddle River, NJ: Pearson Education Inc.

Kozulin, A., & Falik, L. (1995). Dynamic cognitive assessment of the child. *Current Directions in Psychological Science*, *4*(6), 192-196.

Krawec, J. L., & Montague, M. (2019). Developing early numeracy skills: Assessment and intervention. Guilford Publications.

Kumar, R. (2019). Research methodology: A step-by-step guide for beginners. London: Sage.

Lam, R. (2019). Teachers' perceptions and practices of formative assessment in Hong Kong primary schools. Assessment in Education: Principles, Policy & Practice, 26(3), 295-310.

Lesh, R. (2000). Beyond constructivism: Identifying mathematical abilities that are most needed for success beyond school in an age of information. Mathematics Education Research Journal, 12(3), 177- 195.

Lissitz, R. and Schafer, W. (2002) Assessment in Educational Reform: Both Means and Ends. Boston, MA: Allyn and Bacon.

Mayer, R. E., & Hegarty, M. (1996). The process of understanding mathematical problems. In R. J. Sternberg & T. Ben-Zeev (Eds.), The nature of mathematical thinking. Hillsdale, NJ: Erlbaum.

Mbelani , M. (2008). Winds of change in Teachers' classroom assessment practices: A self-critical reflection on the teaching and learning of visual literacy in a rural Eastern Cape High School. English Teaching: Practice and Critique, 7(3), 100-114.

McAfee, O., & Leong, D. (1997). Assessing and guiding young children's development and learning. Boston: Allyn and Bacon.

McAfee, O., Leong, D. J. & Bodrova, E. (2004) Basics of Assessment: A Primer for Early Childhood Educators. Washington, DC: National Association for the Education of Young Children.

McAfee, O., Leong, D., & Bodrova, E. (2004). *Basics of Assessment: A Primer for Early Childhood Professionals*. National Association for the Education of Young Children, 1509 16th Street, NW, Washington, DC 20036.

McAlpine, M. (2002). Principles of Assessment. Glasgow: University of Luton. Available at http://caacentre.lboro.ac.uk/dldocs/Bluepaper1.pdf

McCrory, R. (2019). Reducing Test-Taking Time to Increase Access for Students with Disabilities. Educational Measurement: Issues and Practice, 38(2), 32-42.

McLean, L., Newton, J., & Newton, L. (2017). Assessing early numeracy: Using problem solving and real-world scenarios. Journal of Early Childhood Teacher Education, 3 (10) 34-40.

McLean, M. E., Wolery, M., & Bailey, D. B. (2004). *Assessing infants and preschoolers with special needs*. Prentice Hall.

Ministry of Education. (2004, 2007, 2009). Kei tua o te pae: Assessment for learning: Early Childhood Exemplars. Wellington: Learning Media.

Mitchell, L. (2008). Assessment practices and curriculum resources in Early Childhood Education. Results of the 2007 NZCER national survey for ECE services. Wellington: New Zealand Council for Educational Research.

Morgan, C., & Watson, A. (2002). The interpretative nature of teachers' assessment of students' mathematics: Issues for equity. *Journal for Research in Mathematics Education, 33(2). 78-110.*

Musset, P., Goujon, A., Mengin, F., & da Costa, L. (2019). Assessing Scientific, Reading and Mathematical Literacy: A Framework for Targeting and Developing Assessment Methods. OECD Education Working Papers, No. 201, OECD Publishing. doi:10.1787/1d23360a-en

Nabie, M. J., Akayuure, P. and Sofo, S. (2013). Integrating Problem Solving and Investigations in Mathematics: Ghanaian Teachers' Assessment Practices. *International Journal of Humanities and Social Science, 3(15) 46-56.*

NaCCA, (2019). Lower Primary Mathematics Curriculum. Accra: Ministry of Education.

NAEYC (2003) 'Early childhood curriculum, assessment, and program assessment.' (Accessed 12 May 2022).

NAEYC (2005) 'Screening and assessment of young English–language learners.' (Accessed 12 May 2022).

National Council of Teachers of Mathematics (2005). Curriculum Focal Points for Pre-Kindergarten through Grade 8 Mathematics. Reston, VA: NCTM.

National Council of Teachers of Mathematics (2005). *Curriculum Focal Points for Pre-Kindergarten through Grade 8 Mathematics.* Reston, VA: NCTM.

National Council of Teachers of Mathematics (NCTM). (2014). Principles to actions: Ensuring mathematical success for all. NCTM.

National Research Council (2001). Adding it up: Helping children learn mathematics. Washington DC: National Academy Press.

Nitko, A. J. and Brookhart, S. M (2007). Educational Assessment of Student (5th ed.). Upper Saddle River, NJ: Merril.

Njoroge, R. N., & Orodho, J. A. (2017). Implementation of Early Grade Mathematics Assessment in Kenya: A Comparative Study. Journal of Education and Practice, 8(22), 69-75.

Njoroge, R. N., & Orodho, J. A. (2017). Implementation of Early Grade Mathematics Assessment in Kenya: A Comparative Study. Journal of Education and Practice, 8(22), 69-75

Nwankwo, I. N. (2013). Research report and article writing in educational management and social sciences. Awka: LoveIsaac Consultancy Services.

Oduro, E. O. (2015). Assessment in Mathematics Classrooms in Ghana: A Study of Teachers' Practices. An unpublished Doctorate Thesis submitted to the University of Sussex, United Kingdom.

Oduro, E. O. (2015). *Assessment in Mathematics Classrooms in Ghana: A Study of Teachers' Practices.* An unpublished Doctorate Thesis submitted to the University of Sussex, United Kingdom.

Orodho, J. A. (2009). Elements of Education and Social Science Research Methods. Maseno: Kenezja Publisher

Pacheco, M.M.D.R. (2007). Concepts and assessment practices in undergraduate courses. Unpublished doctoral dissertation, Pontifícia Universidade Católica de São Paulo, São Paulo.

Piper, B., & Zuilkowski, S. S. (2017). Time as a challenge to the implementation of early grade mathematics assessments. International Journal of Educational Development, 54, 1-8.

Podmore, V. (2006). Observation: Origins and Approaches to Early Childhood Research Practice. Wellington: New Zealand Council for Educational Research.

Popham, W.J. (2008) Transformative assessment. Alexandria: Association for Supervision & Curriculum Development.

Rahim, S. S. A., Venville, G., & Chapman, A. (2009). Classroom assessment: Juxtaposing teachers' beliefs with classroom practices. 2009 Australian Association for Research in Education: International Education Research Conference. Retrieved May 19, 2012 from http://aare.edu.au/09pap/abd091051.pdf

Remesal, A. (2011) Primary and secondary teachers' conceptions of assessment: A qualitative study. *Journal of Teaching and Teacher Education*. 27(2), 472–482.

Resnick, L. B. (2005). Education and learning to think. Washington, DC: National Academy Press.

Rong, X. & Preissle, J. (2009) Educating Immigrant Students in the 21st Century: What Educators Need to Know. Thousand Oakes, CA: Corwin Press.

Routledge

RTI International. (2014c). Early Grade Mathematics Assessment (EGMA) Toolkit: RTI International.

Rust, C. (2002). Learning and Teaching briefing papers. www.brookes.ac.uk/services/ocsld/resources/assessment/purposes.htm accessed 10th May, 2022.

Scotland, J. (2012). Exploring the philosophical underpinnings of research: Relating ontology and epistemology to the methodology and methods of the scientific, interpretive, and critical research paradigms. English Language Teaching, 5(9), 9. CA: Sage.

Senk, S. L., Beckmann, C. E., & Thompson, D. R. (1997) Assessment and grading in high school mathematics classrooms. Journal for Research in Mathematics Education, 28(2), 187-215.

Shazia, S. (2014). *Self–concept, learning styles, study habits and academic achievement of adolescents in kashmir: A study on psychological variables and academic achievement of adolescents in Kashmir*. Anchor Academic Publishing (aap verlag).

Shepard, L. A. (2005). Linking Formative Assessment to Scaffolding. Educational Researcher 63(3), 66–70.

Slentz, K., Early, D., & Mckenna, M. (2008). A guide to assessment in early childhood: Infancy to age eight: Washington State Office of Superintendent of Public Instruction.

Smith, A. (1998). Understanding children's development. Wellington, New Zealand: Bridget Williams Books.

Smith, M. S. (2006). Teaching mathematics in the 21st century: Methods and activities for grades 6-12. Pearson.

Stiggins, R. J., Frisbie, R. J., & Griswold, P. A. (2007). Inside high school grading practices: Building a research agenda. Educational Measurement: Issues and Practice 8(2), 5–14.

Stiggns, R. J,(2005).Classroom Assessment for Students Success. Washington DC: natural education Association.

Stobart, G. (2008) Testing Times: The Uses and Abuses of Assessment. London: Routledge.

Susuwele-Banda, W. (2005). Classroom Assessment in Malawi: Teachers' Perceptions and Practices in Mathematics. *Science and Education Research, 8*(3), 102-117.

Suurtamm, C., Koch, M and Arden, A. (2010). Teachers' assessment practices in mathematics: classrooms in the context of reform. Assessment in Education: Principles, Policy & Practice, 17(4) 399–417.

Taras, M. (2005). Assessment–summative and formative–some theoretical reflections. *British journal of educational studies*, *53*(4), 466-478.

Townsend, B., Lannin, J., & Barker, D. (2009). Promoting efficient strategy use. Mathematics Teaching in the Middle School, 14, 542.

Van De Walle, J. A. (2001). Elementary and middle school mathematics: Teaching developmentally. Boston: Allyn and Bacon.

Wahyuni, D. (2012). The research design maze: Understanding paradigms, cases, methods and methodologies.

Wiliam, D. (2009). Assessment for learning: Why, what and how?. Institute of Education, University of London.

Williams, S., & Crowe, E. (2016). The relationship between learning styles and academic achievement in students of pharmacy. Journal of Educational Evaluation for Health Professions, 13(8), 1-5. doi:10.3352/jeehp.2016.13.8

Williamson, D., Cullen, J., and Lepper, C. (2006). "From Checklists to Narratives in Special Education". Australian Journal of Early Childhood, vol. 31 no. 3, pp. 20–30.

Wils, L., & Ginsburg, H. P. (2016). Mathematics education for young children: What it is and how to promote it. In International handbook of research in mathematics education (pp. 233-267). Springer.

Witt, J., Elliot, S., Kramer, J., & Gresham, F. (1994). Assessment of children: Fundamental methods and practices. Madison, WI: Brown & Benchmark.

Wortham, S.C. (2008). Assessment in Early Childhood Education (fifth ed.). Upper Saddle River, NJ: Pearson Merrill Prentice Hall.

Yelkpieri, D. & Tamanja, E. M. J. (2019). Fundamentals of Educational Research. UEW Printing Press.

Yilmaz, K. (2013). Comparison of quantitative and qualitative research traditions: Epistemological, theoretical, and methodological differences. European Journal of Education, 48(2), 311–325. doi:10.1111/ejed.12014

Young, M. E. (1996) Early Child Development: Investing in the Future. Washington DC: The Word Bank.

APPENDICES

APPENDIX A

QUESTIONNAIRE FOR TEACHERS

This questionnaire is being used to gather information on teachers assessment of early grade numeracy. The information is being collected as part of a Master's Thesis. It is therefore strictly for academic purposes. I will be grateful to have you take part in the study by answering the questions as honestly as possible.

Please be assured that the information you provide will be kept confidential.

Thank you.

Instruction: Tick √ the appropriate bracket [ ] representing your response to the question or statement.

Section A: Background Data

1. Sex: Female [ ] Male [ ]
2. Which of the following age range has your age?

Below 20 [ ] 20-29 [ ] 30-39 [ ] 40-49 [ ] 50-59 [ ] 60 and above [ ]

3. What is your highest academic qualification?

   SSSCE/WASSCE [ ] Diploma [ ] Bachelor's Degree [ ]

   Masters [ ]

4. What is your professional qualification?

Cert 'A' [ ] DBE [ ] B. Ed [ ] M. Ed./MPhil (Education) [ ]

5. How many years have you been teaching?

Less than 4 years [ ] 4-8years [ ] 9-12 years [ ] 12-16 years [ ] above 16 years [ ]

Section B: Perception of teachers about assessment of early grade numeracy

Indicate by a tick (√) in the column the response which best describes your level of acceptance of the statements below that relates how you perceive assessment of early grade Numeracy.

SA =Strongly Agreed; A = Agreed; N = Neutral; D = Disagree; SD =Strongly Disagree

S/N	STATEMENT	SA	A	N	D	SD
	Assessment as Learning					
1	The assessment tasks should promotes metacognition					
2	Assessment tasks in numeracy is focused on pupils' self-monitoring					
3	Assessment tasks in numeracy is focused promoting self-directed learning among pupils.					
	Assessment for Learning					
4	Teachers' assessment tasks in numeracy should elicit pupils' problem solving skills during instruction					
5	Assessment in class should focused on supporting pupils strengths and weaknesses for remediation					
6	Assessment of numeracy supports pupils learning of concepts					
	Assessment of Learning					
7	Teachers' assessment of numeracy occurs at the end of instruction					
8	Teachers' assessment should provide feedback to improve teaching method and approach					
9	Teachers' assessment of numeracy occurs at the end of instruction					

Section C : Techniques of assessing early grade numeracy

Indicate how often you use the following assessment techniques in assessing pupils in Numeracy in a term. Indicate by a tick (√) in the column the response which best describes your agreement to the use of each assessment technique in the classroom.

S/N	STATEMENT	USED	NOT USED
1	Test		
2	Class exercises		
3	Homework		
4	Oral interview		
5	Group work		
6	Portfolio		
7	Peer assessment		
8	Child self-assessment		
9	Projects		
10	Observation		
11	Checklist		
12	Rating scale		

SECTION D: CHALLENGES TEACHERS FACE IN ASSESSING EARLY GRADE NUMERACY

Indicate the extent to which you agree or disagree to the following statement on the challenges you face in assessing early grade numeracy. Indicate by a tick (√) in the column the response which best describes your agreement to each of the statement.

S/N	STATEMENT	SD	D	N	A	SA
1	Language barriers can affect the accuracy of assessment results					
2	Teachers have limited time to administer and grade assessments					
3	Limited availability of appropriate assessment tools					
4	Different learning styles make it difficult for teachers to assess numeracy skills accurately.					
5	Limited teacher training leads to inaccurate or incomplete assessments of numeracy					

APPENDIX B

OBSERVATION PROTOCOL ON TEACHERS ASSESSMENT PRACTICES

Date…… Name of the school…… Time of observation…… Start …… End …… Class……Teachers' gender…… Number of students ……..

Lesson

Topic:……

OB = Observed; NOB =Not Observed

S/N	STATEMENT	**OB**	**NOB**
1	Teacher uses multiple assessment techniques to assess		
2	Teachers' assessment caters for individual differences in the classroom		
3	Teacher provides equal access for all students to participate		
4	Teacher provides adequate time for reflection.		
5	Teacher uses child self-assessment		
6	Teachers probes pupils' conceptual knowledge.		
7	Teacher provides enough tasks for pupils		
8	Teacher assesses pupils frequently.		
9	Teacher assesses pupils in groups		
10	Assessment tasks involve eliciting the conceptual understanding of pupils		

Thank you