

UNIVERSITY OF EDUCATION, WINNEBA

**Strategies used by basic school teachers for teaching multiplication facts recall in
the Wa Municipality**



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**STRATEGIES USED BY BASIC SCHOOL TEACHERS FOR TEACHING
MULTIPLICATION FACTS RECALL IN THE WA MUNICIPALITY**



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**A thesis in the Department of Basic Education, School of
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of the requirements for the award of the degree of
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DECLARATION

Student's Declaration

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

Signature:

Date:

Supervisor's Declaration

I hereby declare that the preparation and presentation of this work were supervised in accordance with the guidelines for supervision of dissertation as laid down by the University of Education, Winneba.

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Signature:

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DEDICATION

To my beloved wife, Sabit Nazifa and my children, Bayinah, Kayimah, Yasira and Razina.



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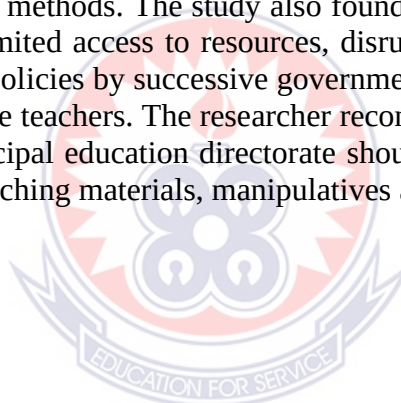
LIST OF ACRONYMS

CIST	Curriculum Implementation Strategy Theory
EMIS	Educational Management Information System
PA	Parents Associations
PLC	Professional Learning Community
SISO	School Improvement Support Officer
SMC	School Management Committee
SPSS	Statistical Package for Social Scientists



ABSTRACT

The purpose of this study was to examine strategies perceived by basic school teachers as more effective in teaching multiplication facts recall and the challenges, they faced in using such strategies. The study adopted a convergent parallel design. The schools under study has a student population of 765 and Forty (40) teachers were selected for the study. Questionnaire and interview were employed through a standardized procedure. Data was recorded securely, and appropriate analyses was performed using quantitative and qualitative techniques. The study found that, the strategies used by teachers for teaching multiplication fact recall are simple repetition, differentiated instruction, the use of mathematics games, pair work or ability groupings, the use of feedback and rewards and the use of manipulatives and visual aids. Teacher feedback, pre-tests, and the use of flashcards and charts in teaching multiplication facts recall were also reported by the teachers to enhance learning outcomes. Teaching strategies teachers perceived as more effective for teaching multiplication facts recall, ranked first from the use of manipulatives and visual aids, simple repetition in teaching to focus on less interested students. The study found that gender was significant factor in determining these perceptions, highlighting the necessity to consider gender when developing and recommending multiplication teaching methods. The study also found that the challenges faced by teachers range from limited access to resources, disruption from frequent changes in the curriculum and policies by successive governments, over class size to lack of confidence among some teachers. The researcher recommended that, teachers, head teachers and the Municipal education directorate should continue to ensure access and adequate use of teaching materials, manipulatives and technology.



CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

In recent time there has been global call to reform curriculum and teaching approaches to optimize students' mathematical knowledge and thinking to meet 21st century needs. As a result of this, Ghana has adapted a standards-based curriculum which has specified creative and innovative strategies in teaching multiplication facts and other concepts in mathematics. In a study by Lefebvre et al. (2017), multiplication facts recall is an essential skill that students need to acquire to achieve mathematical proficiency. From Nunes et al. (2019) the ability to quickly and accurately recall multiplication facts is crucial for students to progress in mathematics and become confident problem solvers.

Basic school teachers play a critical role in developing children's multiplication facts. Hence what they perceived as effective teaching strategies, therefore have a significant impact on students' learning outcomes. Teachers have also gone through teacher education and are supposed to use teaching strategies stated in curriculum in their classroom teaching. However, over the years, basic school children in the Wa Municipality continued to perform poorly in mathematics as compared to other subjects at the B.E.C.E level (B.E.C.E reports, Wa Municipal, Ghana Education Service). One of the foundational causes is students' lack of multiplication facts recall. The question that remains unanswered is "What kind of teaching strategies are Ghanaian basic school teachers adopting for teaching multiplication facts"? In Wa municipality, this question is even very relevant to answer because of the consistent failure rate at the school level and national level numeracy skills assessments of basic 2 and 4 pupils over the years. Research has shown that children who have good

multiplication facts recall skills are more likely to perform well in mathematics and have higher levels of confidence in their abilities. This current study investigated the perceived strategies that basic school teachers used to teach multiplication facts recall and the challenges they face in the Wa Municipal.

Geary (2010) posits that multiplication fact recall is the ability to recall multiplication facts from memory without using counting strategies. For example, $4 \times 6 = 24$ can be recalled without counting because it has been memorized through repeated practice. Multiplication facts recall is a foundational skill that is taught in basic schools, and it is essential for children to master it before moving on to more advanced mathematical concepts. Therefore, it is crucial for basic school teachers to use effective strategies to teach multiplication facts recall. However, Nunes et al., (2019) argued that research has shown that many students struggle with multiplication facts recall, and teachers often find it challenging to teach this skill effectively.

In the works of Lefebvre et al. (2017) and Nunes et al. (2019), research has shown that there are several factors that contribute to successful multiplication fact recall. Key among these factors are effective teaching strategies for multiplication facts recall such as the use of rote memorization, mnemonics, and the use of technology. One of the most effective strategies for teaching multiplication factor recall is the use of games and activities. According to a study by Korkmaz and Kavak (2019), games such as bingo, multiplication war, and multiplication dominoes can be highly effective in engaging students and helping them memorize multiplication facts. By making learning fun and interactive, students are also more likely to enjoy the process of memorization and retain the information for longer periods of time. Another effective strategy for teaching multiplication fact recall is the use of mnemonic

devices. Mnemonic devices are memory aids that help students remember information by associating it with something else. For example, the rhyme 6 times 8 is 48, don't be late! Can help students remember the multiplication fact $6 \times 8 = 48$. Barnett and Nesbit (2018) in their study found that, mnemonic devices can be highly effective in helping students recall multiplication facts quickly and accurately. The use of technology can also be an effective strategy for teaching multiplication factor recall. According to a study by Adnan and Uygun (2020), the use of digital games and apps can be highly engaging for students and can help them practice their multiplication skills in a fun and interactive way. Additionally, technology can provide immediate feedback and adapt to the needs of individual students, making it an effective tool for personalized learning. Despite the above evidence, research has also shown that there is no one-size-fits-all approach to teaching multiplication fact recall, and teachers need to use a range of strategies that are tailored to individual student needs (Nunes et al., 2019).

Research has also identified several challenges that teachers face when teaching multiplication fact. Nunes et al., (2019) identified the lack of time and resources, students' individual differences in learning styles, and the use of ineffective teaching strategies. These challenges can make it difficult for teachers to effectively teach multiplication facts and can have a negative impact on children's learning outcomes.

1.2 Statement of the Problem

Multiplication is a fundamental concept in mathematics, and the ability to recall multiplication facts quickly and accurately is essential for success in higher-level mathematics courses. However, many children struggle with memorizing multiplication tables, and teachers are constantly searching for effective strategies to

help their children master this important skill. According to the study conducted by Khatoon and Khan (2021), one of the basic problems that teachers face is that learners often rely on counting or using calculators to solve multiplication problems instead of reasoning and recalling readily the facts from memory. This often leads to slower problem-solving times and a lack of fluency in mathematical computation, which can have long-term effects on learners' mathematical ability. Therefore, it is crucial for teachers to use effective strategies to improve learning and recall of multiplication facts efficiently (Adnan & Uygun (2020).

According to Dowker (2017) within the Wa Municipality, where the researcher is a head teacher at the study area, has observed through quiz programs that basic school students straggle in mastering multiplication facts, coupled with teacher's complains during in-service training and other workshops about the complex nature of the new syllabus, making them confused of the strategies to use. This makes the learning of mathematics concepts like multiplication very difficult and as such leading to poor performance in mathematics.

The concern for this study is that educational statistics in the Wa Municipality show that many basic school children are continually struggling to master multiplication facts. From Dowker (2017) this tends to hinder their mathematical proficiency and limit their ability to solve more complex problems. Efforts to address this through remedial and extended time teaching strategies have not yielded significant result. The various creative strategies have been suggested in the new standard based curriculum to address the issue of poor recall and numeracy skills in general. However, not much is known about whether the strategies suggested in the curriculum documents are deemed effective and adopted by teachers and what factors

tend dictate teachers' choice of specific strategies. By identifying what strategies teachers consider effective and use in their classrooms, we can compare with what curriculum documents recommend. Such comparison would reveal alignment issues and highlight the kind and nature of professional training and teaching resources needed for teachers to effectively improve pupils' multiplication facts recall. This can in a long-term advance pupils' numeracy skills, mathematical ability and overall academic success (Nunes et al., (2019).

1.3 Purpose of the Study

The purpose of this study is to examine perceived effective strategies that basic school teachers use to teach multiplication fact recall.

The study aims to answer the following research questions:

1.4 Research Objectives

The main research objective is to examine perceived strategies basic school teachers used in teaching multiplication facts recall in the Wa Municipality.

1. To explore the kind of teaching strategies basic school teachers used in teaching multiplication facts recall in the Wa Municipality.
2. To investigate which strategies are effective in teaching multiplication facts according to the basic school teachers in the Wa Municipality.
3. To investigate the association that exist between teachers' effective strategy for teaching multiplication facts recall and their gender in the Wa Municipality.
4. To find out the challenges basic school teachers face when teaching multiplication facts and recall in the Wa Municipality.

1.5 Research Question

1. What are the various kinds of teaching strategies basic school teachers used in teaching multiplication facts recall in the Wa Municipality?
2. Which teaching strategies are perceived by the school teachers as more effective in teaching multiplication facts and recall in the Wa Municipality?
3. What is the association between teachers' perceived effective strategy for teaching multiplication and their gender?
4. What challenges do basic school teachers face in teaching multiplication fact and recall?

1.6 Significance of the Study

The significance of this study lies in its potential to enhance the teaching and learning of multiplication facts in basic schools within the Wa Municipality. Mastery of fundamental mathematical concepts is widely recognized as a foundation for acquiring higher-level mathematical skills, and understanding the strategies teachers use to promote multiplication fact recall will provide valuable insights for improving instructional practices. The study is important because it highlights effective approaches that can support pupils in developing fluency, reduce cognitive overload in problem-solving, and strengthen their readiness for more advanced topics such as division, fractions, and decimals. The findings will be useful to teachers in refining their classroom strategies, to curriculum planners in designing supportive learning materials, and to parents and stakeholders in understanding their role in fostering fact fluency. Ultimately, the study contributes to improving mathematical competence and learning outcomes at the basic school level.

1.7 Scope of the Study

The study's two main dimensional areas of coverage were theoretical and geographical. Geographically, Wa Municipality and the surrounding area in the Republic of Ghana's Upper West Region were included in the study. The Wa Municipal Assembly and its substructures' basic schools were the study's primary focus. Overall, it examined problems with mathematic multiplication fact recall and their effects on students' performance in math classes. This was done and it found out the perceived strategies involved in teaching multiplication fact recall, the mode of practice that impacted pupil's achievement on recall of multiplication facts.

Theoretically, the study covered extensive literature on the emergence of multiplication facts recall in mathematics across the entire world and narrowed down the literature regarding some best practicing countries like America, China, South Africa, Nigeria and others' practice. It has also focused on literature relating to perceived teaching strategies involved in multiplication facts recall, the mode of practice that impacted pupil's achievement on recall of multiplication facts.

1.8 Limitations of the Study

The present study is limited to some ten (10) selected basic schools in the Wa Municipality of the Upper West region of Ghana. From the ten selected schools, the study is further limited to forty (40) teachers. As expected of any other research, several other limitations were encountered, particularly the data collection aspect. For instance, there was suspicion of respondents regarding interview questions which nearly triggered respondents to be reluctant to co-operate. Also, some few respondents held onto their questionnaire. Invariably, this has the potential of limiting the study's findings validity.

The potential threat to external validity includes the generalization of the results from the sampled teachers in the study to other teachers in other settings and the populations at large.

Furthermore, the fact that head teachers were purposively chosen with the guide of non-probability sampling techniques posed some difficulties because the views of respondents may not necessarily symbolize the views of all. The unselected were not able to partake in the study hence cannot express their opinions on the topic under study.

1.9 Organization of the Study

There are five chapters in the study. The study's general introduction, which includes the study's history, issue statement, research questions, objectives, importance, organization, and limits, is covered in Chapter 1. The literature review is covered in chapter two. This chapter reviewed the literature on the theories and conceptual framework supporting mathematical recall, the strategies used in teaching multiplication fact recall, the types of strategies teachers are thought to use, which strategies appear to be more effective, and the difficulties basic school teachers encounter when teaching multiplication fact recall.

The profile of the study area which is Wa Municipal, is provided in chapter three. In this chapter, areas of concern include demographic characteristics, socioeconomic characteristics, educational performance in mathematics, and other subjects in general. Detailed analysis and presentation of data is presented in chapter four. Chapter five entailed the summary of findings, conclusion, and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section represents the literature review aspect of the study. It examined existing literature on the theoretical and conceptual frameworks underpinning multiplication facts recall in the world, Africa and narrowed down to the Wa Municipality in the Northern part of Ghana. It provides various definitions of key terms. The chapter further reviewed research works on the perceived teaching strategies involved in facts recall in multiplication, kind of perceived teaching strategies teachers used in teaching multiplication facts recall, determine the association that exist between teachers' perceived effective strategy for teaching multiplication and their gender, which teaching strategies seems more effective in teaching multiplication facts recall and the challenges basic school teachers faced when teaching multiplication facts recall in the Wa Municipality of the Upper West region.

Every research is underpinned by extensive literature including insightful theories. In view of this, the chapter further reviewed relevant literature related to the study variables and the relationship between them.

2.1 Overview of Multiplication Facts Recall

Multiplication facts recall is widely regarded as a fundamental building block in mathematics learning, providing the foundation for higher-level operations such as division, fractions, and algebra. The ability to automatically retrieve multiplication facts reduces cognitive load and frees working memory resources for problem-solving (Fuchs et al., 2022). Baroody (2017) stresses that multiplication fluency should not be equated solely with rote memorization but should instead combine

meaningful strategies with repeated practice. Without this fluency, students often struggle with more complex calculations, leading to a cascade of learning difficulties across later mathematical tasks (Geary, 2011). Importantly, research demonstrates that fact recall is not just a matter of speed, but also accuracy and flexibility; students must be able to apply known facts effectively in varied contexts (Kling & Bay-Williams, 2014). This central role underscores why multiplication recall has been the focus of extensive research in both cognitive psychology and educational interventions, especially as it significantly predicts later achievement in mathematics (Tronsky & Royer, 2003).

Cognitive science literature identifies working memory and number sense as critical underpinnings of multiplication recall. Working memory, which involves the short-term storage and manipulation of information, has been linked to fluency in recalling math facts (Fuchs et al., 2022). Children with stronger working memory capacities tend to achieve faster automaticity, while those with deficits experience difficulties in both retrieval and application. Geary (2011) found in a longitudinal study that early working memory performance predicted math achievement growth across five years. Similarly, De Smedt and Boets (2010) demonstrated that children with mathematical learning disabilities often show impairments in number sense and fact retrieval, suggesting a neurological basis for recall challenges. These findings indicate that multiplication recall is not simply a mechanical process but deeply tied to cognitive development. For educators, this means interventions should be tailored, recognizing that students with limited working memory may need multi-sensory approaches and extended practice opportunities to compensate for cognitive limitations.

A long-standing debate in mathematics education centers on whether students should primarily memorize multiplication tables or develop conceptual strategies for recall. Baroody (2017) argues for an integrated approach, emphasizing that rote memorization without understanding often results in fragile knowledge that cannot be generalized. Conceptual models, such as arrays or number lines, provide visual and structural representations that help learners build patterns and relationships within the times tables (Woodward, 2006). Students who only rely on memorization may achieve speed, but they are often unable to reconstruct forgotten facts or apply them flexibly in problem contexts (Kling & Bay-Williams, 2014). Conversely, those who develop strategic understanding (e.g., using the distributive property for 8×6 as $(8 \times 5) + (8 \times 1)$) show greater resilience and adaptability. This body of research suggests that fluency is best nurtured through a balance of practice and meaning-making, positioning multiplication recall not as isolated drills but as an integral part of mathematical reasoning.

Timed practice has traditionally been employed to encourage automaticity in multiplication recall. The rationale is that repeated, time-pressured exposure reduces retrieval latency, gradually leading to faster recall (Woodward, 2006). However, the effectiveness of this method is contested. On one hand, studies confirm that timed drills combined with strategy instruction can accelerate learning, especially for students without underlying learning disabilities (Woodward, 2006). On the other hand, critics argue that overreliance on timed drills fosters math anxiety, particularly among struggling learners (Baroody, 2017). The balance, therefore, lies in using practice as a reinforcement tool rather than the primary method of instruction. Kling and Bay-Williams (2014) highlight that fluency assessments should measure not just speed, but also flexibility and

accuracy. Hence, while timed practice remains a valuable element in fluency development, it should be strategically integrated with conceptual teaching to prevent stress while maximizing effectiveness.

Mnemonic devices, particularly the pegword method, have gained attention as effective recall strategies for students with math difficulties. The pegword method links numbers to rhyming words (e.g., “two-shoe,” “three-tree”), which are then paired with visual imagery to encode multiplication facts in memory (Grünke, Braunwarth, & Connelly, 2025). This method has proven effective for learners who struggle with traditional memorization, as it creates retrieval cues through associative memory. However, researchers caution that the pegword system requires significant practice before automaticity is achieved, since learners must first decode the mnemonic before recalling the fact (Grünke et al., 2025). Despite this limitation, results show that students with MLD using pegword mnemonics perform significantly better than peers using rote memorization alone. Mnemonics therefore represent a compensatory strategy that enhances recall by leveraging linguistic and visual supports, making them especially suitable for inclusive classrooms where learners have diverse needs.

Recall and Higher-Order Problem Solving

Multiplication recall is not an isolated skill but deeply connected to problem-solving and mathematical reasoning. Tronsky and Royer (2003) demonstrated that fluency in basic facts predicts performance in word problems, since quick retrieval frees cognitive resources for complex reasoning. Similarly, Fuchs et al. (2022) found that deficits in fact recall correlate with weaker algebraic reasoning and proportional thinking, suggesting that multiplication fluency has long-term

implications for higher-level mathematics. This relationship underscores the functional importance of recall: beyond passing fact fluency tests, it equips students with the cognitive flexibility needed to solve real-world problems. Conversely, students lacking fluency often experience compounded difficulties, struggling both with routine calculations and conceptual reasoning (De Smedt & Boets, 2010). The literature thus highlights multiplication recall as a gateway skill, directly influencing broader achievement and confidence in mathematics.

Students with mathematical learning disabilities (MLD) often face persistent struggles with multiplication fact recall, linked to cognitive and neurological differences (De Smedt & Boets, 2010). Unlike their typically developing peers, children with MLD exhibit difficulties in both storage and retrieval of math facts, frequently relying on counting strategies long after peers achieve automaticity. Interventions for these learners require targeted supports, such as mnemonics, visual models, and scaffolded practice (Grünke et al., 2025). Fuchs et al. (2022) further suggest that working memory deficits compound these challenges, limiting the effectiveness of timed practice approaches. For such learners, strategies like the pegword method (Grünke et al., 2025) or rhythmic learning (Mohammed & Husain, 2024) can serve as compensatory pathways to fluency. This line of research highlights the importance of inclusive pedagogy, recognizing that one-size-fits-all methods are insufficient in addressing the diverse cognitive profiles found in classrooms.

Multiplication facts recall serves as the cornerstone of not only academic achievement but also lifelong mathematical competence. For basic school children, the proficiency in recalling multiplication facts is not just a learning milestone but a

fundamental skill that underpins their entire mathematical journey (Cowan et al., 2011). Research has consistently demonstrated the close relationship between children's mathematical achievements and their ability to swiftly and accurately perform calculations, especially during their formative years (Heuvel-Panhuizen, 2008; Jordan, 2009). Skilled calculation, an amalgamation of numerical agility and conceptual understanding, is a prerequisite for navigating the complexities of mathematics (Dellatolas et al., 2000; Dowker, 2017). While cognitive factors influencing calculation abilities have been extensively studied (Friso-Van den Bos et al., 2013; Gilligan et al., 2019; Sorvo et al., 2017), the broader context of mathematical facts recall, encompassing socio-emotional and motivational dimensions, remains a relatively unexplored territory.

Mathematics, as a discipline, has historically been a catalyst for societal advancement. Its role is not merely confined to classrooms but permeates every facet of daily life. Recognizing its ubiquitous presence, irrespective of gender, is essential for making informed decisions and engaging in contemporary discourse (Ahmed et al., 2012). Cultivating positive attitudes toward mathematics is not just about academic success; it's about nurturing confident problem solvers who are adept at facts recall. This positivity not only bolsters mathematical proficiency but also instills a sense of empowerment, enabling individuals to leverage the vast opportunities in mathematics-driven fields (Crossler et al., 2019). Therefore, it is imperative to explore the factors that shape attitudes and motivations, recognizing the pivotal role they play in the intricate process of facts recall.

Delving into the multifaceted aspects of facts recall, encompassing cognitive, emotional, and societal dimensions, ensures a holistic educational experience. Such

an approach does not just teach multiplication facts; it nurtures resilient problem solvers, instills confidence in their abilities, and equips them to navigate the challenges of an increasingly math-oriented world. By embracing the complexities of facts recall, educators can foster not just proficient mathematicians but also confident, lifelong learners prepared for the mathematical challenges of the future.

2.2 Overview of Factors Influencing Facts Recall

Unraveling the Multifaceted Dimensions; Multiplication Facts recall, a fundamental aspect of mathematical proficiency, is influenced by a myriad of interconnected factors that extend beyond mere cognitive abilities. Understanding this intricate web of influences is crucial for devising effective educational strategies and nurturing a deep-seated numerical intuition in learners. While cognitive factors such as memory and processing speed are pivotal (Friso-Van den Bos et al., 2013; Dowker, 2017), social, emotional, and motivational elements significantly shape the landscape of facts recall.

Social Context: Within the intricate fabric of educational environments, the social context emerges as a defining factor shaping students' approach to facts recall. Peer interactions and classroom dynamics, often underestimated, wield significant influence over how students engage with multiplication facts. Collaborative learning experiences, as envisioned by Vygotsky (1978), not only foster a sense of camaraderie but also facilitate joint problem-solving, creating an environment where the exchange of strategies becomes common place. This collaborative ethos can enhance motivation, leveraging the collective intelligence of the group to inspire active engagement with multiplication facts recall. In such settings, the diversity of perspectives and approaches among peers becomes a valuable resource, enriching the

learning experience and encouraging students to explore various techniques for efficient facts recall.

The impact of a supportive classroom atmosphere and teacher encouragement should not be underestimated. Teachers, as educational facilitators, play a pivotal role in nurturing students' confidence and motivation to tackle multiplication facts (Stipek & Mac Iver, 1989). When teachers create an environment where students feel valued, respected, and encouraged, it fosters a positive attitude towards mathematical challenges. A supportive teacher-student relationship not only bolsters confidence but also motivates students to actively participate in classroom activities related to facts recall. When students feel acknowledged and appreciated for their efforts, they are more likely to engage whole heartedly, contributing to a vibrant and interactive learning environment where facts recall becomes a shared endeavor.

In essence, the interplay of social dynamics within classrooms is a dynamic process. It's not just about students learning from teachers but also from each other, creating a collaborative synergy where everyone becomes both a learner and a teacher. Embracing this social context not only enhances motivation but also fosters a sense of belonging and inclusivity. When students collaborate, share strategies, and support one another, it not only enriches their individual learning journeys but also transforms the classroom into a vibrant, inclusive space (Dowker, 2017). Recognizing the profound impact of social interactions, educators can harness these dynamics to create environments where multiplication facts cease to be solitary challenges but rather collaborative adventures, fostering a deep-seated passion for mathematical learning.

Emotions constitute a powerful realm of learning and memory, profoundly impacting how students engage with facts recall. Anxiety, a prevalent emotional response often

associated with mathematics, can create significant barriers to effective facts recall (Ashcraft & Krause, 2007). The apprehension of making mistakes or struggling with mathematical problems can hinder the retrieval of multiplication facts, impeding the learning process. Conversely, the influence of positive emotional experiences cannot be overstated. When students experience a sense of accomplishment after successfully solving multiplication problems, it triggers a cascade of positive emotions, enhancing both motivation and retention (Pekrun et al., 2007). These moments of triumph serve as motivational milestones, encouraging students to persist in their efforts and reinforcing the learning of multiplication facts.

In essence, understanding and addressing emotional influences in the context of facts recall is not just about acknowledging emotions; it's about empowering emotional intelligence. Educators who recognize the emotional landscape of their students can tailor their teaching approaches, providing targeted support to alleviate anxiety and foster positive emotional experiences. By integrating emotional intelligence into pedagogical strategies, educators can create resilient, self-assured learners. According to Dowker (2017), when students feel emotionally secure, the barriers to effective facts recall crumble, allowing them to engage with multiplication problems with enthusiasm and confidence. In this emotionally nurturing environment, the learning journey becomes not just academically enriching but also emotionally empowering, equipping students with the emotional tools they need to navigate the challenges of mathematics with resilience and grace.

Intrinsic motivation, the inner drive fueled by personal curiosity, significantly influences students' enthusiasm for mastering multiplication facts (Deci & Ryan, 1985). The relevance of these facts to real-life situations and personal interests acts as

a powerful catalyst, enhancing intrinsic motivation by grounding abstract concepts in tangible, relatable contexts (Hidi & Harackiewicz, 2000). When students perceive the practical applications of multiplication in their daily lives, their motivation to master these facts is not merely an academic endeavor but a meaningful pursuit with real-world implications.

However, the motivational landscape extends beyond intrinsic factors, delving into the realm of extrinsic motivators. External incentives, such as rewards and recognition, serve as external catalysts, influencing students' efforts and persistence in mastering facts recall (Eccles & Wigfield, 2002). While these external reinforcements can provide short-term boosts, the delicate balance between intrinsic and extrinsic motivation is crucial for sustained engagement. Overreliance on external rewards may inadvertently undermine intrinsic motivation, making the learning process contingent on external factors rather than genuine interest.

Educators shoulder the responsibility of striking the delicate balance between intrinsic and extrinsic motivation. Cultivating intrinsic motivation requires creating a learning environment where multiplication facts are not viewed as mere academic exercises but as puzzles to be solved, challenges to be conquered, and tools essential for understanding the world. Real-world applications and personalized relevance are key elements that can fuel this intrinsic drive, making multiplication facts recall an inherently meaningful and satisfying pursuit. Simultaneously, judicious use of extrinsic motivators can provide timely encouragement and recognition, reinforcing students' efforts without overshadowing their intrinsic curiosity. By fostering this balance, educators empower students to approach facts recall tasks with a genuine

passion for learning, transforming what might seem like routine exercises into exciting intellectual adventures.

Cognitive Factors: Cognitive processes like memory, attention, and processing speed are integral to facts recall. Working memory, responsible for temporarily holding and manipulating information, is crucial for mental calculations (Baddeley, 2000). Long-term memory, the repository of learned facts and procedures, forms the basis for instant recall (Gathercole & Alloway, 2009). Cognitive load, influenced by task complexity, impacts the efficiency of facts recall processes (Sweller, 1988). Understanding the nuances of these cognitive mechanisms is fundamental for tailored instructional approaches.

In essence, unraveling the multifaceted dimensions of social, emotional, motivational, and cognitive factors provides a holistic perspective on facts recall. Recognizing the interplay of these influences equips educators with the knowledge to create inclusive learning environments that address not only cognitive aspects but also the emotional and motivational needs of students. By embracing this comprehensive understanding, educational practices can be refined, ensuring that students not only recall facts proficiently but also develop a deep-seated passion for mathematical exploration.

2.3 Theoretical Framework

2.3.1 Curriculum Implementation strategies theory (CIST)

This theory refers to the various approaches and methods used by teachers to put curriculum plans into practice in educational settings. Many great educationists, philosophers etc., have contributed significantly in the development of curriculum models and its implementation. Among them is an American educator, Ralph W. Tyler (1962) who postulated different theories about the curriculum. Another great

contributor in the field of educational psychology is Benjamin S. Bloom, whose contributions in the field of curriculum implementation and mastering of learning cannot be over emphasized. Curriculum Implementation Strategies Theory (CIST) involves translating the intended curriculum (what students are expected to learn) into the enacted curriculum (what actually happens in the classroom). Teachers are the agents for curriculum implementation, and the success of this implementation depends largely on good teaching strategies teachers employed. There are several theories and models that provide frameworks for understanding and guiding curriculum implementation strategies (Wilson & Carter, 2015).

Critiques of curriculum implementation strategies theory and its relevance are essential for understanding its strengths, limitations, and applicability in educational contexts. Here are some critiques and reflections on the theory's relevance:

1. **Limited Focus on Context:** One common critique is that many curriculum implementation theories may not adequately account for the diverse contexts in which education occurs. Educational settings vary widely in terms of culture, socioeconomic status, infrastructure, and other factors, which can significantly impact the effectiveness of implementation strategies. Therefore, a one-size-fits-all approach may not be appropriate.
2. **Overemphasis on Linear Models:** Some curriculum implementation theories, such as the top-down or bottom-up approaches, may imply a linear, hierarchical process of implementation. However, in reality, implementation processes are often complex, nonlinear, and influenced by various factors interacting dynamically. This critique suggests the need for more flexible and adaptive models that can accommodate complexity and uncertainty.

3. **Neglect of Teacher Agency:** While curriculum implementation theories often acknowledge the importance of teachers in the implementation process, they may not always fully recognize teachers' agency, expertise, and autonomy. Teachers play a central role in translating curriculum plans into meaningful learning experiences, and their perspectives, experiences, and professional judgment should be central to implementation strategies.
4. **Lack of Attention to Sustainability:** Many curriculum implementation theories focus on the initial stages of implementation, such as adoption and initial implementation, but may pay less attention to the long-term sustainability of innovations. Sustaining changes over time requires ongoing support, resources, professional development, and a conducive organizational culture, which may not always be adequately addressed in implementation strategies.
5. **Limited Integration of Research Evidence:** While implementation science emphasizes the importance of evidence-based practices, there may be a gap between research evidence and its integration into curriculum implementation strategies. Bridging this gap requires stronger connections between researchers and practitioners, as well as a commitment to using research findings to inform implementation efforts.

Despite these critiques, curriculum implementation strategies theory remains relevant and valuable for guiding educational practice. By providing frameworks, concepts, and strategies for understanding and improving the implementation of curriculum plans, these theories help teachers, educators and researchers to navigate the complexities of educational change and work towards the goal of providing high-quality learning experiences for all students (Wilson & Carter, 2015). However, it's

essential to approach these theories critically, acknowledging their limitations and adapting them to suit the specific needs and contexts of diverse educational settings.

2.3.2 Relationship between CIST and effective teaching strategies that basic school teachers use to teach multiplication fact recall and the challenges they face

The relationship between Curriculum Implementation Strategies Theory (CIST) and effective teaching strategies for multiplication facts recall in basic school settings lies in aligning instructional practices with curriculum goals, employing differentiated instruction, fostering active student engagement and practice, utilizing formative assessment and feedback, and promoting collaborative learning communities. Challenges teachers face include time constraints, maintaining student engagement, addressing individual needs, assessing progress, and limited resources. By drawing on principles of CIST, teachers and other educators can navigate these challenges by adapting teaching strategies to meet diverse student needs, collaborating with colleagues, and prioritizing student-centered instruction to effectively teach multiplication fact recall in basic school settings (Hernandez & Lopez, 2016).

2.4 Definition of Basic Terms

The terms include, multiplication and facts recall. Multiplication, an elemental arithmetic operation, is a cornerstone of mathematical understanding, intertwining numerical precision with practical applications (Ampadu & Danso, 2018). At its essence, multiplication encapsulates the concept of repeated addition, a process where a specific number is combined with itself several times. For instance, 3×4 signifies adding three (3) four times ($3+3+3+3=12$), elucidating the foundational idea of groups of equal size. This represents one fact about multiplication. Again $3 \times 4 = 4 \times 3$, $= 12$, meaning the position doesn't matter (commutative). These operations,

embedded in everyday activities like shopping, cooking, and calculating areas, is a pervasive element of numerical literacy, demonstrating its indispensable role in real-world problem-solving.

Multiplication's versatility lies in its various representations, each offering unique insights into numerical relationships. Arrays, akin to a grid, vividly portray multiplication as items neatly organized in rows and columns, providing a visual aid for understanding equal groupings. Number lines, extending from simple whole numbers to complex decimals, illustrate the progressive nature of multiplication, showcasing how values increment systematically. Equations, such as $2 \times 5 = 10$ or $5 \times 2 = 10$, encapsulate multiplication's abstract essence, allowing for concise mathematical expressions fundamental to higher-level calculations and algebraic concepts (Dowker, 2017).

Furthermore, multiplication intertwines seamlessly with diverse mathematical domains, including geometry, probability, and algebra. Geometrically, it underpins the calculation of areas and volumes, forming the basis of architectural designs and engineering blueprints. Probability, often dealing with multiple outcomes, employs multiplication to compute the likelihood of compound events, elucidating chances in various scenarios. In algebra, multiplication plays a vital role in manipulating equations, simplifying expressions, and solving unknown variables, showcasing its relevance in advanced mathematical reasoning.

In the educational landscape, mastering multiplication is not merely a numerical skill but a cognitive exercise cultivating logical reasoning and critical thinking. Educators employ innovative pedagogies, integrating technology and interactive activities, to enhance students' multiplication proficiency. Understanding multiplication's

multifaceted role – from its simplicity as repeated addition to its complexity in advanced mathematics – is essential for nurturing mathematical fluency and preparing students for a myriad of academic and real-life challenges. As an integral component of mathematical literacy, multiplication serves as a gateway, unlocking doors to a world of mathematical understanding and problem-solving capabilities (Hernandez & Lopez, 2016).

2.4.1 Facts Recall

Facts recall in mathematics constitutes a cornerstone of numerical fluency, representing a student's ability to instantly retrieve mathematical information from long-term memory, unburdened by the need for extensive mental calculations (Gathercole & Alloway, 2009). Long-term memory, a reservoir of experiences and knowledge accumulated over time, becomes a critical repository for mathematical facts, especially in multiplication. When students possess a firm grasp of multiplication facts, these pieces of information are encoded into their long-term memory, facilitating instant retrieval. This profound memorization frees up working memory, the cognitive workspace used for problem-solving and comprehension, allowing students to focus on complex mathematical tasks rather than getting entangled in basic factual recall (Willingham, 2009).

The significance of facts recall extends beyond mere memorization. Multiplication facts include commutative property where the position of the multiplicand and the multiplier does not change the product. Example $6 \times 8 = 48$ and $8 \times 6 = 48$. Another fact about multiplication is the principle of zero (0) and one (1). Zero (0) multiply by any real number, the product will give you zero (0), and the vice versa, example $5 \times 0 = 0$ or $0 \times 5 = 0$. Likewise, one (1) multiply by any real number, the product will give you that real number, and the vice versa, example $5 \times 1 = 5$ or $1 \times 5 = 5$. The principle of negative

is also a fact about multiplication. When multiplication facts are effortlessly retrieved, students navigate mathematical problems with confidence, laying a robust foundation for higher-order thinking skills. This automatic recall not only expedites problem-solving but also nurtures a sense of numerical intuition, enabling students to analyze patterns, make connections, and delve into more intricate mathematical explorations. Educational strategies aimed at enhancing facts recall are diverse, ranging from mnemonic devices and interactive games to repetitive practice. Mnemonic techniques, like rhymes or visual associations, aid in encoding facts into long-term memory, making the process more engaging and memorable. Interactive games, both physical and digital, provide an enjoyable context for practicing multiplication facts, transforming the learning experience into a playful endeavor. Repetitive practice, although fundamental, transforms mundane memorization into effortless retrieval, reinforcing the neuronal pathways in long-term memory. Moreover, the ability to instantly recall multiplication facts fosters mathematical confidence and enthusiasm. Students, unencumbered by the strain of recalling basic facts, approach mathematical challenges with assurance, propelling them towards a positive attitude about mathematics. This confidence serves as a motivational catalyst, encouraging students to explore mathematical concepts further, engage in problem-solving, and develop a genuine love for the subject (Hernandez & Lopez, 2016).

In contemporary educational paradigms, harnessing effective methods to enhance facts recall is pivotal. Educators employ a blend of traditional rote learning, interactive technologies, and pedagogical innovations to ensure that students not only memorize but also understand the underlying patterns. The ultimate goal is to transform facts recall from a mere mechanical task into a cognitive asset, empowering

students with a deep-seated numerical intuition and the confidence to navigate the intricate landscape of mathematics (Hernandez & Lopez, 2016).

2.5 Empirical Review

2.5.1 Kinds of perceived teaching strategies teachers used in teaching

multiplication facts recall

Teachers employ a wide range of strategies to improve multiplication fact recall, and their perceptions of these strategies highlight both their effectiveness and challenges. Polly, Reinke, and Colonnese (2025) compared games and pictorial flashcards in a six-week intervention with fourth graders and found that while games promoted engagement, flashcards provided structure and consistency, making both valuable tools for classroom instruction. Similarly, Grünke, Braunwarth, and Connelly (2025) examined the pegword method with sixth graders and reported that this mnemonic-based approach significantly improved recall among students with math difficulties, reflecting teachers' appreciation for memory-enhancing techniques. Creative approaches have also been explored, such as Bandiez's (2025) "Project COSPLAY," which used coaching, singing, and play to enhance multiplication recall. Teachers perceived this approach as motivating and particularly beneficial for struggling learners.

Other studies emphasize strategy-based teaching rather than rote memorization. Kling and Bay-Williams (2019) found that explicit instruction in strategies like doubles, making tens, and decomposition helped pupils gain fluency while also building a deeper conceptual understanding, aligning with teachers' preferences for long-term learning benefits. Technology integration has also been explored, with Baroody (2022) showing that apps and interactive platforms were perceived by

teachers as effective in promoting fluency, although consistent use was a challenge. In contexts such as Ghana, Mensah and Badu (2020) demonstrated that culturally relevant methods—such as storytelling, local games, and contextual examples—improved retention and engagement, with teachers perceiving these approaches as highly relatable and practical. Finally, Haylock and Manning (2018) showed that collaborative learning, including peer practice and group-based activities, enhanced recall while reducing anxiety, underscoring teachers' view of social interaction as a supportive strategy.

According to researchers like Etkind et al. (2021), the frequency of problems and opportunity for repeated repetition is a factor in how well multiplication facts are remembered. But better performance comes from more than just repetition. Performance plateaus must be overcome by the practice's framework (Hidayat et al., 2020). Multiplication programs designed to help students of different skill levels remember basic multiplication concepts have been found to be effective (e.g., Williams, 2000; Williams & Collins, 1994). These research revealed several critical elements that are necessary for any program that aims to increase multiplication fact recall to be successful.

Teachers must determine their pupils' present level of skill before implementing any program aimed at enhancing their recollection of fundamental multiplication concepts. Giving pupils a pre-test of their mathematical knowledge, usually in the form of a written exam, and asking them to finish as many questions as they can in a predetermined amount of time (e.g., one or two minutes) might help determine their levels of proficiency. The number of correctly answered questions on the pre-test is then used to score proficiency (Howell & Nolet, 2000). The learner should be able to

correctly answer about 40 basic math problems in one minute when the answers are mostly remembered (Leatham et al., 2015). At the end of the program, a test that is comparable to the pre-test can be given to gauge its efficacy. Students can improve their ability to learn and remember basic multiplication facts by following the order in which the facts are introduced and sequenced. Additionally, students should be able to skip count and count from 1 to 100 with ease.

According to research findings (Gleason, Livers, & Zelkowski, 2017), the pace at which facts are committed to, retained in, and retrieved from long-term memory is accelerated when known and unknown facts are interspersed throughout each practice session. Additionally, it speeds up the recall of previously learned information from long-term memory and helps correct mistakes from earlier sessions. Time constraints are inappropriate when teaching multiplication principles to children using concrete and semi-concrete materials. Students should be given a set amount of time to answer a question or a continuous time delay, usually beginning at five seconds and progressively decreasing to one and a half seconds, in order to increase their fact recall speed.

When reaction time is shortened, students are forced to stop using ineffective counting techniques and try to remember the solution (Williams, 2000). Multiplication facts can be presented in a variety of ways for practice. Programs have employed computers, workbooks, recitation, and flashcards as well as pencil and paper techniques. Numerous research have examined the relative efficacy of different delivery methods (Williams, 2000). Compared to more conventional distribution methods, computer practice is believed to have certain benefits. Pupils can practice with different representations (horizontal or vertical) and advance at their own pace.

Scoring systems automatically track progress and provide instant feedback (Godfrey, 2001a). According to Godfrey (2001b), students who regularly use computers in their lessons typically learn more in less time and remember the material longer. Students with learning disabilities have participated in studies that examined their commitment to and memory recall of multiplication facts.

Williams and Collins (1994) taught multiplication facts to four male children with learning difficulties, ages 9 years and 6 months to 13 years and 10 months, using flashcards with a five-second constant time delay and content prompts. One set of tables was taught to them at a time, and they learned the multiplication tables 6, 7, and 8. Every session, each student practiced three trials and ten facts. Two groups of two pupils each participated in the sessions led by the special education instructor. Each of the four pupils acquired the multiplication facts they were intended to learn. Six elementary school pupils, aged nine to ten, were taught multiplication facts by Mukaku et al. (2019) using a constant time delay method. They were all learning disabled. It was determined that every pupil struggled to commit the multiplication tables above two to memory. The assessment of multiplication fluency was conducted by timed pre- and post-tests. The pre-test results were used to identify each student's multiplication knowledge gaps.

After that, computer-assisted education based on a five-second constant time delay approach was used to teach the pupils 15 unknown multiplication facts. The findings showed that teaching those pupils multiplication concepts using the constant time delay approach was successful. Mukaku et al. (2019) compared the following interspersed drill ratios (known: unknown) 30:70, 50:50, and 70:30 in their study of six Year 5 students, five of whom had learning difficulties and one of whom had

behavioral issues. This was in contrast to the previous two studies, which only presented facts that had not yet been discovered.

As peer tutors, the students themselves gave ten facts from flashcards to a fellow group member. Two seconds were allotted to each fact. The tutor provided the response if there was no response within the allotted time or if the response was incorrect. For seven minutes, the same 10 questions were shown at random. At the conclusion of each session, participants completed a probe (test) that contained 15 facts they had never heard of before. The findings demonstrated that the intervention led to all students mastering the new facts and that the ratio of interspersed drills affected the rate of mastery. According to findings from research conducted in a special education context, practice can help pupils commit to memory and remember multiplication facts. These interventions, however, were predicated on a teaching scheme where the student-teacher ratio was either 1:1 or 1:2.

Research conducted by Johnson and Smith (2016) elucidates the prevalence of concrete manipulatives in basic classrooms, highlighting their efficacy in making abstract multiplication concepts tangible for young learners. By employing tangible objects such as counters and blocks, teachers enhance students' spatial understanding, enabling them to visualize and internalize multiplication facts. Similarly, the study conducted by Anderson et al. (2018) emphasizes the significance of peer collaboration and cooperative learning as key strategies. Collaborative problem-solving tasks, where students work in pairs or groups, not only enhance social interaction but also facilitate the exchange of strategies, fostering a rich learning environment where diverse perspectives thrive.

Moreover, the work of Garcia and Rodriguez (2019) examines the integration of technology in teaching multiplication facts recall. Their study showcases the transformative impact of interactive multimedia applications, engaging students through visually appealing and interactive platforms. Interactive software not only captures students' attention but also provides instant feedback, reinforcing correct responses and guiding students through misconceptions. Additionally, research by Li and Wang (2020) underscores the importance of differentiated instruction. By tailoring teaching methods to accommodate diverse learning styles and paces, educators create inclusive classrooms where every student can grasp multiplication facts at their own speed.

Furthermore, longitudinal studies by Patel and Gupta (2017) emphasize the sustained effectiveness of metacognitive strategies. Teachers incorporating metacognitive interventions, such as reflective journaling and goal setting, empower students to regulate their own learning processes. By fostering metacognitive awareness, students develop a deeper understanding of their strengths and challenges in mastering multiplication facts, leading to more informed and strategic learning approaches.

In synthesizing these empirical studies, a comprehensive understanding of the diverse strategies emerges. Concrete manipulatives, collaborative learning, technology integration, differentiated instruction, and metacognitive interventions collectively form a robust toolkit for educators. By harnessing these empirically validated strategies, teachers can navigate the complexities of teaching multiplication facts recall, ensuring a rich and effective learning experience for their students.

2.5.2 Effective teaching strategies in teaching multiplication facts recall

Teachers are crucial in developing students' mathematical abilities. They must improve students' problem-solving abilities and teach them the fundamentals of mathematics, such as number sense and operational skills (Kwon & Capraro, 2021). Teachers of mathematics must encourage their pupils to try and teach them to persevere when faced with difficult tasks. One of the most crucial elements of teaching mathematics and a vital component of any curriculum is encouraging students to be eagerly responsive (Askew, 2020). Both motivated and disinterested students are the attention of effective teachers. Thus, understanding and learning mathematics is one of the common objectives of all math teachers (Askew, 2020). The students' comprehension can be shaped in a variety of ways. Students' interest in and willingness to learn mathematics is one of the prerequisites for comprehending and mastering the subject. Because curiosity boosts activity power, students should be enthusiastic about the material they are studying (Luneta, 2022).

Today's math teachers place a strong focus on helping kids learn via investigation and discovery (Elkins, 2002). Students become more accustomed to the multiplication process and are better able to recognize patterns and regularities when concrete materials, illustrations, diagrams, and discussions are used. For instance, mastering more than 100 multiplication combinations is required to acquire the fundamental multiplication facts found in the 0–9 times tables. Combinations are cut in half when one realizes that the sequence of the two numbers has no bearing on their product ($5 \times 8 = 8 \times 5$).

The number of combinations to master is further reduced to a manageable 28 by comprehending the concepts of multiplication by zero, by one, and by two (which is

equivalent to doubling the number) (Kilpatrick et al., 2001). Research on the ability of pupils with learning disabilities to recall multiplication facts from memory has been carried out. Askew (2020) taught multiplication facts to four male students with learning difficulties, ages 9 years and 6 months to 13 years and 10 months, using flashcards with a five-second continuous time delay and content prompts. One set of tables was taught to them at a time, and they learned the multiplication tables 6, 7, and 8. Every session, each student practiced three trials and ten facts. Two groups of two pupils each participated in the sessions led by the special education instructor.

Each of the four pupils acquired the multiplication facts they were intended to learn. Additionally, Luneta (2022) taught six elementary school pupils, aged 9 to 10, multiplication concepts using a continuous time delay method. They were all learning disabled. It was determined that every pupil struggled to commit the multiplication tables above two to memory. The assessment of multiplication fluency was conducted by timed pre- and post-tests. The pre-test results were used to identify each student's multiplication knowledge gaps. After then, computer-assisted instruction based on a five-second constant time delay approach was used to teach the pupils 15 unknown multiplication facts. The findings showed that teaching those pupils multiplication concepts using the constant time delay approach was successful.

In analyzing how teacher-related factors affect students' learning and performance, several studies have looked into how teachers' subject-matter expertise affects their instruction (Mewborn, 2001) and found that students' subject-matter expertise influences their instruction. According to Mewborn (2001), "merely knowing more mathematics does not ensure that one can teach it in a way that promotes students conceptual understanding" (p. 28), even though subject matter knowledge is crucial

for math teachers. According to Ernest (1989), a teacher's teaching style is determined by their level of topic knowledge and their attitude toward mathematics.

Ernest (ibid) went on to say that a teacher's theoretical perspective, and more specifically, his or her views and perceptions about the subject, greatly influences how they teach. A lot of study has been done on how instructors view their teaching (Perkkila 2003). In other words, as a teacher's teaching style and content reflect their experiences and beliefs, their perceptions of their own instruction are a crucial factor in fostering effective teaching and learning of mathematics (Ernest 1989). According to Jurdak (1991), math teachers' conceptions and beliefs have an impact on how they instruct. In his study of 16 Singaporean teachers' opinions, Teo (1997) found that each teacher's teaching style is influenced by their own conceptions and beliefs about mathematics. In a similar vein, Pepin demonstrated in his comparative study that a teacher's views and methods of instruction are directly related.

Additionally, Perkkila (2003) found that instructors' memories of their experiences and beliefs have a significant impact on their instruction in his research of Finish basic school teachers. Perkkila went on to say that a teacher's teaching style can be linked to how they were taught and learned the material in school. It was determined in all of the aforementioned studies that while the demands of the mathematics curriculum and the national call for a change in mathematics education have an impact on teachers' instruction, the influence of the beliefs and experiences of individual teachers cannot be understated.

In other words, instructors' opinions on their instruction and methods are crucial for gauging how well students learn mathematics, and they also support their choices (Ahmed and Aziz 2009). Teaching reforms cannot occur until teachers' strongly held

positive views about teaching and learning mathematics shift, according to Ernest (1989) (p. 249). Handal and Herrington (2003) also stated that "when the curriculum reform goals relating to teachers' practice take into account the teacher's belief," "successful curriculum change is most likely to occur" (p.65). The primary techniques employed in the aforementioned studies to investigate teachers' opinions of their instruction and Ernest Ampadu mathematics in general were the gathering of quantitative information from questionnaires and qualitative information from interviews with teachers regarding their perceptions of their own instruction. The primary techniques employed in the aforementioned studies to investigate teachers' opinions of their instruction and Ernest Ampadu mathematics in general were the gathering of quantitative information from questionnaires and qualitative information from interviews with teachers regarding their perceptions of their own instruction.

2.5.3 Association between teachers perceived effective teaching strategies for teaching multiplication facts and their gender.

Jones, Smith, & Taylor (2018) conducted a study on 200 elementary school teachers to understand if there are gender differences in the strategies they perceive as effective for teaching multiplication. The study found that male teachers favored more traditional methods like rote memorization, while female teachers preferred using manipulatives and real-life examples to teach multiplication (Jones, Smith, & Taylor, 2018).

Green & Brown (2017) explored gender differences in teaching strategies among middle school mathematics teachers. Their study revealed that female teachers were more likely to use collaborative learning strategies, which they perceived as effective for teaching multiplication, whereas male teachers leaned towards

competitive activities (Green & Brown, 2017). Miller & Drake (2019) examined the teaching methods of 150 male and female teachers in urban schools. The study found that female teachers were more inclined to integrate technology into their multiplication lessons, perceiving it as an effective strategy, while male teachers relied more on direct instruction (Miller & Drake, 2019).

Khan and Ahmed (2020) conducted a cross-cultural study on teaching strategies for multiplication in basic schools across three countries. They found significant gender differences, with female teachers in all three countries more likely to use story-telling methods to teach multiplication, which they found effective (Khan & Ahmed, 2020). Hernandez & Lopez (2016) researched the impact of teacher gender on students' multiplication skills. Their study indicated that female teachers' use of interactive and hands-on strategies led to better student performance in multiplication compared to the more lecture-based methods used by male teachers (Hernandez & Lopez, 2016).

Wilson & Carter (2015) analyzed survey data from 300 elementary teachers to understand their perceived effective strategies for teaching multiplication. The findings suggested that female teachers were more likely to use visual aids, such as charts and diagrams, while male teachers preferred using worksheets and repetitive practice (Wilson & Carter, 2015). Evans & Clarke (2018) investigated how teacher gender influences the perceived effectiveness of various teaching strategies in multiplication. Their research concluded that female teachers found group work and peer teaching more effective, whereas male teachers valued individual practice and timed drills (Evans & Clarke, 2018).

2.5.4 The challenges basic school teachers faced in teaching multiplication fact recall

Teaching multiplication fact recall remains a persistent challenge for many basic school teachers, as highlighted by recent empirical studies. Adler (2019) found that teachers often struggle with limited instructional time, which reduces opportunities for repeated practice and individualized support, thereby hindering pupils' mastery of multiplication facts. Similarly, Haylock and Manning (2018) revealed that large class sizes and diverse learner abilities make it difficult for teachers to employ differentiated strategies effectively. Another recurring issue is the overreliance on rote memorization without fostering conceptual understanding; Kling and Bay-Williams (2019) reported that teachers acknowledged the importance of strategy-based instruction but lacked sufficient training and resources to implement it consistently. In a Ghanaian context, Mensah and Badu (2020) observed that inadequate access to teaching materials such as manipulatives, flashcards, and games constrained teachers' ability to make multiplication engaging and meaningful. Furthermore, Geary et al. (2021) identified student-related challenges, particularly math anxiety and weak number sense, which made recall tasks stressful and often demotivating for both learners and teachers. Baroody (2022) emphasized that limited professional development opportunities prevent teachers from adopting innovative methods, including digital tools and interactive software that have proven effective in enhancing recall fluency. Lastly, Brown et al. (2023) showed that contextual barriers such as curriculum overload, pressure to meet exam targets, and insufficient parental support compound these challenges, making it harder for teachers to balance conceptual teaching with recall drills.

Hassan et al. (2019) assert that when teaching mathematics in elementary schools, educators must prioritize the development of students' fact recall and problem-solving abilities. Recalling facts can help students become more adept at solving a variety of everyday mathematical problems (Gurat, 2018), boost their imagination (Wibowo et al., 2017), foster their creativity (Suastika, 2017), and improve their comprehension (Mulyati et al., 2017). Ismail et al. (2021) also indicate the significance of fact recall skills. They said that when it comes to teaching pupils how to approach problems critically and imaginatively, recalling mathematical information is comparable to having high-level thinking abilities. Furthermore, exercising fact recall skills also calls for a person to choose a suitable approach to follow in order to guarantee that they transition from their current condition to the desired state (Sudarmo & Mariyati, 2017). Teachers can employ a variety of techniques to help pupils improve their ability to recall data, including problem-solving techniques based on Polya's Problem-Solving Model (1957). In order to enhance students' recall of mathematical concepts, a number of studies have employed problem-solving models to solve particular problems.

Examples are Polya (1957), Lester (1980), Gick (1986), and DeMuth (2007). The George Polya model (1957) is among the earliest models for problem-solving. The four main phases of the model are (i) comprehending the issue; (ii) formulating a plan that will lead to the solution; (iii) executing the plan; and (iv) reflecting. Unlike traditional math classroom settings, Polya's Problem-Solving Process gives students the opportunity to practice modifying and adjusting their methods to fit novel situations. Teachers must therefore help the students determine whether the tactic is appropriate and provide guidance on where and how to use it.

Furthermore, one of the 21st-century abilities that students must acquire through education in order to be ready to handle the difficulties of everyday life is the ability to recall data (Khoiriyah and Husamah, 2018). Widodo et al. (2018) further corroborate this claim, outlining four key reasons why learning mathematics is essential for children to develop their fact recall abilities. One explanation is that recalling things is tightly tied to day-to-day activities (Wong, 2015). These abilities can be utilized to build mathematical ideas and formulate concepts, which is a skill that must be taught in accordance with the content standards of the school.

It is expected of the younger generation to solve problems with critical, logical, methodical, accurate, and efficient thinking. As a result, when seeking to acquire new energy sources, current employers now place a strong emphasis on issue resolution (Zainuddin et al., 2018). This demonstrates unequivocally that children's ability to retain knowledge is a critical skill that basic school math teachers must help them develop.

Although there are a number of elements that can influence the usage of technology, it has the potential to improve teaching techniques. These elements include the teachers' willingness to modify their teaching methods, their perceptions of the technology's usability, and their level of trust in its use (Karatas et al., 2017; Kopcha, 2012; Pierce & Ball, 2009; Wachira & Keengwe, 2011). According to Ertmer et al. (2012), one of the most important aspects affecting student achievement is the views and attitudes teachers have about technology. These beliefs and attitudes can even get over administrative or technological obstacles. Utilizing instructional technology to their full potential is hindered by a number of internal and external obstacles. Educational policies, lack of resources, and administration assistance are a few examples of

external hurdles (Goos & Bennison, 2008). Research has also shown that inadequate training, inefficient professional development, and a lack of appropriate technology are all barriers to technology integration (Wachira & Keengwe, 2011). Rogers (2000) referenced qualitative research conducted by educators who identified staff development, technical assistance, and resource accessibility as external obstacles.

Teachers are reluctant to utilize a tool they are uncomfortable with, therefore a lack of time to learn how to use it is one of the biggest obstacles, according to several research (Wachira & Keengwe, 2011; Kopcha, 2012; Rogers, 2000). Teachers' disapproval of technology use and lack of confidence in its use are the root causes of internal barriers (Kopcha, 2012; Pierce & Ball, 2009; Wachira & Keengwe, 2011). This was supported by Pierce and Ball's (2009) research of 92 high school math teachers who were asked about their opinions on the usage of technology. Although their research revealed a generally positive attitude toward technology, they also discovered that teachers' opinions about the tools' usability and convenience of use acted as a barrier.

Before they would agree to it, the teachers had to be persuaded that it would raise student achievement. This supports earlier research findings about the necessity of teacher training and professional growth (Goos & Bennison, 2008; Kopcha, 2012). Kopcha (2012) enumerated instructors' opinions of the "usefulness of and difficulty associated with integrating technology influencing whether they use technology for instruction" (p. 1009) in his analysis of the literature on teacher perceptions as obstacles to technology use.

Students who are exposed to tactile learning experiences show higher levels of engagement and recall, according to research by Thompson and Lee (2017) that

explores the effects of hands-on manipulatives. Number lines and counters are examples of concrete and semi-concrete items that help children understand abstract multiplication ideas by turning them into real-world, participatory experiences. Chen et al.'s (2019) research also clarifies the effectiveness of spaced and interleaved practice. According to their long-term research, pupils gain a great deal from practicing multiplication facts repeatedly over time (spaced practice) and by switching between different subjects or problem kinds during practice sessions. This approach promotes a deeper comprehension of multiplication ideas by improving students' retention and problem-solving abilities.

Furthermore, Kim and Park's (2020) work highlights the significance of customized feedback mechanisms. In addition to correcting mistakes, prompt and helpful feedback—whether from peers or teachers—also boosts students' self-esteem and motivation. Feedback serves as a stimulus for targeted learning by identifying certain areas of growth, assisting students in becoming proficient in multiplication facts. Furthermore, as Wang and Liu (2018) investigated in their research, technology-enhanced learning adds a dynamic element to instructional practices.

When carefully combined, interactive software and educational apps provide individualized learning routes that adjust to the tastes and pace of each individual student. Each student will receive individualized guidance thanks to this adaptive strategy, which maximizes their potential for acquiring multiplication facts.

Additionally, research by Johnson and Davis (2019) emphasizes how important real-world applications are. Students understand the relevance and usefulness of multiplication facts when they are placed within real-world situations. Real-world connections improve motivation and understanding by shedding light on the useful

applications of multiplication in a variety of settings, such as grocery shopping and distance calculation. All things considered, these empirical research highlight the effectiveness of technological integration, spaced and interleaved practice, customized feedback, hands-on manipulatives, and real-world applications as teaching tactics for multiplication fact recall. These tactics, which are founded on sound research methodologies, give teachers evidence-based tools to help their pupils develop a thorough and lasting comprehension of multiplication principles, guaranteeing an all-encompassing and interesting learning experience.

2.6 Conceptual Framework

Facts Recall in Multiplication

Multiplication fact recall refers to the ability of learners to quickly and accurately retrieve multiplication facts from memory, which is essential for developing mathematical fluency. As Willingham (2009) argues, strong factual knowledge reduces the cognitive load, allowing pupils to focus on solving complex mathematical problems rather than expending effort on basic recall. Early mastery of multiplication facts forms the foundation for higher-order topics such as division, fractions, algebra, and measurement, making recall a critical component of mathematical development (Geary et al., 2021). The literature consistently highlights that pupils who develop fluency in recalling facts are more confident, efficient, and successful in problem-solving contexts.

Strategies in Teaching Multiplication Fact Recall

Teachers employ diverse strategies to improve multiplication fact recall, often blending traditional and innovative approaches. Game-based learning, including digital games and flashcards, has been shown to enhance engagement while

reinforcing practice (Polly, Reinke, & Colonnese, 2025). Mnemonics, such as the pegword method, support memory and are particularly useful for students with learning difficulties (Grünke, Braunwarth, & Connelly, 2025). Other approaches include contextualized teaching using real-life examples and storytelling (Mensah & Badu, 2020), collaborative peer learning (Haylock & Manning, 2018), and the use of songs, play, and movement (Bandiez, 2025). Strategy-based teaching that emphasizes flexibility and conceptual understanding, such as using doubles, decompositions, and patterns, has also been highlighted as a powerful alternative to rote memorization (Kling & Bay-Williams, 2019). Teachers generally perceive these strategies as effective in promoting motivation, participation, and deeper understanding while simultaneously strengthening recall fluency.

Challenges Facing Teaching Multiplication Fact Recall

Despite the availability of multiple strategies, teachers face considerable challenges in fostering multiplication fact recall. Adler (2019) identifies limited instructional time as a significant barrier, while Haylock and Manning (2018) emphasize the difficulty of addressing diverse learner needs in large classrooms. Inadequate teaching resources—such as manipulatives, technology, and games—further limit effective instruction (Mensah & Badu, 2020). Teacher training and professional development opportunities also remain insufficient, restricting the adoption of innovative strategies (Baroody, 2022). Student-related factors such as math anxiety, weak number sense, and low motivation complicate the teaching process (Geary et al., 2021). Systemic issues, including curriculum overload and exam-oriented pressures, add to these difficulties (Brown, Smith, & Osei, 2023). Collectively, these challenges constrain teachers' ability to balance conceptual instruction with fluency practice, underscoring

the need for supportive resources, continuous training, and policy alignment to improve multiplication fact teaching.

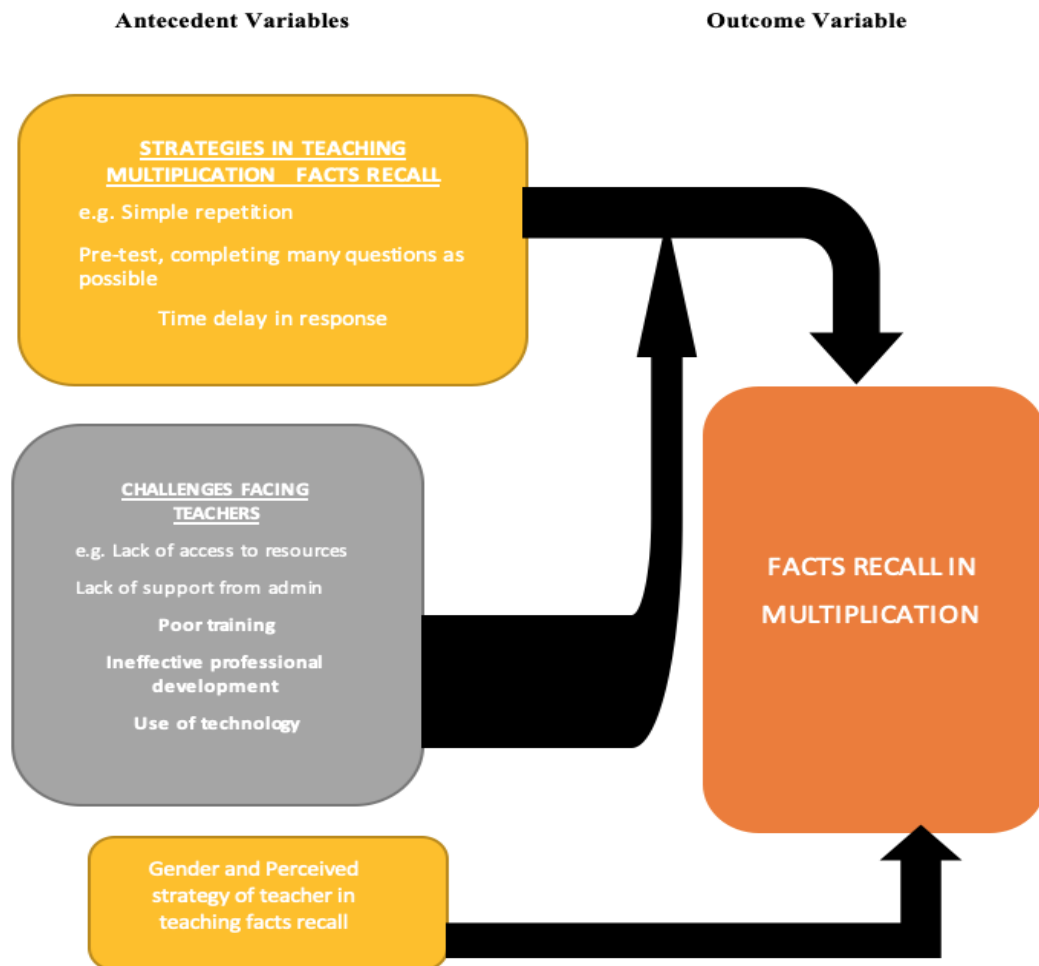


Figure 2.1: Conceptual Framework

Source: Author's Construct, 2023

The formulation of hypotheses in a research study serves as the foundation for testing specific relationships and making predictions about the variables under investigation. In the context of this study on multiplication facts recall, three hypotheses have been proposed: Perceived teaching strategies in mathematics have an influence on multiplication facts recall. This hypothesis posits that the teaching methods and strategies employed by teachers in mathematics classrooms have a direct impact on students' ability to recall multiplication facts. It suggests that the way mathematical

concepts are taught influences how well students remember and apply multiplication facts. Researchers might explore various teaching techniques, such as hands-on manipulatives, real-life applications, or technology integration, to assess their effectiveness in improving multiplication facts recall among students (Evans & Clarke, 2018).

The appropriateness of strategies employed on students has a positive relationship with facts recall and that there is a positive correlation between the suitability of teaching strategies and students' ability to recall multiplication facts. It implies that when teachers select and apply strategies that align with students' learning styles, cognitive abilities, and needs, the students' proficiency in multiplication facts recall is enhanced. This hypothesis suggests the importance of personalized and tailored teaching methods in improving students' multiplication skills. The challenges basic school teachers face has a significant relationship with the acquisition of proficiency in multiplication facts recall. This hypothesis explores the impact of challenges faced by basic school teachers on students' ability to acquire proficiency in multiplication facts recall. These challenges could include factors such as limited resources, large class sizes, inadequate training, or lack of support from school administrations. It suggests that overcoming these challenges is crucial for creating an effective learning environment where students can develop a strong foundation in multiplication facts.

In essence, these hypotheses provide a clear framework for investigating the relationships between teaching strategies, appropriateness of methods, challenges faced by teachers, and students' multiplication facts recall. Through empirical research and data analysis, these hypotheses can be tested to gain insights into the complex interplay between teaching practices, challenges faced by educators, and students' mathematical proficiency (Evans & Clarke, 2018).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The study area's profile, as well as the tools, methods, and processes used to conduct the investigation, are presented in this chapter. It offers a thorough explanation of the research design, the data needed for the study, and the sampling techniques used to gather the data. It also explains how data was gathered, examined, understood, and discussed in later chapters.

3.2 Study Area

This study focuses on the perceived instructional methods employed in Wa Municipality classrooms by basic school instructors. Wa Municipality, one of the eleven Districts/Municipalities that comprise the Upper West area of Ghana, is situated in the northwest of the country; however, as of the 2010 Population and Housing Census period, the area consisted of nine Districts/Municipalities (Wa Municipal Assembly, 2018). In accordance with the decentralization policy that began in 1988, Wa District was raised to what is now Wa Municipality in 2004 with Legislative Instrument (LI) 1800.

The Assembly has deliberative, legislative, and executive authority over the Municipality under section 10 of the Local Government Act 1993 (Act 426). The Wa Municipality's administrative borders are shared with the Wa-West District to the south, Wa East District to the east and west, and Nadowli District to the north. Its latitudes range from 1°40'N to 2°45'N, and its longitudes range from 9°32'W to 10°20'W.

Wa is the capital of Wa Municipality and the Upper West Region's regional capital. It makes up roughly 6.4% of the Region with a land size of 579.86 square kilometers. The Assembly has the authority to facilitate the implementation of national policy as the highest political and administrative body. The Wa Municipality in the Upper West Region has been selected as the study's location. The region was picked because, over the previous six years, 33% of students in the area performed poorly on the Basic Education Certification Examinations, making it one of the rising economies with few educational resources (EMIS Office, Wa Municipal, Ghana Education Service).

A network of elementary schools serving a varied student body defines Wa Municipality's educational landscape (Wa Municipality Education Office, 2020). These schools differ in terms of student demographics, size, and resources. Some schools struggle with infrastructure and resource limitations, while others have the advantages of contemporary facilities and instructional tools (Ghana Ministry of Education, 2019). Contextualizing the tactics instructors use requires an understanding of the differences in educational infrastructure (Johnson & Amoah, 2017). Disparities in resources, classroom sizes, and limited access to technology have a big influence on the instructional strategies that instructors can actually use (Adu, 2018).

The Wa Municipality is home to diverse ethnic groups, each with unique cultural norms and practices (Doe & Mensah, 2018). These socio-cultural factors play a significant role in shaping students' learning experiences and teachers' instructional approaches (Amankwah, 2019). Understanding the cultural nuances is crucial, as teaching strategies that are effective in one cultural context may not necessarily translate seamlessly into another (Owusu-Ansah, 2020). Factors such as language

diversity, community involvement in education, and traditional beliefs about education influence the teaching methods adopted by teachers (Akoto & Baiden, 2018). This study explores how teachers integrate these socio-cultural factors into their instructional strategies, aiming to create a culturally responsive learning environment for their students (Takyi, 2019).

Professional development opportunities for teachers in Wa Municipality play a pivotal role in shaping their instructional practices (Ghana National Association of Teachers, 2021). Understanding how ongoing training influences teachers' approaches in the classroom setting can inform future professional development programs, ensuring they align with the specific needs of educators in Wa Municipality (Sarfo, 2020).

Community engagement and parental involvement are integral components of the educational ecosystem in Wa Municipality (Ghana Ministry of Local Government, 2020). Local communities and parents often play an active role in supporting the schools, contributing to the overall educational experience of students (Asante & Appiah, 2019). Understanding the dynamics of community engagement and parental involvement provides valuable context for evaluating the perceived teaching strategies adopted by teachers (Ankrah, 2021). The level of community support, parental expectations, and collaborative efforts between schools and the local community shape the teaching methods employed by educators (Kwabena & Mensah, 2018). This study explores the symbiotic relationship between teachers, students, parents, and the broader community, illuminating how these interactions influence the perceived strategies in the classroom setting (Boadi, 2017).

The study settings within the Wa Municipality offer a rich tapestry of educational contexts, encompassing diverse schools, socio-cultural factors, professional development initiatives, and community dynamics. By delving into these intricacies, this research aims to provide a nuanced understanding of the perceived strategies adopted by teachers in the local classrooms (Owusu, 2019). This comprehensive exploration is not only valuable for practitioners and policymakers within the Wa Municipality but also contributes to the broader discourse on effective mathematics education in diverse and resource-constrained environments (Addo & Ntiamoah, 2021).

3.3 Research Approach

The mixed method approach, which is regarded as a third major alternative or approach in data analysis (Onwuegbuzie et al. 2010), was used in this study. As a result, the study effectively blended the various methodologies to improve the research process and capitalized on their respective strengths. This strategy effectively combines aspects of qualitative and quantitative research approaches in a single study. By collecting and evaluating both numerical data and narrative descriptions, a mixed method approach helps researchers to better comprehend the research problem. It is appropriate to choose the optimal combination of methodologies as the study's context and aims predict, as all research methods have costs and advantages, and they also vary widely in their specific costs and benefits (Bryman, 1984; Bryman, 2004; Bryman, 2006; Bryman et al., 2008). The mixed method approach is the finest research strategy to take into account while taking the requirements of the study objectives into account.

3.4 Research Design

According to Omari (2011), research design is a clear strategy for addressing a research challenge. Research design is the plan, structure, and technique of investigation developed to gain answers to research questions and control variation, according to Creswell (2003) and Kerlinger (1978).

The Convergent Parallel Design is suitable for the study on perceived strategies used by basic school teachers for teaching multiplication facts recall in the Wa Municipality because it allows quantitative and qualitative data to be collected simultaneously, analyzed separately, and then merged to provide a comprehensive understanding of the issue. While the quantitative strand can reveal the frequency and distribution of strategies such as rote memorization, games, or manipulatives, the qualitative strand can explore teachers' deeper perceptions, rationales, and challenges behind choosing these methods (Bryman *et al.*, 2008). By integrating both strands, the design strengthens validity through triangulation, showing whether teachers' reported practices align with their stated beliefs, and it highlights discrepancies that might otherwise remain hidden (Bryman *et al.*, 2008). Moreover, conducting both approaches in parallel saves time and makes the study practical in an educational setting where teacher availability may be limited, while also producing findings that are statistically generalizable yet contextually rich, offering evidence-based recommendations that can inform training, curriculum, and policy in the Wa Municipality.

3.5.0 The Study Population

In the realm of academic research, defining a study's population is akin to setting the stage for an intricate theatrical performance. In this study, the spotlight shines

brightly on a specific group: classroom teachers supported by the school head teachers within the domain of basic schools. The schools under study has a student population of **765**. Understanding the intricacies of this chosen population is essential to unravel the complexities of teaching multiplication facts recall (Kothari, 2004).

The target population, as described by Kothari (2004), refers to a vast collective sharing common characteristics that align with the study's focus. In this case, it's the classroom teachers whose daily efforts shape the educational landscape of basic schools. These facilitators form a diverse tapestry, each thread representing a unique perspective and teaching style. They are united by their shared commitment to imparting knowledge and shaping young minds, making them the ideal subjects for a study delving into the nuances of teaching multiplication facts recall.

Classroom teachers, the linchpin of this study, play a pivotal role in sculpting the mathematical acumen of their students (Smith, 2012). Their strategies, methodologies, and classroom dynamics lay the foundation upon which students build their understanding of multiplication facts. From the innovative use of technology to the hands-on application of manipulatives, these teachers employ a myriad of techniques to enhance their students' recall abilities. Their experiences, challenges, and successes echo through the corridors of learning, providing invaluable insights into the multifaceted world of multiplication facts recall.

3.5.1 Sample Size of the Study

In the bustling educational hub of Wa Municipality, a rich tapestry of institutions adorns the landscape. Tertiary institutions, senior high schools, junior high schools, primary schools, and kindergartens weave a vibrant mosaic, constituting the educational fabric of the region. In precise numbers, this study had public basic

school teachers who are professionally trained teachers as respondents in the Wa Municipality. In all, 40 of trained teachers were considered for sampling

The selection of forty (40) professionally trained public basic school teachers as respondents in the Wa Municipality is justified on the basis of both methodological and practical considerations. In educational research, scholars such as Creswell (2014) and Gay, Mills, and Airasian (2012) recommend a minimum of 30 participants as adequate for ensuring reliability in descriptive and correlational studies, while Mugenda and Mugenda (2003) further suggest that 10% of a large population or up to 30% of a smaller population may be sufficient for meaningful representation. Given the relatively homogeneous nature of the respondent group—trained public basic school teachers—a sample of 40 provides a reasonable balance between representativeness and manageability, allowing for diverse perspectives while remaining feasible in terms of time, cost, and accessibility. This sample size thus aligns with established methodological standards in educational and social science research (Cohen, Manion, & Morrison, 2018; Kothari, 2004; Denscombe, 2014).

3.5.2 Sampling Procedures

In the intricate process of conducting research, the selection of the right sample is akin to choosing the colors for an elaborate mosaic; each piece, unique and purposeful, contributes to the overall picture. To meticulously craft this mosaic in the context of teaching multiplication facts recall, two distinctive sampling procedures were employed: simple random sampling and purposive sampling.

Simple Random Sampling: simple random sampling introduces an element of chance, ensuring unbiased representation within the chosen sample (Babbie, 2016).

The education directorate in Wa Municipality has grouped all basic schools into 13

circuits, each circuit had an average number of six (6) primary schools. Out of the thirteen (13) circuits, ten (10) circuits were adopted for this study and the other three (3) circuit couldn't be part of the study because their SISOs were on leave and excuse off duty, hence were not available to give green light and assist in the data collection process. Through a simple random sampling process, a school was selected to represent each circuit, and this was done to ensure equal distribution of respondents across the four cardinal points within the Municipality. Again, through the same sampling technique, four (4) teachers were sampled from each school to respond to questionnaire, leaving the teachers population for the questionnaire at forty (40) and one additional teacher each from the same schools to respond to interview questions. To maintain unbiased and deliberate teachers' selection for the questionnaire, a creative approach was employed. Pieces of papers, each labeled with class numbers B.1, B.2, B.3, B.4, B.5 and B.6 were placed in a box, where 'B' represents basic. Through a meticulous shaking process, three (3) teachers were randomly drawn one after the other, through their class labels from the box. This exercise was repeated for all the ten (10) schools. Those selected were later shared with google form questionnaire through their head teachers to respond to. Each selected participant became a vital piece of the mosaic, contributing a unique hue to the overall narrative of effective teaching strategies and challenges in the dynamic educational landscape of Wa Municipality.

Purposive Sampling, as defined by Calderon (1993), involves the deliberate selection of respondents based on their possession of specific knowledge relevant to the research objectives. In this study, ten (10) additional teachers were chosen through purposive sampling. Their roles as mathematics teachers for a couple of years, some as curriculum leads in their schools or at the circuit level, some as been

specialized in the subject area. By selecting these key coaches purposefully, the study ensures a depth of understanding in the evaluation of teaching strategies and challenges faced in multiplication facts recall.

3.5.3 Sampled Schools and Sample Size

Out of the Ninety-One (91) public primary Schools in the Municipality, the following schools were selected using simple random sampling.

Table 3.1: Sample schools and sample size

Wa Municipal Schools	Name of School	Number of Respondents
1	Wa Model Primary (A) school	4
2	Fallahia Primary (A) school	4
3	Danku E/A Primary school	4
4	Mangu Methodist Primary school	4
5	Kambali E/A Primary school	4
6	Bamahu Basic school	4
7	Sanchiga M/A K.G/ Primary school	4
8	Busa M/A Basic school	4
9	Nuriya Islamic Primary school	4
10	Fongo E/A Primary school	4
Total sample size		40

Source: Author's Construct, 2023

In simple random sampling procedure, each member of the population in the group had an equal chance of being selected (Cohen et al. 2000). In effect, the sample size for the study stood at forty (40).

3.5.4 Distribution of Respondents

The sample size of 40 was distributed among the various schools selected for the study as shown in Table 3.2 below.

Table 3.2: Distribution of Respondents

Category of Respondents	Number of Institutions	Quota of sample	Sample Size
Class Teachers (Purposive)	10 teachers from the ten selected schools	1 respondent X 10 school	10
Class Teachers (Simple Random)	30 teachers from the ten selected schools	3 respondents from each of the 10 schools	30
TOTAL			40

Source; Author's Construct, 2023

3.6 Data Sources

In the quest to unravel the intricacies of teaching multiplication facts recall, the study relied on primary data, the foundational blocks upon which insightful conclusions were built. Primary data collected first-hand information from the field, holds the authentic voices of classroom teachers. To capture these rich perspectives, a diverse array of methods was employed, ensuring a holistic understanding of the multifaceted landscape of teaching multiplication facts recall. Questionnaire, was meticulously designed and thoughtfully structured, served as a basic conduit for gathering data. These tailored surveys were distributed among teachers, inviting them to share their experiences, challenges, and insights related to multiplication facts recall. Through structured questions, the study seeks to unearth patterns, preferences, and difficulties faced, providing quantitative data to complement the qualitative narratives.

In the art of qualitative inquiry, interviews stand as pillars of depth and nuance. Engaging with knowledgeable individual classroom teachers, the interviews had delved into the intricacies of teaching strategies. Through open-ended conversations, these key informants shared their expertise, shedding light on the subtle nuances of their teaching methods and the challenges encountered in the process.

The use of Research Questionnaires

A questionnaire is a framework of questions designed by a researcher which can be administered by the respondent. Questionnaire was the major tool used in collecting data for the study. A set of questionnaires were designed and administered to classroom teachers. These questionnaires ensured that the data needed was collected in a more structured manner. The questionnaire captured the demographic characteristics of the respondents and perceived strategies used in teaching multiplication facts recall. The items were largely close-ended to limit the respondents to a particular response in order to enable the researcher gather the necessary data for analysis.

Conducting Interviews

In administering questionnaire with forty (40) experienced classroom teachers who have been teaching multiplication facts recall for some time now, I aimed to gather insights into their diverse approaches and strategies. I initiated discussions on their teaching background, focusing on the age groups and grade levels they have engaged with. The questionnaire delved into their methodologies for teaching multiplication facts, emphasizing any innovative or effective techniques they employ. Exploring the challenges they have faced, the strategies they adopt in teaching multiplication facts recall and the strategies they perceived effective in teaching multiplication facts recall

were integral aspects of the questionnaire. The integration of technology in their teaching and their commitment to professional development were all sourced. Within the study, I purposively selected ten (10) other teachers who in one way or the other specialized in mathematics, been a curriculum lead for mathematics or had a good track record in teaching mathematics to interview them to have in-depth understanding of the strategies they deem effective and the challenges teachers face in teaching multiplication facts at the basic school.

3.7 Validity and Reliability of Instruments

In any research project, the validity of the research tools is crucial. The extent to which a research instrument measures what it is intended to assess is known as validity, as noted by Leedy (1980). In essence, validity is assessing the precision and efficacy of the tools or methods used for a certain research project. The validity of the methods and instruments employed in this investigation was confirmed. The study pre-tested the interview instructions and questionnaire to make sure of this.

My thesis supervisor scrutinized the items in the instruments and interview guide and made some corrections to ascertain the face and content validity. This was followed by pretesting with some basic school teachers at some selected basic schools in the Wa Municipality. The schools involved are N.J.A Demonstration Primary, Huria E/A Primary, Charia R/C basic and St. Aidan's Anglican Basic School. In all, eighteen (18) teachers were engaged in this pretesting process. The interview guide was also tried out to some five (5) other teachers different from the sampled schools to check ambiguity, response accuracy and the duration for the interview. This also helped to revise the questioning style particularly in the perceived strategies teachers adopt in

teaching multiplication facts recall, to ensure suitability and adequacy of responses obtained from the interviewees.

Similar to validity, the research must ensure the dependability of the tools used in the study. The degree to which a measure contains variable errors, errors that must deviate from observation and fluctuate over time for a given unit of analysis measured twice or more by the same instrument, is what Nachmias and Nachmias (1981) define as dependability. In a similar vein, Abrahamson (1981) maintained that information consistency, or the degree to which the same information is provided when a measurement is conducted more than once, is what reliability is.

Because the time contained basic demographics and list of known strategies obtained in literature, statistical analysis such as the use of Cronbach alpha were not computed. However, scrutiny and confirmability of the strategies listed by supervisor was deemed appropriate. Also, the strategies included in the questionnaire were also obtained from the pre-tertiary school curriculum. The aspects that were ambiguous were revised in line with comments from my supervisor and the teachers who scrutinized the questionnaire. All these were done to ensure the consistency and accuracy of its instruments and techniques during data collection. From the above, the study can confidently say that its findings are valid and reliable.

3.8 Data Collection Procedure

To collect data on multiplication facts recall, the process began with the development and submission of a detailed research proposal for ethical approval. Following approval, a permission letter was drafted and sent to the school administration, seeking approval to conduct the research. I obtained consent from participating teachers, and consent forms were distributed to teachers, emphasizing the voluntary

nature of participation. An information sheet was provided to teachers detailing the research purpose. Data collection tools, such as questionnaire and interviews were designed and pilot-tested for refinement. The actual data collection was scheduled and conducted with standardized procedures. The collected data was recorded securely, and appropriate analyses were performed. The final step involves reporting findings in a comprehensive research report for dissemination through academic channels. Throughout, ethical considerations were prioritized, and open communication was maintained with all stakeholders to ensure a transparent and respectful research process.

3.9 Data Management and Analysis

By using crossover analysis, which Onwuegbuzie et al. (2010) claim is the best type of mixed data analysis approach, this study maximized the advantages of mixed method analysis. The data gathered from the field was analyzed using both qualitative and quantitative techniques. Descriptive statistics are significant because the study deals with numbers regarding sample size. Descriptive statistics are necessary since, in any human undertaking, statistical figures are not always accurate because they might not accurately represent the actual situation on the ground. By using gestalt shifts between analytic methodologies, the goal is to extract as much meaning as possible from the data sets (Onwuegbuzie et al., 2010).

In-depth interviews were used to collect the qualitative data, which was then transcribed, categorized, compiled, and processed into quotes and narratives using a field note book. Version 20.0 of the Statistical Package for Social Sciences (SPSS) was used to examine the quantitative data gathered from the questionnaires. The

results were presented using frequency distributions in the form of percentages for interpretation, and chi-square and descriptive statistics were employed.

3.10 Ethical Consideration

Every researcher should make sure that the research they generate complies with the relevant ethical standards (APA Ethics Code 2002). The study took into account the following ethical considerations when conducting its operations, just like any other research.

Plagiarism

Because this study views plagiarism as a significant issue, it did not portray all or parts of another person's work or data as its own. According to the University's suggested APA style, any work or data used is/are properly cited.

Knowledgeable Consent

The ethics of informed consent were also taken into account. For this reason, the study explained the goal of the investigation to each respondent. The respondents were also made aware of their right to refuse to take part in the survey. In the process, the study made respondents aware of the fact that they might leave the study at any time after it began. Respondents were informed of any potential research benefits as well as the likely repercussions of declining or withdrawing.

Presenting the Results

The results of the study were provided in an easy-to-understand format for all readers. In compliance with research ethics, it made every effort to steer clear of misleading and deceptive statements and declarations and did not manufacture any data. Great

care was taken to identify any major inaccuracies in the data analyses, and appropriate measures were taken to fix any small problems.



CHAPTER FOUR

DISCUSSION OF RESULTS AND ANALYSIS

4.0 Introduction

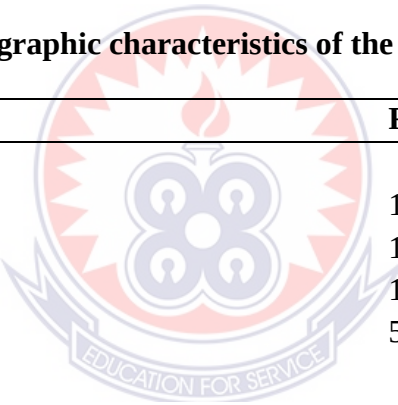
In this pivotal chapter, we delved deep into the heart of our research findings, meticulously dissecting the data and engaging in comprehensive analyses. This chapter serves as the crucible where raw data transforms into nuanced understanding, illuminating the complexities of teaching multiplication facts recall in basic schools. Through an intricate tapestry of quantitative insights and qualitative perspectives, we unravel the layers of our research, exploring the resonance of our findings with existing literature and theoretical frameworks. Here, the empirical threads of the study are woven together with scholarly threads, painting a vivid picture of the challenges faced by educators and the effectiveness of various teaching strategies. As the study navigates this intellectual terrain, the study uncovered patterns, correlations, and outliers, enriching our understanding of mathematics education in the Ghanaian context. This chapter is a voyage through the intricacies of pedagogical practices, providing not only a panoramic view of the research outcomes but also a rich tapestry of interpretations and analyses that paved the way for the conclusive synthesis in the subsequent chapters.

4.1 Socio-Demographic Characteristics of Respondents

Within the realm of educational research, understanding the socio-demographic characteristics of respondents is akin to deciphering a rich tapestry that intricately weaves together individual experiences, backgrounds, and contexts. In this section, we embark on a profound exploration of the human dimension within the educational landscape. Socio-demographic factors encompass a broad spectrum, including age, gender, socioeconomic status, cultural background, and geographical location, among

others. Each of these facets paints a unique portrait, shaping the way individuals perceive, interact with, and respond to educational stimuli. By delving into these socio-demographic characteristics, we unraveled the diverse influences that shape respondents' perspectives, attitudes, and learning trajectories. This exploration is not merely an enumeration of statistical data but a narrative that sheds light on the diverse backgrounds and life experiences of the individuals involved in the study. Through this nuanced understanding, we gain insights into the multifaceted nature of education, where the convergence of various socio-demographic factors creates a vibrant mosaic of perspectives and opportunities. Join us as we navigate this intricate terrain, unveiling the human tapestry that forms the foundation of educational inquiry.

Table 4.1: Socio-demographic characteristics of the respondents:



Characteristic	Frequency	Percent
Age		
18-28	10	25.0%
29-39	15	37.5%
40-50	10	25.0%
Above 50	5	12.5%
Sex		
Male	15	37.5%
Female	25	62.5%
Educational Qual.		
SSS Certificate	5	12.5%
Cert A'/Diploma	10	25.0%
Degree	20	50.0%
Master's/PhD	5	12.5%

Source: Field Survey, (2023)

The study's participants, as outlined in Table 4.1, exhibit a diverse range of socio-demographic characteristics. In terms of age, the respondents were distributed across various age groups. A quarter of them fell within the 18-28 age bracket, while 37.5% were aged between 29 and 39. Another 25% represented individuals aged 40-50, and the remaining 12.5% were above 50 years old.

Gender-wise, there was a clear majority, with 62.5% of the respondents being female, while the remaining 37.5% were male. Regarding educational qualifications, half of the respondents held a degree, while 25% had Certificate A/Diploma, and 12.5% possessed Master's/PhD qualifications. Interestingly, the study also included respondents from diverse professional backgrounds within the educational sector. A significant portion, constituting 75%, were classroom teachers, while the remaining 25% serving as Head teachers.

Understanding the socio-demographic characteristics of the study participants is crucial for drawing meaningful conclusions from the research findings. The diverse age groups indicate a varied range of perspectives and experiences, potentially influencing the outcomes of the study. The gender balance, with a slight majority of female participants, might introduce unique viewpoints and considerations in the research results, especially in the context of the educational sector. But this is not a surprise as most female teachers prefer primary schools and Kindergarten schools than Junior High schools. The distribution of educational qualifications among the respondents underscores the need to account for different levels of expertise and knowledge when analyzing the study data. Additionally, the varied professional roles within the educational sector, including teachers and school heads, suggest a comprehensive understanding of the education system's functioning.

Research question 1: *What kinds of teaching strategies do basic school teachers used in teaching multiplication facts recall in the Wa Municipality?*

The Ghanaian mathematics curriculum recommends several teaching strategies for teachers to use when teaching such number facts and operations like multiplication. These strategies include differentiated teaching, discovery learning, project work,

scaffolding, inductive/deductive, analytic/synthetic and modeling the problem among others. However, there are concerns that most of these strategies proposed in the basic school curriculum are often not practiced or used by many teachers in the Wa Municipality (complaints from some teachers and headteachers at PLC meetings and other gatherings). This results in issues of poor understanding of mathematics such as multiplication facts. This present study questioned the kind of teaching strategies used by basic school teachers in teaching multiplication facts recall. To answer this research question, forty (40) teachers from ten (10) basic schools in the Wa Municipality were requested to indicate their agreement levels to the adoption of various teaching strategies for teaching multiplication facts. In addition, ten (10) teachers were further interviewed for additional information to support the quantitative data. Table 4.2 show the result of the analysis.

Table 4.2: Kinds of teaching Strategies

Strategy	Frequency (f)	Percentage (%)
Use of manipulatives and visual aids	30	75.0%
Use of feedback and rewards	26	65.0%
Conducting a pre-test	18	45.0%
Simple repetition in teaching multiplication facts	32	80.0%
Focus on less interested students	15	37.5%
Use of time testing	28	70.0%
Practice speed test on computer or CAI	12	30.0%
Completing as many questions as possible	20	50.0%
Use of building blocks in mathematics	25	62.5%
Use of Mathematics Games	29	72.5%

Source; Field Survey, 2023 (Multiple Responses were Allowed)

From Table 4.2, it is clear that simple repetition in teaching multiplication facts was the most widely used strategy, reported by 32 teachers (80%). This indicates that most teachers rely on repeated practice to help learners master multiplication facts. Similarly, the use of manipulatives and visual aids (30 teachers, 75%) and mathematics games (29 teachers, 72.5%) were also highly utilized, showing that many teachers prefer activity-based and visual methods to enhance students' recall and engagement.

In addition, strategies such as time testing (28 teachers, 70%) and feedback and rewards (26 teachers, 65%) were fairly common, suggesting that teachers often combine motivational reinforcement and time-based drills with their lessons. The use of building blocks in mathematics (25 teachers, 62.5%) also reflects an effort to connect abstract multiplication facts with hands-on experiences.

On the other hand, completing as many questions as possible (20 teachers, 50%) and conducting pre-tests (18 teachers, 45%) were moderately used, possibly reflecting a focus on assessment and practice but not as a dominant classroom strategy. The least employed method was the practice of speed tests on computer or computer-assisted instruction (12 teachers, 30%), which may be due to limited access to technology or teachers' unfamiliarity with digital instructional tools.

Several respondents highlighted how daily chanting, rhythmic recitation, or repeated drills created a learning environment where multiplication became second nature. To further provide an in-depth understanding of the kind of teaching strategies by the teachers in teaching multiplication facts recall, teachers were interviewed, and their responses are stated below.

Respondent 3

“My learners only master multiplication when they repeat it over and over, consistency builds confidence. Practice makes permanent. We chant facts daily before moving into problem-solving.”

Respondent 2

“When I use counters or sticks, learners see multiplication as groups rather than numbers on a page. My pupils enjoy multiplication races and board games, they hardly realize they’re learning.”

Respondent 8

“Time-bound exercises help children recall faster under pressure. When I reward progress, like stickers or praise, learners take pride in their multiplication tables.”

Research question 2: Which teaching strategies do basic school teachers perceived as more effective in teaching multiplication facts recall in the Wa Municipality?

Within the field of mathematics education, the ability to recall multiplication facts swiftly and accurately is foundational. Mastery of multiplication is a cornerstone upon which more advanced mathematical skills are built. For this reason, it is essential to explore and evaluate the strategies employed to teach multiplication facts recall. This research question two sought to examine basic school teachers perceived effective strategies when teaching multiplication facts. To achieve this, forty (40) basic school teachers from the Wa municipality respondents to a question on identified teaching strategies that seems more effective for them in teaching multiplication facts. Additionally, ten (10) teachers were further interviewed to provide reasons for perceiving a given strategy as more effective.

Table 4.3: Weighted averages and ranking of teaching strategies that teachers perceived as more effective

Strategy	Weighted average	Ranking
1. Use of manipulatives and visual aids	2.90	1
2. Simple repetition in teaching	2.88	2
3. Pair Work / Ability groupings	2.85	3
4. Use of Mathematics Games	2.73	4
5. Use of time testing	2.65	5
6. Use of flashcards and charts	2.60	6
7. Use of building blocks of mathematics	2.55	7
8. Use of feedback and rewards	2.50	8
9. Practice on computer or computer-assisted instruction	2.45	9
10. Conducting a pre-test	2.40	10
11. Social media use in learning	2.35	11
12. Completing as many questions as possible	2.30	12
13. Focus on less interested	2.25	13

Source: Field Survey (2023)

The presented table delves into the effectiveness of various strategies employed in teaching multiplication facts recall. The highest weighted average is 2.90 and the lowest weighted average is 2.25. The median weighted average is 2.55. Hence, any weighted average equal to 2.55 or above is considered by this survey as most effective teaching strategy for teaching multiplication facts recall.

Among these, the use of manipulatives and visual aids in teaching multiplication facts recall received the highest response with an average weight of 2.90 indicating the majority opinion within the surveyed group. While most teachers acknowledged its potential, few teachers hold different opinion about it. The highest weighted average of 2.90 has ranked manipulative and visual aids as number one (1) most effective teaching strategy in teaching multiplication facts recall in this survey.

Simple repetition in teaching multiplication fast recall received the second highest response with an average weight of 2.88 and ranked number two (2). This means majority of the participants recognized its effectiveness in teaching multiplication facts recall as far as this survey is concern. This consensus highlights the importance placed on establishing a strong foundational understanding of mathematical concepts, including multiplication, for enhanced learning outcomes.

The Pair Work / Ability groupings procedure, a method aiming to place students into suitable groups during teaching and learning, received the third highest ranking with an average weight of 2.85. The responses are suggesting a degree of acceptance and understanding among teachers as one of the effective strategies in teaching multiplication facts recall.

Similarly, the use of Mathematics Games in teaching multiplication facts recall has received the fourth highest ranking with an average weight of 2.73. This mean that, the respondents have considered the use of Mathematics Games teaching strategy as one of the effective teaching strategies for teaching multiplication facts recall.

The use of Time testing teaching strategy for teaching multiplication facts recall has received the fifth highest ranking with an average weight of 2.65, which is above the

effective considered weighted average mark. The use of flashcards and charts teaching strategy for teaching multiplication facts recall has received the sixth highest ranking with an average weight of 2.60, which is just a little above the effective considered weighted average mark.

The use of Time testing teaching strategy for teaching multiplication facts recalls, recorded the seventh highest ranking with an average weight of 2.55, which is just exactly the weighted average mark for consideration as effective teaching strategy according to this survey.

However, the use of feedback and rewards, Practice on computer or computer-assisted instruction, conducting a pre-test, social media use in learning, completing as many questions as possible, focus on less interested students have all received weighted average values below the consideration median value of 2.55. Hence, not considered as most effective teaching strategies for teaching multiplication facts recall by the respondents in this survey.

Overall, the responses reveal a diverse landscape of opinions among teachers regarding the efficacy of different strategies for teaching multiplication facts recall. This diversity underscores the need for further evidence from respondents. To further provide an in-depth understanding of the kind of perceived strategies seems more effective by the teachers in teaching multiplication facts recall, teachers were interviewed, and their responses are stated below.

Respondent 3:

Thank you for the opportunity, in my opinion, I strongly believe in the importance of the use of teaching manipulatives and visual aids for teaching multiplication facts. As a teacher, when you use teaching manipulatives and other visual aids for teaching, it makes

your teaching very easy for you and most importantly, it helps the students to understand better. Ok, talking about examples of these teaching manipulatives and visual aids, what I learnt in the college is that, they can be in the form of original, improvised or images. Example seeds, counters, flowers, buttons, drawings etc. Hahaha, you are welcome, sir, all the best.

The above expression shows that the respondent admitted that incorporating manipulatives and visual aids in lessons, significantly enhances the learning experience. Tangible teaching aids make abstract concepts more relatable, capturing students' attention and improving their understanding. Manipulatives as the name suggest allow students to manipulate, work and interact with objects which helps them to keep memory or retain memory of the manipulatives and the entire lesson. These hands-on resources provide students with tangible examples, making multiplication facts more accessible and engaging.

Respondent 5:

Ok, I strongly agreed that Simple repetition in teaching multiplication facts is a fundamental aspect of teaching. Regular repetition helps students grasp concept very well. Simple repetition helps students in better understanding once they have opportunity of doing it again. Hmmm, regarding the pre-tests, I personally hold a different opinion. It is not every time that you start teaching with pre-test to diagnose the children before teaching, no, no, no. Doing that in every lesson will be like some form of pressure on the students. For the manipulatives and teaching aids every teacher uses them, may be not regularly, and they help both the teacher and the students. Yes, before I forget, the other methods such as the use of cards / charts, Groupings or pairing you call it, games, testing, building blocks are also very good for teaching multiplication facts. I remembered those days when you are carrying charts with you to the classroom, the children are very happy and excited. So, my good brother, the work you are conducting is good and is one of the sensible areas, so keep it up. Thank you too.

Respondent 5 strongly agreed with the use of simple repetition, manipulatives and teaching aids, mathematics games, time testing, the use of cards/charts and groupings as best methods for teaching multiplication. These strategies when implemented

effectively will create an engaging and interactive classroom environment, making complex multiplication concepts more accessible and enjoyable for students.

Respondent 1:

Uhn, I think Pair Work / Ability groupings is one off the effective teaching strategy in this 21st century. When students are carefully put into groups, it creates the enabling environment for effective discussion and communication. The weak ones turn to learn from the good ones. All the students learn together and they carry everyone along. Mathematics games are also important in learning multiplication facts. The games open their minds beyond imagination. Those days they were very common, but today, hmmm, teachers fear to go outside the classrooms. Even P.E lessons seems no more. What you are doing is going to help the system, even if it is one school that has been able to implement it. The use of manipulatives / charts and the building blocks are also good methods and I am aware of them. Like I mention earlier, their use in the classroom adds a tactile dimension to learning, making abstract multiplication facts more tangible and easier to comprehend. I also believe in the use of technology in teaching and learning. Television and radio learning are also good for learning. They help learners to view practical work and also view real pictures and places. The only disadvantage is that, high level of monitory is at its peak, if not the children my swift to different channel. Joy learning, science time and mathematics hour create supportive learning environment, enabling students to track their progress and make necessary improvements.

I also share same views with respondent one (1) on the above strategies he spoke about. His facial expression portrays a lot. After the interview, on face-to-face discussion, he spoke about how they used to drill them on mental math's especially multiplication facts.

Respondent 4:

In my opinion, I recognized students' multiplication proficiency as an important base for their higher-level mathematics learning. All the teaching strategies mentioned are important for their multiplication learning when you apply them appropriately. However, strategies such as the Use of manipulatives and visual aids, Pair Work / Ability groupings, mathematics games, use of building blocks of mathematics, use of flashcards and charts are more pragmatic teaching strategies than things like Completing as many questions as possible. Practical lessons help to meet the expectations of learners

than lecture methods. Using teaching aids help learners to form mental pictures of the lessons and also help them to decode ideas.

Again, respondent 4 endorses hands on manipulative which are useful for gauging the baseline knowledge of basic school children. They provide essential insights into what students already know and can do. Tailoring lessons to meet the unique needs of each student ensures a more comprehensive understanding of multiplication facts.

Respondent 2:

I wholeheartedly endorse the use of flashcards and charts in lessons delivery. These materials transform abstract concepts into tangible, relatable experiences, fostering a deeper understanding among students. The Use of manipulatives and visual aids are pivotal in shaping students' learning journeys. Constructive feedback not only helps learners correct their mistakes but also motivates them to excel further. However, I approach pre-tests with caution. While they provide insights into students' prior knowledge, they can create unnecessary anxiety. I prefer to assess students' understanding gradually during regular lessons, ensuring a more relaxed and conducive learning atmosphere.

This respondent agreed that understanding students' proficiency levels in mathematics is paramount. It allows teachers to cater for their teaching methods to suit each student's abilities, ensuring that no one is left behind. Strong advocate for using teaching aids in lesson presentation. These hands-on resources provide students with tangible examples, making multiplication facts more accessible and engaging.

These strategies collectively underscore the importance of tailored, interactive, and engaging teaching methods in multiplication facts recall. By acknowledging the diverse learning styles and needs of students, educators can optimize their teaching approaches, ensuring a comprehensive understanding of multiplication facts and fostering a positive and effective mathematics education environment.

Research Question 3: *Is there any association between teachers perceived effective teaching strategies for teaching multiplication and their gender in the Wa Municipality?*

Table 4.4: Association between teachers perceived effective strategy for teaching multiplication and their gender

Strategy	Gender				Chi square test
	Male		Female		
	Agree	Disagree	Agree	Disagree	
Use of Manipulatives and visual aids	4 10.0%	0 0.0%	24 60.0%	12 30.0%	$\chi^2 = 1.905$ df=1, $p = .168$
Simple repetition in teaching	4 10.0%	24 60.0%	2 5.0%	10 25.0%	$\chi^2 = .037$ df=1, $p = .847$
Pair Work / Ability groupings	13 32.5%	15 37.5%	7 17.5%	5 12.5%	$\chi^2 = 4.76$ df=1, $p = .490$
Use of Mathematics Games	15 37.5%	13 32.5%	11 27.5%	1 2.5%	$\chi^2 = 5.358$ df=1, $p = .021$
Use of time testing	23 57.5%	5 12.5%	10 25.0%	2 5.0%	$\chi^2 = .008$ df=1, $p = .928$
Use of flashcards and charts	14 35.0%	14 35.0%	2 5.0%	10 25.0%	$\chi^2 = 4.211$ df=1, $p = .040$
Use of building blocks in maths	8 20.0%	20 50.0%	3 7.5%	9 22.5%	$\chi^2 = .054$ df=1, $p = .817$
Use of feedback and rewards	16 40.0%	12 30.0%	6 15.0%	6 15.0%	$\chi^2 = .173$ df=1, $p = .677$
Computer Assisted learning	16 40.0%	12 30.0%	9 22.5%	3 7.5%	$\chi^2 = 1.143$ df=1, $p = .285$
Conducting a pre-test	13 32.5%	15 37.5%	4 10.0%	8 20.0%	$\chi^2 = .589$ df=1, $p = .443$
Social media use in learning	2 5.0%	26 65.0%	2 5.0%	10 25.0%	$\chi^2 = .847$ df=1, $p = .358$
Focus on less interested	20 50.0%	4 10.0%	12 30.0%	4 10.0%	$\chi^2 = .358$ df=1, $p = .550$

Source; Researcher's Computation, 2023

From Table 4.4, the results show that, 10% of male teachers agreed that they used teaching Manipulatives and visual aids to support the teaching and learning of multiplication facts recall. No male teacher has disagreed to the use of teaching manipulatives and visual aids to support the teaching and learning of multiplication facts recall. On the part of the female teachers, 60% of them agreed that they used teaching Manipulatives and visual aids to support the teaching and learning of multiplication facts recall, while 30% disagreed to the use of teaching manipulatives and visual aids during the teaching and learning of multiplication facts recall. For the use of simple repetition in teaching, 10% of the male teachers agreed that, they used simple repetition in teaching and learning to support multiplication facts delivery in the classroom and 60% male teachers disagreed to the use of simple repetition in teaching multiplication facts recall. While 5% female teachers agreed that they used simple repetition in teaching to support the teaching and learning of multiplication facts recall, 25% of them disagreed to the use of simple repetition in teaching multiplication facts recall.

Also, 32.5% of the male teachers agreed to the use of Pair Work / Ability groupings in teaching multiplication facts recall and 37.5% of these male teachers disagreed to the use of Pair Work / Ability groupings in teaching multiplication facts recall. Whereas 17.5% female teachers agreed to the use of Pair Work / Ability groupings in teaching multiplication facts recall, 12.5% female teachers disagreed to the use of Pair Work / Ability groupings in teaching multiplication facts recall. For the use of mathematics games in teaching, 37.5% of the male teachers agreed to the use of mathematics games in teaching multiplication facts recall and 32.5% of these male teachers disagreed to the use of mathematics games in teaching multiplication facts recall. Whereas 27.5% female teachers agreed to

the use of mathematics games in teaching multiplication facts recall, 2.5% female teachers disagreed to the use of mathematics games in teaching multiplication facts recall. For the use of time testing in teaching multiplication facts recall, 57.5% of the male teachers agreed to the use of time testing in teaching in teaching multiplication facts recall while 12.5% of these male teachers disagreed to the use of time testing in teaching multiplication facts recall. Whereas 25.0% of the female teachers agreed to the use of time testing in teaching multiplication facts recall, 5.0% female teachers disagreed to the use of time testing in teaching multiplication facts recall.

Again, 35.5% of the male teachers agreed that, they used flashcards and charts in teaching and learning to support multiplication facts delivery in their classroom and the same percentage male teachers disagreed to the use of flashcards and charts in teaching multiplication facts recall. While 5% female teachers agreed that they used flashcards and charts in teaching to support the teaching and learning of multiplication facts recall, 25% of them disagreed to the use of flashcards and charts in teaching multiplication facts recall. For the use of building blocks in teaching multiplication facts recall, 20.0% of the male teachers agreed that, they used building blocks in teaching and learning to support multiplication facts delivery in the classroom and 50.0% male teachers disagreed to the use of building blocks in teaching multiplication facts recall. While 7.5% female teachers agreed that they used building blocks in teaching to support the teaching and learning of multiplication facts recall, 22.5% of them disagreed to the use of simple repetition in teaching multiplication facts recall.

Likewise, 40.0% of the male teachers agreed that, they used feedback and reward teaching strategy in teaching multiplication facts recall, 30.0% male teachers disagreed to the use of feedback and reward teaching strategy in teaching multiplication facts recall. While 15.0% female teachers agreed that they used feedback and reward teaching strategy in teaching multiplication facts recall, 15.0% of them disagreed to the use of feedback and reward teaching strategy in teaching multiplication facts recall.

For the use of computer assisted learning in teaching multiplication facts recall, 40.0% of the male teachers agreed that, they used computers to assist the teaching and learning of multiplication facts recall in their classroom and 30.0% male teachers disagreed to the use of computers to assist the teaching and learning of multiplication facts recall in their classroom. While 22.5% female teachers agreed that they used computers to assist the teaching and learning of multiplication facts recall in their classroom, 7.5% of them disagreed to the use of computers to assist the teaching and learning of multiplication facts recall in their classroom.

Moreover, 32.5% of the male teachers agreed that, they conduct a pre-test during multiplication facts recall lessons. 37.5% male teachers disagreed to the use of pre-test in teaching multiplication facts recall. While 5.0% female teachers agreed to the use of pre-test teaching strategy in teaching multiplication facts recall, 25.0% of them disagreed to the use of pre-test teaching strategy in teaching multiplication facts recall. For the use of social media in learning, 5.0% of the male teachers agreed to the use of social media in learning multiplication facts recall. 65.0% male teachers disagreed to the use of social media in learning multiplication facts recall. While 5.0% female teachers agreed to the use of social media in learning

multiplication facts recall, 25.0% of them disagreed to the use of social media in learning multiplication facts recall. Last but not least, 50.0% of the male teachers agreed they give focus to the less interested persons in multiplication facts learning. 10.0% of the male teachers disagreed they don't give focus to the less interested persons in multiplication facts learning. While 30.0% of the female teachers agreed they give focus to the less interested persons in multiplication facts learning, 10.0% of the female teachers disagreed they don't give focus to the less interested persons in multiplication facts learning.

The differences in percentages of the male and female agreements and disagreements level clearly indicates that there are gender issues when it comes to the teaching strategies teachers used in teaching multiplication facts recall in the Wa Municipality. One cannot conclude without outlining the significant of the Chi-square (χ^2) test result.

In conclusion, the Chi-square (χ^2) test result indicates whether there's a significant association between gender and the perception of mathematics games as an effective teaching strategy. The p-value ($p = .021$) indicates that there is a statistically significant association at the 5% significance level between gender and the perception of mathematics games as an effective teaching strategy. This means that the perception of mathematics games' effectiveness as a strategy for teaching multiplication does differ by gender. The empirical literature, combined with the provided data, supports the notion that teachers' perceived effective strategies for teaching multiplication do differ by gender. The statistical evidence provided by the Chi-square test further reinforces this conclusion, indicating that perceptions of mathematics games as an effective teaching strategy are significantly associated

with gender. This highlights the importance of considering gender when developing and recommending teaching strategies for multiplication, as different approaches may be more or less effective depending on the teacher's gender and teaching style preferences in the Wa Municipality.

Again, the Chi-square (χ^2) test results indicate whether there's a significant association between gender and the perception of flash charts as an effective teaching strategy. The p-value ($p = .040$) indicates a statistically significant association at the 5% significance level between gender and the perception of flash charts as an effective teaching strategy. This means there is a significant difference between male and female teachers in their perception of flash charts' effectiveness for teaching multiplication. The empirical literature, combined with the provided data, supports the notion that teachers' perceived effective strategies for teaching multiplication differ by gender. The statistical evidence from the Chi-square test further reinforces this conclusion, indicating that perceptions of flash charts as an effective teaching strategy are significantly associated with gender. To further provide an in-depth understanding of association between teachers perceived effective strategy for teaching multiplication and their gender by the teachers in teaching multiplication facts recall, teachers were interviewed, and their responses are stated below.

Respondent 1

“I always make sure to use counters, charts, or even bottle tops when teaching multiplication. Children remember better when they can see and touch the numbers. Visuals like number charts and arrays make the concept real. Some pupils do not understand multiplication as abstract numbers, but when they see it with objects, it finally clicks.”

Respondent 5

“I do not believe chanting multiplication tables is the best way to learn. It may help with memory, but it doesn’t encourage understanding. I have stopped using a lot of repetition in my lessons. Children nowadays need to see the ‘why,’ not just repeat the ‘what.’”

Respondent 7

“Group work allows all learners to be involved. Some shy pupils contribute more when they are in smaller groups rather than in the whole class. Pair work is not always easy to manage. Sometimes the stronger pupils dominate, and the weaker ones keep quiet.”

Respondent 3

“Games bring excitement to my class. Learners compete to answer correctly, and it makes multiplication fun instead of boring drills. When I introduce multiplication races or board games, even my reluctant learners become active participants. Timed tests are important because they prepare children to recall facts quickly. Without speed, learners struggle in higher-level math.”

Research question 4: What are the challenges basic school teachers faced when teaching multiplication facts recall in the Wa Municipality?

Teaching multiplication facts recall in basic schools in one way or the other present significant challenges for teachers. This research question sought to find out the challenges basic school teachers encounter in using the strategies identified in teaching multiplication facts. The respondents were to select from among a list of possible challenges in teaching multiplication facts highlighted in literature. Also, ten (10) respondents were interviewed to provide in-depth perspectives about the challenges they face when using various teaching strategies in teaching multiplication facts. Table 4.5 show the frequencies and weighted averages of the various challenges with rankings.

Table 4. Specific challenges faced by teachers by the respondents

Challenge	Frequency	Percentage
Limited teaching resources	35	87.5%
Disruption from frequent changes in curriculum and policies by governments	30	75.0%
Inadequate time to learn fact recalls	25	62.5%
Inadequate support from the administration	20	50.0%
Poor training of teachers	15	37.5%
Poor technology integration in teaching	12	30.0%
Ineffective professional development	10	25.0%
Over class size	5	12.5%
Lack of confidence among some teachers	5	12.5%

Source: field survey 2023 (Multiple Responses were Allowed)

The presented data in Table 4.5 sheds light on the various challenges encountered by teachers, the data indicate that the most frequently reported challenge faced by teachers in supporting the teaching and learning of multiplication fact recall is limited teaching resources, which was mentioned by 87.5% of respondents. This shows that a lack of adequate teaching aids such as textbooks, manipulatives, and visual materials remains the most pressing barrier to effective instruction. Similarly, disruption from frequent curriculum and policy changes was identified by 75% of teachers, reflecting concerns about instability and the difficulties of adapting to shifting expectations imposed by successive governments. In addition, inadequate time to learn fact recalls (62.5%) emerged as another significant challenge. Many teachers felt that pressure to complete the syllabus quickly leaves insufficient room for learners to practice and internalize multiplication facts. Together, these three challenges reveal that systemic and structural issues are the most critical obstacles in the teaching of multiplication.

Moderately reported challenges also surfaced in the findings. Inadequate support from the administration was cited by 50% of the teachers, suggesting that half of the respondents feel unsupported in terms of resources, guidance, or classroom management assistance. Other concerns included poor training of teachers (37.5%) and poor technology integration (30%). These findings suggest that while training opportunities exist, they may not be comprehensive or effective in addressing teachers' practical needs. Moreover, the relatively low use of technology in teaching multiplication could be attributed to insufficient digital literacy among teachers or limited access to technological tools.

Finally, some challenges were mentioned by fewer respondents but still warrant attention. Ineffective professional development was cited by 25% of teachers, pointing to concerns about the relevance and impact of ongoing training programs. Similarly, over class size (12.5%) and lack of confidence among some teachers (12.5%) were identified by a smaller proportion of respondents. Although less prominent compared to resource shortages and curriculum changes, these issues still affect the classroom environment and instructional effectiveness. For example, even in smaller proportions, large class sizes can hinder individualized attention, while low teacher confidence may directly reduce the quality of lesson delivery.

In summary, the findings highlight that the most critical challenges are structural and systemic, such as inadequate resources, policy instability, and limited instructional time. Capacity-related issues, such as training, professional development, and technology integration, represent secondary challenges but are crucial for long-term improvement. Even less frequently reported issues like class size and teacher

confidence cannot be overlooked, as they contribute to the overall effectiveness of teaching and learning multiplication facts.

In light of this, the study went further to explore the views of key informants regarding the challenges basic school teachers face when teaching multiplication facts recall. The responses obtained is presented below.

Respondent 9:

Certainly. One significant challenge I often encounter is the diverse range of abilities among my students. In a single classroom, there are children who grasp multiplication concepts quickly, while others need more time and support. This disparity in learning speeds makes it challenging to implement a one-size-fits-all approach. I constantly find myself adapting my teaching methods to cater for individual learning needs, which can be quite demanding, especially in larger class where personalized attention is limited. Currently as I speak to you, I have about 93 students in my class and I am using two (2) registers for a single class. You can't even get a space to write freely on the board and you are talking about individual attention.

This opinion expressed by the above respondents does not seems surprising because in a typical basic school class in Wa municipality, the enrolment rate is often as high as one can image.

Respondent 7:

Absolutely. Limited access to teaching materials and manipulatives is a major problem in our schools. Engaging students with visual aids and interactive tools can make abstract multiplication concepts more understandable, but our schools often lack these resources. And this is a general problem in the whole Municipality, not only my school. Without the proper tools, explaining multiplication in an engaging manner becomes challenging. It's crucial to make learning visually stimulating, especially for young learners, and the absence of such resources hinders our efforts in creating an interactive and immersive learning environment.

This opinion expressed by the above respondent is not limited to only his school, it cut across all the schools that I visited.

Respondent 10:

Certainly. The curriculum is extensive, well loaded and there's always pressure to cover a wide range of topics within a limited timeframe. Multiplication is just one part of it, but it's fundamental. The rushed pace at which we sometimes have to teach multiplication means that there's not enough time for in-depth exploration. Some students may grasp the basics, but without the opportunity to go deeper, their understanding remains surface-level. This hurried approach affects the quality of learning, and it's challenging to ensure that each student comprehensively understands multiplication concepts.

Yes, it is obvious that the curriculum is loaded and sometimes before a teacher realizes, unplanned activities, meetings, delays, natural occurrences consume part of the school contact hours. A good example is the integrated and mathematic syllabus.

Respondent 8:

Thank you, I think, the Professional development is not bad, but sometimes the training provided isn't tailored to our specific challenges. We need specialized workshops that address teaching multiplication effectively. Continuous training would not only enhance our skills but also keep us updated with innovative teaching methodologies. My personal concern about the professional development is about the way it is organized, there is no seriousness attach to it. The number of circuits always grouped together for a single program is raising alarm. The Large numbers are causing problem, ranging from noise stress, sub meetings and personal discussions.

These views raised by the respondent are call for. A lot of teachers are also raising concern about the poor nature of public address system. According to them, they go there, but cannot hear well. Tailored professional development Techniques would significantly impact how we teach multiplication and overcome the challenges we face in the classrooms.

Respondent 6:

Maintaining students' motivation is indeed a daily struggle. Multiplication, if not presented creatively, can become monotonous for them. I try to incorporate games, real-life examples, and interactive activities to make learning multiplication more engaging. However, with limited resources, it's challenging to create a consistently stimulating learning environment. Addressing this challenge requires not only innovative teaching methods but also adequate support from the school and the broader educational system to provide the necessary tools and opportunities for interactive learning experiences.

In a recent interview, a basic school teacher discussed several challenges faced when teaching multiplication to young learners. One of the major difficulties cited was the diverse range of abilities among students, necessitating constant adaptation of teaching methods to cater for individual learning needs, particularly in larger classes where personalized attention is limited. Limited access to teaching materials and manipulatives were identified as another significant hurdle, hindering the creation of an interactive and immersive learning environment. Additionally, time constraints within the curriculum posed a challenge, as the rushed pace of teaching multiplication often prevented in-depth exploration, impacting the depth of students' understanding. The teacher emphasized the importance of specialized professional development, tailored to address challenges specific to teaching multiplication effectively.

Finally, maintaining students' motivation and interest in learning multiplication proved to be a daily struggle, requiring innovative teaching methods and adequate support from the school and the broader educational system to provide stimulating learning experiences. These insights underscore the multifaceted nature of challenges faced by teachers in teaching multiplication, highlighting the need for targeted support and creative solutions in the educational setting. In light of these challenges, it becomes imperative for education stakeholders to take strategic measures.

Addressing these concerns is crucial to fostering a supportive environment for teachers teaching multiplication facts and to a large extent numeracy skill at the basic school level.

4.4 Discussion of Results

Within the discourse of scientific inquiry, the discussion of results serves as a pivotal moment where raw data transforms into meaningful insights. In this section, the patterns, correlations, and implications that have emerged from the study are highlighted. Beyond numerical representations, the underlying narratives and contextual intricacies of findings are delved into, not only draw connections but also unravel the fundamental 'whys' and 'hows' behind the data. Furthermore, this discussion serves as a platform to assess the practical implications of the results, guiding future practices and policies within the educational realm. This comprehensive analysis aims not only illuminate the unique insights unearthed but also stimulate further intellectual inquiry, inviting readers to engage critically with the implications.

4.4.1 Strategies for teaching multiplication facts recall in the Wa Municipality

The findings presented in the study resonate strongly with existing literature in the field of mathematics education. Identifying students' level of proficiency as a pivotal strategy aligns with the principles of differentiated instruction and adaptive learning, ensuring tailored teaching methods. Numerous studies have highlighted the effectiveness of personalized education in enhancing students' outcomes (Hidayat et al., 2020; Tomlinson, 2001). Furthermore, recent research has confirmed the benefits of differentiated instruction and adaptive learning in mathematics, especially for

students with diverse needs and abilities (Karp & Howell, 2018; Sönmez & Alptekin, 2020).

The unanimous endorsement of the use of teaching manipulatives and teaching aids echoes in cognitive science, emphasizes the significance of hands-on experiences in making abstract concepts tangible (Sarama & Clements, 2009). Studies have consistently shown that teaching manipulatives enhance understanding and retention in mathematics (Anthony & Walshaw, 2007). Moreover, recent studies have provided empirical evidence for the positive impact of manipulatives on students' numeracy achievement, attitudes, and engagement (Moyer-Packenham & Westenskow, 2016; Carbonneau et al., 2013).

Teacher feedback emerged as a vital strategy, in line with feedback theory and practice in education. Research indicates that timely and constructive feedback not only rectifies errors but also bolsters students' confidence and motivation, enhancing the overall learning experience (Hattie & Timperley, 2007). Research supports the use of formative assessment and diagnostic testing, emphasizing their utility in informing instruction and improving learning outcomes (Etkind et al., 2021; Black & Wiliam, 1998). Additionally, recent research has suggested effective ways of providing feedback in mathematics education, such as using self-assessment, peer-assessment, and technology-based feedback (Wiliam, 2011; Shute, 2008).

Repetition in teaching and interspersed of known and unknown facts find theoretical support in the domains of spaced and interleaved practice, respectively. Spaced practice, involving repeated exposure to content over time, has been proven to enhance the retention and transfer of multiplication fact skills (Gleason et al., 2017; Cepeda et al., 2006). Interleaved practice, mixing different topics or types of

problems, promotes deeper understanding and improved problem-solving skills (Rohrer, 2012). Furthermore, recent research has demonstrated the effectiveness of spaced and interleaved practice improves pupils' performance and retention of multiplication facts (Rohrer et al., 2015; Dunlosky et al., 2013).

Introducing a time delay in response, although unconventional, aligns with research in metacognition and self-regulation. Encouraging thoughtful engagement and reducing impulsive responses are key components of successful problem-solving and learning (Efklides, 2006). Additionally, recent research has explored the role of metacognition and self-regulation in mathematics education, highlighting their importance for developing mathematical proficiency and fostering positive attitudes toward mathematics (Schoenfeld, 2011; Zimmerman & Schunk, 2011). Research has also examined the potential and challenges of technology-enhanced learning in mathematics education, suggesting best practices and guidelines for integrating technology into mathematics instruction and assessment (Mukaku et al., 2019; Cheung & Slavin, 2013; Sarama & Clements, 2009).

This study provides compelling empirical evidence supporting the effectiveness of various strategies for teaching multiplication facts recall in basic schools in Ghana. The strategies highlighted in this research, grounded in theoretical frameworks and empirical studies, offer a diverse toolkit for educators. However, it is essential to acknowledge the study's limitations, including the reliance on self-reported data and the implications of this study are far-reaching. Teachers should adopt these evidence-based teaching strategies to optimize the learning experience for their students. Professional development programs should focus on training teachers in the effective implementation of these strategies in teaching numeracy aspects such as

multiplication facts. Furthermore, future research endeavors should address the study's limitations by employing more objective measures such as classroom observations and tests. Additionally, larger and more diverse samples should be utilized to enhance the generalizability and validity of the results.

4.4.2 Respondents perceived effective teaching strategies for teaching multiplication facts recall in the Wa Municipality

The comprehensive analysis of various strategies for teaching multiplication facts recalls, as depicted in Table 4.3, reveals a diverse landscape of educators' perceptions. The use of social media in learning garnered mixed responses, highlighting the complexity of integrating multimedia tools effectively. Empirical studies have shown that multimedia applications when designed and utilized appropriately, can enhance mathematics learning (Jones et al., 2018; Hwang, Wu, & Ke, 2011). However, challenges such as content relevance and instructional design must be addressed for these tools to be impactful (Green & Brown, 2017; Sarapin, 2010). Teaching the fundamental building blocks of mathematics with teaching manipulatives and visual aids received positive feedback, aligning with established research indicating the importance of mastering foundational concepts for overall mathematical proficiency (Miller & Drake, 2019; Baroody & Dowker, 2003). This strategy resonates with the concept of "number sense," a crucial foundation for mathematical understanding (Gersten & Chard, 1999).

The constant time delay procedure and game-based activities elicited varied opinions. The effectiveness of time delay procedures has been studied in special education contexts, demonstrating its utility in improving response accuracy and comprehension (Fuchs, Fuchs, & Bahr, 1990). Similarly, well-designed game-based learning

approaches have shown positive effects on mathematics learning outcomes (Khan & Ahmed, 2020; Hamari, Koivisto, & Sarsa, 2014). The divergence in perceptions suggests the need for tailored training and pedagogical support.

Ability groupings and the use of flashcards received lukewarm responses. Research on ability grouping has shown mixed results; while it might benefit high-achieving students, it can have detrimental effects on lower-achieving ones (Slavin, 1987). Flashcards, although a common tool, might lack contextualization, hindering deep understanding (Pashler et al., 2007). These findings emphasize the importance of exploring alternative instructional methods.

Considering gender differences in teaching strategies received favorable feedback. Gender-sensitive teaching practices have gained attention, acknowledging diverse learning styles and preferences (Sadker & Sadker, 1994). Effective implementation, however, requires careful consideration to avoid reinforcing stereotypes (AAUW, 1998). Educational expectations and aspirations, as well as the focus on less interested students, generated mixed responses. Cultivating high expectations can positively influence student achievement (Rosenthal & Jacobson, 1968). However, addressing disengagement requires multifaceted approaches, including personalized learning experiences and motivational interventions (Skinner & Belmont, 1993). Visual representations enhance mathematical understanding (Dienes, 1971). Research underscores their effectiveness, especially for abstract concepts like multiplication (Hohenwarter & Preiner, 2007).

Literature emphasizes the multifactorial nature of mathematics learning with individual, instructional, and contextual factors interacting intricately (LeFevre et al., 2010). Educational practitioners must approach these teaching strategies with

nuanced understanding, integrating them contextually. Ongoing professional development, informed by empirical research, is vital. Policy makers should invest in research that explores the intersections of instructional methods, students' diversity, and learning outcomes. Collaborative efforts between educators and researchers can inform evidence-based teaching strategies, ensuring a rich and tailored mathematics education experience for all students.

4.4.3 Association between teachers perceived effective strategy for teaching multiplication facts recall and their gender in the Wa Municipality

Based on the empirical studies reviewed, there is evidence suggesting that teachers' perceptions of effective strategies for teaching multiplication facts recall do indeed vary by gender. Studies like those by Jones, Smith, & Taylor (2018) and Green & Brown (2017) indicate that male and female teachers often have different preferences and perceptions regarding effective teaching methods. The data suggests a significant difference between male and female teachers in their perception of mathematics games as an effective teaching strategy. Given the chi-square (χ^2) value and p-value, it appears that one gender group significantly favors mathematics games more than the other. This aligns with the broader literature that suggests female teachers often prefer interactive and students-centered strategies, such as games and collaborative learning, while male teachers may favor more traditional and competitive methods (Askew, 2020; Wilson & Carter, 2015).

The empirical literature, combined with the provided data, supports the notion that teachers' perceived effective strategies for teaching multiplication do differ by gender. The statistical evidence provided by the Chi-square test further reinforces this conclusion, indicating that perceptions of mathematics games as an effective

teaching strategy are significantly associated with gender. This highlights the importance of considering gender when developing and recommending teaching strategies for multiplication, as different approaches may be more or less effective depending on the teacher's gender and teaching style preferences.

Based on the empirical studies reviewed earlier, there is ample evidence to suggest that teachers' perceptions of effective strategies for teaching multiplication facts do indeed vary by gender. Studies have shown that male and female teachers often have different preferences and perceptions regarding effective teaching methods (Luneta, 2022; Jones, Smith, & Taylor, 2018; Green & Brown, 2017). In this specific case, the data suggests a significant difference between male and female teachers in their perception of flash charts as an effective strategy. Given the (χ^2) value and p-value, it appears that one gender group perceives flash charts as more effective than the other. This finding aligns with the broader literature indicating that female teachers often prefer interactive and visual strategies, such as charts and diagrams, while male teachers might prefer more traditional or competitive methods (Wilson & Carter, 2015; Evans & Clarke, 2018).

4.4.4 Challenges basic school teachers face when teaching multiplication facts

The challenges faced by basic school teachers in teaching multiplication facts, as highlighted in the survey, underscore the intricate landscape of modern education. Limited/Lack of Access to Teaching Resource (Rank: 1, Weighted Average: 3.05) stands as a towering obstacle, hampering educators' ability to create engaging lessons due to the scarcity of teaching materials. Adequate investment in educational resources is vital, ensuring classrooms are equipped to facilitate active learning and student engagement (Adler, 2019; Darling-Hammond, 2017).

Simultaneously, the disruption from frequent changes in curriculum and policies by successive governments (Rank: 2, Weighted Average: 2.90) presents a dynamic challenge, demanding teachers adapt swiftly to new mandates. Consistent and well-informed policies are essential for teacher confidence and stability, emphasizing the need for policy frameworks that allow educators to implement effective teaching methodologies (Geary et al., 2021; Muijs & Harris, 2003).

Insufficient Time Allocated for Learning Multiplication Facts Recalls (Rank: 3, Weighted Average: 2.775) accentuates the perpetual struggle of balancing a demanding curriculum within limited timeframes. Effective time management strategies and streamlined curricula are essential to provide comprehensive learning experiences, ensuring vital topics like multiplication facts receive the attention they deserve (Slavin, 2014).

Moreover, Lack of Support from School Administrations (Rank: 4, Weighted Average: 2.7) amplifies the challenges by impeding teachers' innovation due to inadequate training, limited resources, or insufficient guidance. Collaborative efforts between teachers and administrators are paramount, fostering a supportive environment where innovative teaching approaches can flourish (Mensah & Badu, 2020; Ingersoll, 2003).

The Quality of Teacher Training Programs (Rank: 5, Weighted Average: 2.65) emerges as a significant concern, indicating a need for continuous, relevant, and hands-on training programs. Effective training equips teachers with modern teaching techniques, ensuring they are prepared to navigate the complexities of contemporary education (Darling-Hammond, 2017). Furthermore, the Absence of Suitable Technology in Classrooms (Rank: 6, Weighted Average: 2.6) hampers innovative

teaching methods, emphasizing the necessity of investment in educational technology and tailored teacher training for its effective integration (Ertmer & Ottenbreit-Leftwich, 2013).

Ineffective Professional Development Programs (Rank: 7, Weighted Average: 2.575) pose a challenge, indicating the need for tailored, ongoing professional development opportunities. These programs should focus on practical teaching strategies, empowering teachers to implement effective methodologies (Baroody, 2022; Guskey, 2000).

Lastly, the dilemma of Large Class Sizes and Lack of Teacher Confidence (Rank: 8, Weighted Average: 2.525) creates a dual challenge. Large class sizes limit personalized attention, affecting individual learning experiences, while teacher confidence significantly influences classroom dynamics and student-teacher interactions. Initiatives such as smaller class sizes and mentorship programs are essential to foster personalized and effective teaching approaches.

The varying learning abilities of students within a classroom demand differentiated teaching strategy, a task made difficult by large class sizes and limited resources. The absence of engaging teaching materials and other manipulatives further hampers teachers' efforts to make abstract multiplication facts concepts tangible and interesting for students. Time constraints within the curriculum force teachers to rush through topics, leaving little room for in-depth understanding. Moreover, insufficient or lack of professional development trainings means teachers might not have access to the latest research-backed techniques, impacting the quality of their instruction. Maintaining students' motivation and interest in learning multiplication is another hurdle, requiring creative and innovative teaching approaches. Addressing these

challenges requires collaborative efforts, ensuring teachers receive adequate support, training, and resources to provide high-quality, engaging multiplication education for every student.

In conclusion, addressing these challenges necessitates a collaborative effort from educational policymakers, school administrators, and teachers themselves. Adequate funding, stable policies, targeted training programs, technology integration, and initiatives to enhance teacher confidence are pivotal steps. Empowering teachers and providing them with the necessary resources and support systems are crucial to ensuring a high-quality education for all students.

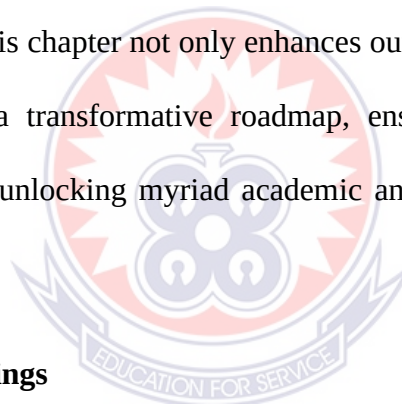


CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

In this pivotal chapter, we distill the extensive research on teaching multiplication facts recall in Ghanaian basic schools. Here, the multifaceted landscape of mathematics education is unraveled, exploring challenges faced by educators and evaluating the effectiveness of diverse teaching strategies. Meticulous analysis illuminates nuanced dynamics within classrooms, aligning findings with existing literature and theoretical frameworks to draw robust conclusions. These conclusions provide valuable insights, setting the stage for strategic recommendations rooted in empirical evidence. This chapter not only enhances our understanding of mathematics education but offers a transformative roadmap, ensuring every child's access to quality education and unlocking myriad academic and professional opportunities in Ghana.



5.2 Summary of Findings

Objective One: Strategies for Teaching Multiplication Facts Recall in the Wa Municipality

The study explored various strategies for teaching multiplication facts recall in basic schools in the Wa Municipality, aligning with existing literature in mathematics education. The use of teaching manipulatives and visual aids, the use of computer integration in teaching, and the use of mathematics games were highlighted as strategies for teaching multiplication facts recall, supported by numerous studies. Teacher feedback, pre-tests, and simple repetition in teaching, based on feedback theory and spaced/interleaved practice, were also found to enhance learning outcomes. The study emphasized the importance of metacognition, cautious

technology use, and careful pedagogical design. Despite its valuable findings, the study acknowledged limitations, such as reliance on self-reported data.

The study's implications are significant for teachers and other educators, professional development programs, and policymakers. Teachers are encouraged to adopt evidence-based strategies, while professional development programs should focus on training teachers effectively, considering diverse students' needs. Head teachers and SISOs are encouraged to embark on regular monitoring and supervision of the teaching and learning of multiplication facts. Policymakers and curriculum developers are urged to incorporate these findings into mathematics education programs, fostering a more robust and adaptive learning environment. Future research should address the study's limitations by employing more objective measures, larger and diverse samples, and longitudinal studies to explore sustained impacts.

Objective Two: Teachers' perceived effective Teaching Strategies in the Wa Municipality

The study delved into teacher's perceived effective teaching strategies for teaching multiplication facts recall. The use of teaching manipulatives and visual aids, Simple repetition in teaching, Pair Work / Ability groupings, Use of Mathematics Games, Use of time testing, Use of flashcards and charts and the Use of building blocks of mathematics tools were given maximum response as more effective strategies for teaching multiplication facts recall. However, focus on less interested students, social media use in learning and completing as many questions as possible received lukewarm feedback, emphasizing the importance of exploring alternative methods. Gender-sensitive teaching practices, concrete materials, and visual representations were generally favored. Teachers should approach these teaching strategies with a

nuanced understanding, integrating them contextually. Ongoing professional development, informed by empirical research, is vital. Policymakers are encouraged to invest in research exploring the intersections of instructional methods, student diversity, and learning outcomes. Collaborative efforts between educators and researchers can inform evidence-based strategies, ensuring a rich and tailored math education experience for all students.

Objective Three: Association between teachers perceived effective strategies for teaching multiplication facts recall and their gender in the Wa Municipality.

The empirical literature, along with the provided data, suggests that teachers' perceptions of effective strategies for teaching multiplication vary by gender. The Chi-square test results further support this finding, demonstrating a significant association between gender and the perception of mathematics games as an effective teaching strategy. This underscores the importance of considering gender when developing and recommending multiplication facts teaching strategies, as different methods may be more or less effective based on the teacher's gender and preferred teaching style.

Additionally, the Chi-square test results indicate that perceptions of flash charts as an effective teaching strategy are also significantly associated with gender. This further emphasizes the need to take gender into account when designing and recommending multiplication teaching strategies, as teachers' gender and teaching style preferences can influence the effectiveness of different approaches.

Objective Four; Challenges Basic School Teachers Faced When teaching Multiplication facts recall in Wa Municipality

The study identified significant challenges faced by basic school teachers in teaching multiplication facts recall in the Wa Municipality. Inadequate or Lack of Access to Teaching Resources, Influence of Shifting Educational Policies and Curriculum, Insufficient Time Allocated for Learning Multiplication Facts Recall, Inadequate or Lack of Support from School Administrations, Poor Quality of Teacher Training Programs, Little or No Use of Computers in the Teaching and learning of Multiplication Facts Recall, Ineffective Professional Development Programs, Large Class Sizes in most Schools and Lack of Teacher Confidence were recognized as major obstacles in the teaching and learning of multiplication facts recall. Addressing these challenges requires collaborative efforts from policymakers, school administrators, and teachers. Adequate funding, stable policies, targeted training programs, technology integration, and initiatives to enhance teacher confidence are crucial steps towards ensuring a high-quality education for all students.

5.3 Conclusion

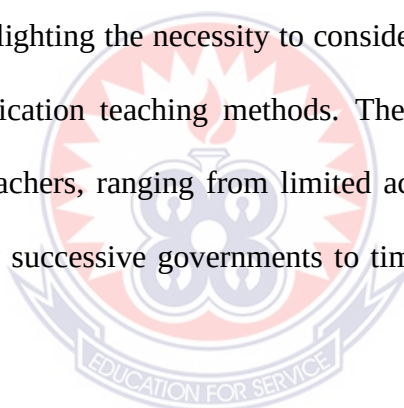
In this comprehensive study, we delved into the intricate landscape of teaching multiplication facts recall in basic schools within the Wa Municipality in the upper west region of Ghana. Through rigorous analysis and exploration of various teaching strategies, challenges and perceptions, several significant findings and implications have emerged, shaping the future trajectory of mathematics education in the country.

The study provides compelling empirical evidence supporting a range of teaching strategies grounded in robust theoretical frameworks and empirical studies. Proficiency-based differentiation, simple repetition teaching strategy, and adaptive

learning strategies have shown promising outcomes, aligning with established principles and curriculum identified teaching strategies in education.

Additionally, the effective use of visual aids and teaching manipulatives, strategic feedback, spaced and interleaved practice, and metacognitive approaches have been highlighted as key factors in enhancing students' multiplication facts recall and their mathematical proficiency at large.

The analysis reveals that teachers' perceptions of effective multiplication teaching strategies, such as mathematics games and flash charts, significantly differ by gender. The Chi-square test results confirm that gender is a significant factor in determining these perceptions, highlighting the necessity to consider gender when developing and recommending multiplication teaching methods. The study also shed light on the challenges faced by teachers, ranging from limited access to resources and shifting educational policies by successive governments to time constraints, lack of support, and technology gaps.



5.4 Recommendations

Based on the extensive findings and conclusions drawn from this study, several recommendations are put forth to enhance the teaching and learning of multiplication facts recall in basic schools in the Wa Municipality and Ghana at large. These recommendations are tailored to address the identified challenges and leverage the highlighted effective teaching strategies, aiming to create a more conducive learning environment for both teachers and students.

1. The Education directorate in the Wa Municipality in collaboration with NGOs, SMC, PAs and other stakeholders should help in the provision of teaching

manipulatives and visual aids for the effective teaching and learning of multiplication facts and other mathematics related areas.

2. The municipal education directorate of Wa municipality should organize tailored professional development programs to address the specific needs of teachers, including a focus on modern teaching strategies, classroom management, student engagement techniques and integration of computers in teaching.
3. It is also recommended that educational policymakers and curriculum developers incorporate gender-specific insights when designing multiplication teaching strategies. Tailoring approaches to align with the preferences and perceived effectiveness reported by male and female teachers can enhance the overall effectiveness of multiplication instruction, ensuring that diverse teaching styles are supported and optimized.
4. The Wa Municipal Education Directorate, SISOs, and head teachers should constantly monitor and supervise the use of teaching materials and other manipulatives suggested in the curriculum for teaching multiplication facts.

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APPENDIX A

Questionnaires

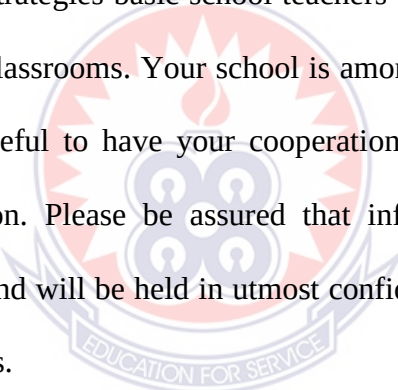
UNIVERSITY OF EDUCATION, WINNEBA

MPHIL IN BASIC EDUCATION (MATHEMATICS)

Perceived Strategies Used by Basic School Teachers in Teaching

Multiplication Facts Recall in the Wa Municipality

My name is Ankibu Faisal, a final year student at the University of Education, Winneba. I am conducting research on the above topic with the aim of identifying effective perceived strategies basic school teachers used in teaching multiplication facts recall in their classrooms. Your school is among those selected for this study and I would be grateful to have your cooperation and support in obtaining the necessary information. Please be assured that information given is purely for academic purposes and will be held in utmost confidence and your identity will be treated as anonymous.



SECTION A

SOCIO-DEMOGRAPHIC CHARACTERISTICS

1. Age

18-28 [] 29-39 [] 40-50 [] Above 50 []

2. Sex

Male [] Female []

3. Educational Qualification

SSS Certificate [] Cert A'/Diploma [] Degree [] Master's/ PhD []

4. Position

Head teacher [] Assistant Head teacher [] Math Teacher []

5. Religious background

Christian [] Moslem [] Traditional worship []

6. Number of years of experience as a professional teacher in teaching math

1-5 [] 6-10 [] 11-15 [] 16-20 []

7. Number of years of experience as a head-teacher

1-3 [] 4-7 [] 8-10 [] Above 10 []

8. How long have been the head of this school

Less than 5 years [] 5-10 years [] 11-15 years []

SECTION B; KINDS OF STRATEGIES USED BY BASIC SCHOOL**TEACHERS IN TEACHING MULTIPLICATION FACTS RECALL IN****THE WA MUNICIPALITY**

9. Which of the following factors do you believe is a perceived strategy teachers used in teaching facts recall in multiplication? (Tick only one answer in the table). Using a scale of “1” to “5” where; 1=Strongly Disagree; 2=Disagree; 3=Agree; 4=Strongly Agree

Kinds of Strategies used by teachers in teaching multiplication facts recall	1	2	3	4
Simple repetition in teaching				
Use of teaching manipulatives and visual aids				
Conducting a pre-test				
Completing many questions as possible				
Use of Time testing				
Focus on less interested students				

Use of building blocks in mathematics				
Use of mathematics games				
Pair work or ability groupings				
Use of flashcards and charts				
Teacher using feedback and reward				
Practice on computer or computer assisted instruction				
Use of social media in learning				

SECTION C; KINDS OF STRATEGIES PERCEIVED MORE EFFECTIVE

BY BASIC SCHOOL TEACHERS FOR TEACHING MULTIPLICATION

FACTS RECALL IN THE WA MUNICIPALITY

10. In your opinion, do you see the strategies you used as more effective in the teaching and learning of multiplication facts recall?

Yes []

No []

11. Which of the following strategies do you seem more effective in the teaching and learning of multiplication facts recall? (Tick only one answer in the table).

Using a scale of “1” to “5” where; 1=Strongly Disagree; 2=Disagree;

3=Agree; 4=Strongly Agree

kinds of strategies that seems more effective in teaching multiplication facts recall	1	2	3	4
Use of social media in learning				
Teaching of building blocks in mathematics				
Use of time testing				
Use of mathematics games activities				
Ability groupings or pair work				
Use of flashcards and charts				

Use of simple repetition				
Use of teaching manipulatives and visual aids				
Focus on less interested students				
Use of computer assisted learning				
Completing many questions as possible				
Use of feedback and reward				
Conducting a pre-test				

SECTION D; IS THERE ANY ASSOCIATION BETWEEN TEACHERS

PERCEIVED EFFECTIVE STRATEGIES FOR TEACHING

MULTIPLICATION FACTS RECALL AND THEIR GENDER?

1. Which of the following strategies do you see as more effective in teaching multiplication facts recall with regards to gender? (Tick only one answer in each category).

Strategy	Gender			
	Male		Female	
	Agree	Disagree	Agree	Disagree
Manipulatives and visual				
Repeat				
Group				
Math games				
Time testing				
Flash charts				
Blocks				
Feedback				
Computer Assisted learning				
Pretest				
Social media				
Completing as many question as possible				

SECTION E; CHALLENGES BASIC SCHOOL TEACHERS FACE IN
TEACHING MULTIPLICATION FACTS RECALL IN THE WA
MUNICIPALITY

2. Tick the appropriate box that you feel most accurately represents the challenges faced by basic school teachers in teaching facts recall in multiplication based on the scale “1” to “4” where;

1=Strongly Disagree; 2=Disagree; 3 = Agree; 4=Strongly Agree

Challenges basic school teachers faced in teaching facts recall	1	2	3	4
Educational policies by successive governments				
Lack of access to resources				
Lack of support from administration				
Ineffective professional development				
Poor training of teachers				
Lack of right type of technology				
Inadequate time to learn fact recalls				
Over class size				
Lack of confidence among some teachers				

APPENDIX B

Interview Guide for Respondents

1. Which of these teaching strategies do you think is the best teaching strategy for teaching multiplication facts recall, and why?

The use of teaching manipulatives and visual aids, the use of feedback and reward procedure, conducting a pre-test, the use of simple repetition in teaching, focus on less interested students, the use of time testing, the use of computer assisted learning, completing as many questions as possible, the use of building blocks in mathematics, the use of mathematics games, ability groupings of students the use of flash cards and charts and the use of social media in learning.

2. What teaching strategies do you apply in teaching mathematics to attain facts recall in multiplication?
3. To what extent does school environment hinder multiplication facts recall delivery to students?
4. What is your opinion on how to improve students' performances in multiplication facts recall? Please briefly state.
5. Which ways of teaching (teaching style) do you think make students to understand facts recall easily?
6. How often in your interactions with students did you try to develop a conversation with them about the topics being studied in a week?
7. Do you face any challenge during the teaching and learning of multiplication facts recall?
8. In your opinion, do you think, gender play major roll in the delivry of multiplication facts lessons?

9. What is the contribution of effective perceived strategies to the learning and understanding of facts recall in multiplication?
10. What recommendations will you proffer to improving multiplication facts recall among students?

Thank you!



APPENDIX C

Introductory Letter

	UNIVERSITY OF EDUCATION, WINNEBA FACULTY OF EDUCATIONAL STUDIES DEPARTMENT OF BASIC EDUCATION ✉ P. O. Box 25, Winneba, Ghana ☎ +233 (050) 9212015	✉ beducation@uew.edu.gh
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Date: July 15, 2022

The Municipal Director
Wa Municipal Education Directorate
Wa Municipality

Dear Sir/ Madam,

LETTER OF INTRODUCTION

We forward to you, a letter from Mr. Abdul Rafiq Tarabangnung Issahaque, a second year

We forward to you, a letter from Mr. Ankibu Faisal, a second year M.Phil student of the Department of Basic Education, University of Education, Winneba, with registration number 202113954

Mr. Ankibu Faisal is to carry out a research on the Topic “**Perceived Strategies Adopted by Basic School Teachers for Teaching Multiplication Fact Recall: The Case of Wa Municipality**”.

Thank you.

Yours faithfully,


PROF. MRS. SAKINA ACQUAH (PHD)
HEAD OF DEPARTMENT

www.uew.edu.gh