UNIVERSITY OF EDUCATION, WINNEBA

TEACHERS' KNOWLEDGE AND PRACTICES OF DIFFERENTIATED INSTRUCTION IN MATHEMATICS IN MAMPONG MUNICIPALITY

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DECLARATION

STUDENT'S DECLARATION

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

Signature:…….....

Date:…….....

SUPERVISORS' DECLARATION

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

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DEDICATION

This research work is dedicated to my lovely family (Mr. Wilfred Kofi Bayuo, Mary BelbeTieson, Lucy Bayuo, EmeliaBayuo and Abasaana Mitchelle).

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LIST OF ACCRONYMS

CRDD	Curriculum Research Development Division
DA	Dynamic Assessment
DI	Differentiated Instruction
GES	Ghana Education Service
MI	Multiple Intelligence
MOE	Ministry of Education
RPK	Relevant Previous Knowledge
TEAL	Teamwork for Empowerment Advocacy and Learning
UNESCO	United Nations Educational Scientific and Cultural Organization
ZPD	Zone of Proximal Development

ABSTRACT

The study sought to investigate the knowledge and practice of differentiated instruction by primary school teachers in the Mampong municipality of Ghana. The study employed a sequential explanatory design within the mixed method approach. The study employed stratified sampling technique to select a sample of 135 primary school teachers from Mampong municipality of Ghana for the quantitative study and from which 9 teachers were selected for the qualitative study. The researcher used questionnaire to collect the quantitative data whiles the qualitative data were collected using observational schedules and semi-structured interviews. The study used descriptive statistics involving frequency, percentages, mean and standard deviation to analyze responses from the questionnaire with the help of Statistical Package for the Social Sciences. The qualitative data on the other hand were analysed using thematic approach. The findings of the study revealed that most of the participants were knowledgeable of differentiated instruction in spite of the fact that there was little evidence of the practice the concept and most participants scarcely teach to address individual differences during instructional hours. The findings also revealed that time, class size and lack of logistics made the implementation of differentiated instruction difficult. The study recommends that teacher educators tune the curriculum to encourage teacher trainees to practice differentiated instruction. The study also recommends frequent organisation of professional development courses related to differentiated instruction by the Ghana Education Service and headteachers to equip teachers with the necessary skills to differentiate instruction and also make it possible for at least two trained teachers to be in each classroom to reduce the workload on teachers. The study suggests that further studies might be conducted to investigate the practice of differentiated instruction, using the pupils as participants instead of the teachers.

CHAPTER ONE

INTRODUCTION

1.0 Overview

The first chapter of this study will give an introduction to the study. It will include the background to the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, delimitation, limitations and organisation of the study.

1.1 Background to the Study

In every classroom, learners differ in their learning styles, readiness and interests. Some of these differences could be seen when learners are asked to recall certain concepts that have been taught over a period of time. Some differences will be more about learning style and preferences. For example, whether the student learns better through auditory, visual, or kinesthetic approaches. Teachers can cater for these diversities to improve each child's learning by using adaptive teaching where the teacher arranges environmental conditions to fit individual differences and weaknesses.

These differences in the classroom call for educators to provide quality education that will seek to cater for all these differences of pupils in respect to learning. Quality education calls on teachers to understand and plan wisely for five key classroom elements: learning environment, curriculum, assessment, instruction, and classroom leadership/management (Tomlinson, Moon & Imbeau 2015). It also calls on teachers to understand the interdependence of those elements in supporting success for each student. Weakness in any of these elements diminishes the effectiveness of all of the others (Tomlinson, Moon & Imbeau 2015). This and other factors have led to many

researchers like Brimijoin, Marquissee and Tomlinson (2003) to prescribe differentiated instruction as the best pedagogical practice to make instruction accessible to all learners regardless of their differences. They further suggested that,learning tasks must be adjusted to each student‘s appropriate learning zone.

Ryan and Cooper (2007) support this with the notion that, when individuals are viewed differently and are given the appropriate response in the classroom with supportive learning environments, their academic success improves.

Tomlinson (2005) defines differentiated instruction as a philosophy of teaching that is based on the premise that students learn best when their teachers accommodate the differences in their readiness levels, interests and learning profiles. A primary aim of differentiated instruction is to take full advantage of all students‘ ability to learn (Tomlinson, 2005).

Tobin and Tippett (2014) opine that, when teachers conduct a diagnostic assessment of the different readiness levels, interests, and learning profiles, it allows educators to act on this knowledge, and provide learners with choices on how to best represent and express their learning through content, process, and product dimensions.

Most mathematics teachers will more frequently teach all students based on a fairly narrow curriculum goal presented in a textbook and because of time and fear of not being able to achieve expected goal of the curriculum, they might teach without varying content, process and product to suit the learning needs of the learners. According to Small (2009), perhaps teachers might not be able to differentiate instruction because differentiating instruction in mathematics is a relatively new idea. Perhaps it is because teachers may never have been trained to really understand how

students differ mathematically. However, students in the same mathematics classroom clearly do differ mathematically in significant ways.

The National Council of Teachers of Mathematics (NCTM, 2000) which is a professional organization whose mission it is to promote teaching and learning in mathematics, recognizes the need for differentiation as it enumerates equity as a requirement for excellence in mathematics education and also high support and expectations for all learners (NCTM, 2000). This requires mathematics teachers to shift from the paradigm of equality where they give the same content process expecting them to produce the same products and focus on equity for all learners where learners access the same instruction and gain understanding despite their differences in learning styles, readiness and interest. This also involves providing resources that will make its implementation a successful one.

In Ghana, quality education is very crucial in the educational system so every sitting Government tries its best to get all stakeholders on board in implementing it. Quality education is of interest to the government, Ministry of Education (MOE), Ghana Education Service (GES) and Cooperate bodies. The relevance of creating an environment that promotes quality education for all has made the Ghana government, as part of her vision towards education, aim at providing quality education for all by way of providing adequate resources and facilities to achieve her goal at all levels of education (Adu-Agyem & Osei-Poku, 2012). This also involves teachers and other stakeholders putting measures into place to ensure that all learners in the classroom get equal access to content, process and product of the instruction given.

The Ghana Education Service Mathematics syllabus for Primary Schools that is the major curriculum material for teaching and learning of mathematics in Ghana clearly

states in the preliminary part that, the national constitution, all children should be given the opportunity to achieve the maximum of their potential. Children of lower abilities need to have the opportunity to experience a range of mathematics, which is appropriate to their level of development, interests and capabilities. Equally, children with exceptional ability in mathematics must be extended (i.e., challenged) and not simply be expected to carry out different repetitions of work they have already mastered (CRDD, 2012).

The need for appropriate pedagogical practices such as differentiated instruction and assessment has prompted researchers like (Boakye-Akomea, 2015; Kuyin & Abosi 2014) to raise concerns on Ghanaian basic school teachers to adapt and differentiate instruction to cater for the diverse learning needs of learners.

A study conducted by Robinson, Maldonado and Whaley (2014) reveals that many teachers in a southeast school district are not implementing differentiated instruction. According to their study, the absence of participation is due to factors such as lack of professional development, lack of time or considering differentiated instruction to be another fad in educational approaches. Also, a study conducted by Amadio (2014) in the United States of America revealed that most teachers failed to differentiate instruction due to time restrictions and also the size of the classroom.

The situation is of no difference in Ghana because some studies have revealed that schools do not differentiate instruction (Owusu, 2016 ; Abora 2015) .

According to Owusu (2016), it was revealed in his study that, teachers only used informal pre-assessment strategies to determine the readiness of students and interest but no pre-assessment to ascertain the learning profile was done. Contents were not responsive to students learning profile and interest but matched the readiness of

students. Abora (2015) also revealed that, majority of teachers had at least fair knowledge on the major concept and practices of differentiated instruction. However, majority of these teachers (93%) scarcely differentiate instruction and taught to address the diverse needs of learners despite the level of their knowledge they appeared to possess on differentiated instruction.

Findings from these studies indicate that primary school teachers lack a general understanding of differentiated instruction and assessment and how to use the approach in instructional practice. Taking a step to research this problem may provide evidence of primary teachers‘ knowledge and practice of differentiated instruction in mathematics classrooms in the Mampong Municipality.

1.2 Statement of the Problem

Research has proven over the years that students‘ academic achievement greatly depends on the impact made by teachers (Hendricks 2008). Teachers are mostly criticized for the poor performance of their learners based on an assertion like this. In Ghana, basic school teachers‘ competences are criticized based on the performance of pupils in the Basic Education Certificate Examination (BECE) (Ministry of Education [MOE], 2010). It has been pointed out by many researchers that, teachers play a major role in the academic achievement of learners (Heacox, 2002; Stake, 2002). It is therefore necessary to note that, the methods employed by teachers in the classroom need to be assessed and properly tuned to suit the learning needs of students.

It is unfortunate that, every classroom today comes along with different individual students who have their own preferred way, appropriate time and a possible content of learning (Gangi, 2011).

Every classroom today comprises of learners with diversities therefore there is the need for every teacher to be able to meet the needs of these diversities but meeting these needs has become a challenge to some teachers (Owusu, 2016). Tomlinson (2004) asserts that, in every classroom all over the world, there are learners with differences in their religion, culture, abilities, disabilities, interest and needs. Ghana is of no exception of this problem of leaner diversity of learners in the classroom (Owusu, 2016). However, it is indicated by Kuyini and Abosi (2014) that most Ghanaian teachers have failed to address the needs of pupils with learning difficulties in the regular classroom. Owusu (2016) confirms this by indicating that, pedagogy has become a _one-size-fits-all' which does not address the complexity of learner needs in Ghanaian classroom.

The focus of the Government of Ghana's inclusive education policy is to provide the most suitable and relevant education for all Ghanaian children to succeed in school and to develop their potentials to become productive citizens (MOE, 2013). In support of this, the Ghanaian basic school teacher is reminded in the syllabi by critically stating that, as a classroom teacher,

–Remember your class may include few pupils with physical and mental challenges. Some of the children may have high mental ability, while others may be slow learners; some may be dyslexic and not able to read or spell well as the others. All these are special needs children who need particular attention" (CRDD, 2012, p. vii).

Evidence from research indicates that the use of differentiated instruction is the best pedagogical practice to meet the diverse needs of learners (Owosu, 2016; Kadum-Bošnjak and Buršic Križanac, 2012, Tomlinson 2004). The modern school, therefore, looks for contempy strategies of learning and teaching, and also calls for more

efficient approaches and procedures of knowledge acquisition and this can be done through differentiated instruction and, accordingly, by a systematic differentiation of students based on the didactic and methodical principle of individualization (Kadum-Bošnjak & Buršic-Križanac, 2012). Over the years studies have indicated differentiated instruction as a way of meeting the diverse academic needs of learners in every classroom (Tomlinson, 2004; Good, 2006).

Despite there are few studies discussing primary school teachers‘ knowledge and practice of differentiated instruction. These studies explore the effects of differentiated instruction on students‘ achievements but do not specifically state the impact of teachers‘ knowledge and practices of the instructional approach. Therefore there exists a gab in the literature concerning primary school teachers‘ knowledge of differentiated instruction and how this knowledge influences instructional practice in the classroom. It is of this reason that has compelled the researcher to investigate primary school teachers‘ knowledge and practices of differentiated instruction in mathematics in the Mampong Municipality.

1.3 Purpose of the Study

The purpose of this study is to explore teachers‘ perception and practices of differentiated instruction in Mampong Municipality in the Ashanti Region of Ghana.

1.4 Objectives of the Study

The specific objectives of the study are to:

1. Investigate primary school teachers‘ knowledge of differentiated instruction in the Mampong Municipality.

2. Assess the pedagogical practices of Mampong Municipal primary school teachers in Differentiated Instruction.
3. Investigate the challenges confronting primary school teacher in practicing differentiated instruction.

1.5 Research Questions

The study was guided by the following questions:

1. What knowledge do primary school teachers have about differentiated instruction in Mampong Municipality?
2. To what extent do primary school teachers practice differentiated instruction in Mampong Municipality?
3. What challenges do primary school teachers experience in differentiated instruction in Mampong Municipality?

1.6 Significance of the Study

The study seeks to explore teachers of Mampong Municipal Basic Schools' knowledge of differentiated instruction and the findings will inform stakeholders to address the need to equip teachers with the necessary training and resources to make them well knowledgeable in the concept of differentiated instruction. The findings of the study are going to help stakeholders to design the appropriate training and teacher developmental programs for teachers to help them upgrade their pedagogical practices in the classroom.

The study is expected to find out how teachers assess pupils in mathematics classrooms to diagnose their needs and eliminate their weak areas. The findings of the study are going to inform the Mampong Municipal on the Challenges its teachers face

in implementing differentiated instruction in the classroom. This will further inform policy makers in forming policies that will seek to eliminate the challenges teachers face in implementing differentiated instruction and assessment.

Findings of this research can be relevant to curriculum planners in designing good curriculum materials that fully outline how to implement differentiated instruction and assessment in the classroom with regards to process, content and product of the curriculum materials. Findings from this research can also inform the government of Ghana to make policies that will aid the implementation of differentiated instruction in classrooms.

Findings from the study can also help Ghana Education Service to organise workshops or trainings to teachers to equip them with the details of differentiated instruction and assessment.

The study will reveal the nature of basic schools environment to the Municipality and suggest resources that will be needed to make the implementation of differentiated instruction in the municipality a successful one.

1.7 Limitation

The study, like other research works have unavoidable limitations. First of all the study was conducted in the Mampong Municipality only due to limited time and scarcity of resources. In effect, the study focused only one district among the 30 districts in the Ashanti Region. Therefore, the findings could not be generalized. Also, not many studies on DI have been done in Ghana; so the literature reviewed was mostly from foreign studies. The study was also limited by the level of detail responds participants gave to the items posed by the researcher especially in the interview.

Some teachers may have been hesitant to reveal they had limited knowledge in differentiated instruction and limited ability to practice it in the classroom. This to some extent could threaten internal validity.

1.8 Delimitation

This study purposefully excluded other subjects and primarily focused on differentiation of instruction of basic mathematics and did not examine other interventions. In addition to that, the study only examines differentiation of instruction through the perspective of primary school teachers in the Mampong Municipality in the Ashanti Region and did not look into the perspective of students.

1.9 Organisation of the Study

The study is organized into five chapters. The first chapter presents the background to the study, statement of the problem, purpose of the study, objectives of the study, research question, significance of the study, limitation and delimitations of the study and organisation of the study. The second Chapter reviews the relevant related literature with the theoretical and conceptual framework of the study. Chapter Three covers the research methodology which examines research design, population and sampling, research instruments, data collection procedures and data analysis. The fourth chapter deals with analysis and discussion of the results from the data gathered. The final chapter that is Chapter five, covers the overview of the study, summary of the findings, conclusions and recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Overview

This chapter reviews related literature under theoretical and empirical evidences. The chapter also reviews the conceptual framework of differentiated instruction. It further reviews the empirical evidence of teachers knowledge and practice of differentiated instruction in schools and the challenges teachers experience in differentiating instruction. The final part of the chapter summarises the related literature reviewed.

2.1 Theoretical Framework Underpinning Differentiated Instruction

The ideology behind differentiated instruction is that, every learner is different and he/she learns differently. The goal of differentiated instruction therefore is to identify these differences and assign the appropriate instruction to each learner needs. Differentiated instruction is grounded in the socio-cultural theory and Gardner‘s theory of multiple intelligence (Burkett, 2013).

2.1.1 Theory of Zone of Proximal Development

Differentiated instruction is based on the socio-cultural learning theory based on the work of Lev Vygotsky in 1962 (Burkett, 2013). The socio-cultural learning theory holds that the previous experiences and culture of the learner are critical because, these influence the learning process for each individual. The learners‘ interpretation of the world is framed by their background and culture and what they discover and attain in the process of learning. (Wertsch, 1997).Kozulin (2002) asserts that Vygotsky considers the learning process as not a solitary exploration of the environment by the child on his own but as a process of the child‘s appropriation of

the methods of actions that exist in a given culture. Kozulin (2002) further stated that, socio-cultural learning approaches are based on the concept that human activities take place in cultural contexts, are mediated by language and other symbol systems, and can be best understood when investigated in their historical development. This principle according to Kuzulin describes a process situated in, but not limited to, social interaction. When beginning an activity, learners depend on others with more experience. Over time the take on increasing responsibility for their own learning and participation in joint activity. Therefore, socio interaction is essential to the development of cognition (Vygotsky, 1978 & Wertsch, 1997).

The Zone of Proximal Development (ZPD) is a central proposition of the socio-cultural learning theory. Shayer (2002) claims that the crucial feature of learning according to Vygotsky is the creation of ZPD. That is to say learning awakens a variety of internal developmental processes that are able to operate only when the child is interacting and cooperating with people in his environment and once these processes are internalized, they become part of the child's dependent developmental achievement.

The ZPD was understood by Vygotsky to describe the current or actual level of development of the learner and the next level attainable through the use of mediating semiotic and environmental tools and capable adult or peer facilitation. The idea is that individuals learn best when working together with others during joint collaboration, and it is through such collaborative endeavors with more skilled persons that learners learn and internalize new concepts, psychological tools and skills.(Shabani, Khatib & Ebadi, 2010). Vygotsky (1962) asserts that, the ZPD must

be acknowledged in order to gain in understanding of the true relationship between learning and development.

Vygotsky (as cited in Ajideh, Farrokhi, & Nourdad, 2012) holds that any human mental function must pass through an external social stage on its path to development in order to become an internal mental function. Therefore, the function is fundamentally social and the process through which it becomes an internal function is known as internalization. So, the role of social mediation in internalization process is of great importance in socio-cultural theory.

Mediation is central to Vygotsky socio-cultural theory. Mediation according to Vygotsky refers to the part played by other significant people in the learners‘ lives, people who enhance their learning by selecting and shaping the learning experiences presented to them. Williams and Burden (1997; as cited by Denhere, Chinyoka & Mambeu, 2013). Vygotsky (1978; as cited in O‘Neil, 2011) claim that, the secret of effective learning lies in the nature of the social interaction between two or more people with different levels of skills and knowledge. This involves helping the learner to move into and through the next layer of knowledge or understanding.

In the context of the ZPD, scaffolding is used to explain the social and participatory nature of teaching and learning which occurs in the ZPD. Educators and researchers have used the concept of scaffolding as a metaphor to describe and explain the role of adults or more knowledgeable peers in guiding children's learning and development (Daniels, 2001). Educators find the metaphor useful as it resonates with their own intuitive conceptions of what it means to intervene successfully in students learning and offers what is lacking in much literature on education – an effective conceptual

metaphor for the quality of teacher intervention in learning (Hammond as cited in Denhere, Chinyoka & Mambeu, 2013).

The structural element of scaffolding refers to those planned, ritualized structures that surround learning tasks. Students become familiar with this collaborative structure for sharing ideas so that it becomes automated. Eventually, the teacher can add flexibility to the structures itself with slight alterations such as including a drawing or a writing option to the steps. The procedural aspect of scaffolding emerges through the unplanned support that occurs in-the-moment and in response to something new the learner introduces in classroom interactions. The on-the-spot nature of procedural scaffolding makes it contingent on the learner and the particular situation in which it occurs. This means that in addition to continually monitoring students' understanding, the teacher is also assessing their own structural scaffolds so as to be able to quickly modify them in order to support students' progression to the ZPD. (Billings & Walqui, n.d)

Vygotsky (1978) also claims that, in schools, students do not merely copy teachers' capabilities; rather they transform what the teachers offer them during the processes of appropriation. During instruction a teacher considers the learners' previous development and nudges the student forward, taking care not to go too far. If the learner is pushed out of his/her comfort level without an appropriate amount of guidance and support, the student will not be able to move forward to the ZPD. Vygotsky recommends that the teacher remains slightly ahead of the students' actual level of development in order to remain within the ZPD. It is in this range that the learner is able to work independently and where new learning takes place. It was further explained that, pre-testing is essential in order to place students in their proper

ZPD. According to Hall, Strangeman and Meyer (2003), the readiness element of differentiated instruction is linked to this developmental component. The teacher can assess the readiness level of students if he is aware of the student‘s ZPD and differentiate instruction according to the student need.

2.1.2 Gardner’s Theory of Multiple Intelligence

Howard Gardner first introduced Multiple Intelligences (M1) theory in 1983 through the book ―Frames of Mind”. Gardner wanted to define human potential by going beyond the IQ score. The theory has led to the development of intelligence tests that contain questions for which more than one answer can be correct. This provides an opportunity for the test taker to demonstrate creative thinking. These tests are based on the idea that different types of intelligence can produce different but equally valid answers to the same question (Sreenidh i& Tay, 2017).

Gardner's Theory of Multiple Intelligences states that human beings have many different ways to learn and process information. However, it also says that these are independent of each other: leading to multiple "intelligences" as opposed to a general intelligence factor among correlated abilities (Sreenidhi & Tay, 2017). They further explained that, to achieve an edge in learning, an individual can leverage that intelligence where he shows strength so as to develop in the area where they may have a challenge. Gardner felt that traditional ways of testing may be biased to certain individuals. According to him, human beings have nine different kinds of intelligence that reflect different ways in which people interact with the world. Although each individual has all nine types of intelligence, no two people possess them in the same configuration. The nine types of intelligence that Gardner referred to are Linguistic,

Logical/Mathematical, Musical, Bodily-Kinesthetic, Spatial, Interpersonal, Intrapersonal, Naturalistic and Existential (Sreenidhi & Tay, 2017). These were further explain as:

1. Linguistic Intelligence: The capacity to use words effectively, whether orally (e.g., as a storyteller, orator, or politician) or in writing (e.g., as a poet, playwright, editor, or journalist). This intelligence includes the ability to manipulate the syntax or structure of language, the phonology or sounds of language, the semantics or meanings of language, and the pragmatic dimensions or practical uses of language. Some of these uses include rhetoric (using language to convince others to take a specific course of action), mnemonics (using language to remember information), explanation (using language to inform), and meta-language (using language to talk about itself).
2. Logical-mathematical Intelligence: The capacity to use numbers effectively (e.g., as a mathematician, tax accountant, or statistician) and to reason well (e.g., as a scientist, computer programmer, or logician). This intelligence includes sensitivity to logical patterns and relationships, statements and propositions (if-then, cause-effect), functions, and other related abstractions. The kinds of processes used in the service of logical-mathematical intelligence include categorization, classification, inference, generalization, calculation, and hypothesis testing.
3. Spatial Intelligence: The ability to perceive the visual-spatial world accurately (e.g., as a hunter, scout, or guide) and to perform transformations upon those perceptions (e.g., as an interior decorator, architect, artist, or inventor). This intelligence involves sensitivity to color, line, shape, form, space, and the relationships that exists between these elements. It includes the capacity to

visualize, to graphically represent visual or spatial ideas, and to orient oneself appropriately in a spatial matrix.

4. Bodily-kinesthetic Intelligence: Expertise in using one's whole body to express ideas and feelings (e.g., as an actor, a mime, an athlete, or a dancer) and facility in using one's hands to produce or transform things (e.g., as a craftsperson, sculptor, mechanic, or surgeon). This intelligence includes specific physical skills such as coordination, balance, dexterity, strength, flexibility, and speed, as well as tactile capacities.
5. Musical Intelligence: The capacity to perceive (e.g., as a music aficionado), discriminate (e.g., as a music critic), transform (e.g., as a composer), and express (e.g., as a performer) musical forms. This intelligence includes sensitivity to the rhythm, pitch or melody, and timbre or tone color of a musical piece. One can have a figural or "top-down" understanding of music (global, intuitive), a formal or "bottom-up" understanding (analytic, technical), or both.
6. Interpersonal Intelligence: The ability to perceive and make distinctions in the moods, intentions, motivations, and feelings of other people. This can include sensitivity to facial expressions, voice, and gestures; the capacity for discriminating among many different kinds of interpersonal cues; and the ability to respond effectively to those cues in some pragmatic way (e.g., to influence a group of people to follow a certain line of action).
7. Intrapersonal Intelligence: Self-knowledge and the ability to act adaptively on the basis of that knowledge. This intelligence includes having an accurate picture of oneself (one's strengths and limitations); awareness of inner moods, intentions, motivations, temperaments, and desires; and the capacity for self-discipline, self-understanding, and self-esteem.

8. Naturalist Intelligence: Expertise in the recognition and classification of the numerous species—the flora and fauna—of an individual's environment. This also includes sensitivity to other natural phenomena (e.g., cloud formations, mountains, etc.) and, in the case of those growing up in an urban environment, the capacity to discriminate among inanimate objects such as cars, sneakers, and CD covers.
9. Existential (Metaphysical) Intelligence: This type of intelligence is concerned with _ultimate issues', what Gardner considers to be the capacity to locate oneself with existential features of the human condition such as the significance of life, the meaning of death and the fate of both the physical and psychological worlds.

Accepting Gardner's Theory of Multiple Intelligences has several implications for teachers in terms of classroom instruction. The theory states that all seven intelligences are needed to productively function in society. Educators, therefore, should think of all intelligences as equally important. This is in great contrast to traditional education systems, which typically place a greater emphasis on the development and use of verbal and mathematical intelligences. Thus, the Theory of Multiple Intelligences implies that educators should recognize and teach to a broader range of talents and skills (Gardner & Hatch, 1989).

A second implication is that teachers should structure the presentation of material in a style that engages most or all of the intelligences. For example, when teaching about the revolutionary war, a teacher can show students battle maps, play revolutionary war songs, organize a role play of the signing of the Declaration of Independence, and have the students read a novel about life during that period. This kind of presentation not only excites students about learning, but it also allows a teacher to reinforce the same material in a variety of ways. By activating a wide assortment of intelligences,

teaching in this manner can facilitate a deeper understanding of the subject material (Gardner & Hatch, 1989).

2.1.3 How the Theory of Zone of Proximal Development and Multiple Intelligence support Differentiated Instruction

The theory of Zone of Proximal Development and the theory of Multiple Intelligence both have perspectives beliefs and ideologies that side with the principles and implementation of differentiated instruction and assessment. First of all both theories support the idea that each learner in the classroom is unique and possess different learning abilities therefore, it is necessary for the teacher to perform a background check to determine the appropriate method to use to meet learners' needs. Tomlinson, and McTigh, (as cited by Least, 2014) supports this with the view that, differentiated instruction gives teachers the opportunity to attend to students' background and needs. This may help build bridges that connect learners and important content.

Eisner (as cited by Gagni, 2011) believed that since each person is born with their own unique strengths and abilities, it makes sense that students learn at different rates. Therefore, it also makes sense that teachers should teach using a differentiated technique, such as Multiple Intelligence. Campbell and Campbell (1999) supports this by stating that, pointed out, Multiple Intelligence offers teachers a new way to look at students. Often, teachers view their students' skills as lacking in one way or another. However, when using MI, teachers view their students as smart or skilled in their stronger intelligence areas and they use those areas of strength to teach students new content.

Also the theory of Zone of proximal development and Multiple Intelligence support the principle of Differentiated Instruction and assessment which stated that, curriculum contents should be modified to suit learner needs in order to attain high

achievement in learning. Gagni (2011) is of the view that the curriculum needs to be adapted to match the intelligence strengths of students so they can connect with what they are learning and that, teachers must be prepared to present their lessons, in a number of ways. This satisfies Gardner's "multiple entries," as information is presented more than one way to accommodate the varying learning needs of students. According to Gangi (2011), content is the curriculum material taught in the classroom, so content can be modified according to the student characteristics of readiness, interest, and learning profile. When using MI, one possible method to modify content is by using cooperative learning groups.

Another principle of Differentiated instruction that has it that teachers should modify their teaching processes to meet learner needs is justified by the theory of zone of proximal development and multiple intelligence. Both theories suggest that, teachers use different approaches to satisfy the diverse nature of learners in the classroom in terms of their learning profile, readiness and interest. Gardner's suggestion of using the multiple entries approach to teach a concept or skill, gives teachers the opportunity to select several intelligences to inform their processes of lesson delivery. When exposed to content material in more than one way, students are given more exposure to the material, thus students have more opportunities from multiple approaches in which to learn the content (Gardner, 2006).

Borko et al (as cited by Least, 2014) suggests that, there are greater challenges for mathematics teachers and the schools in which they work. Striving towards lessons that encourage tasks involving multiple representations as well as tasks that lend themselves to multiple solution strategies, and actively involving students in making

conjectures, providing justifications and explanations, and drawing connections will address differentiated instruction in the classroom.

Another principle of differentiated instruction is creating conducive learning environment for learners to maximize their potentials of learning. Tomlinson (2000) refers to the environment as the ―learning environment", that is, the way in which the classroom operates and feels. Differentiating the learning environment includes providing work spaces that accommodate students that need to work quietly with few distractions, as well as students that need to engage in discussion when working. The MI theory requires the teacher to provide a variety of inviting atmospheres that correspond to the various multiple intelligences for successful application (Abora, 2015). The learner' interaction with the teacher cannot be left out when dealing with the learning environment to maximize students' achievements. That is why Vygotsky used scaffolding as a metaphor to support his theory of zone of proximal development. According to Vygotsky, in order for teaching and learning to be effective and efficient, students need to be challenged continually and often presented with task that require them to seek outside help or assistance. Santangelo and Tomlinson (2009) also believe that it is important for teachers to provide students with adequate scaffolding and support, as well as opportunities for peer and self-evaluation. These assistants need to be available for effective learning to take place. The practice of engaging students in this type of activities is embedded in the concept of scaffolding (Doolittle, 1997).

One ideology that both theories of zone of proximal development and multiple intelligence put across is the groupings of learners according to their interest, capabilities, strengths, and readiness levels so that the teacher can modify the material

by difficulty level and incorporate different intelligences into each lesson to accommodate the learning needs of each group. Gagni (2011) supports this with the notion that, a student with a strong intrapersonal intelligence may prefer working alone on a task and want to work in a quiet place. Another student with a strong interpersonal intelligence would prefer working with others. An area of the classroom could be designated for these students to work on their task without disrupting others. A student with a strong naturalistic intelligence may prefer working outside when possible. This can happen only when the teacher understands and implement the theory of multiple intelligence. This feature can also be seen in Vygotsky‘s zone of proximal development where he suggests collaborative learning as another way of making it possible for learners to gain confidence in their zone of proximal development by a help from a peer or an experienced person.

Following the discussions of both theories of zone of proximal development and multiple intelligence, it can be clearly identified that, they do not support the idea of uniform or one way assessment. Gagni (2011) suggest that when assessing students, it is important to allow them to demonstrate their intelligence strengths. Using a standardized test is not an intelligence-fair way to measure students' growth in knowledge. Typically, standardized tests are catered to the linguistic and logical-mathematical intelligences. Students who are not strong in these areas of intelligence are therefore at a disadvantage. Instead of using a standardized test, teachers in a MI classroom should consider using alternate forms of assessment such as portfolio reviews, projects, and presentations. Students should be allowed to choose an assessment to complete based on their intelligence strengths to demonstrate their knowledge of the content. Rubrics can be used to assess each student's mastery of the content, and assign a grade.

This is of no difference from Vygotsky‘s idea of –dynamic assessment” in his theory of zone of proximal development. The theory of Zone of Proximal Development is the foundation of the forming of Dynamic assessment (This term is first put forward by Israeli scholar Feuerstein in 1979). This assessment attaches great importance to the psychological course of how learning is engendered and happens for children being tested, or in other words, –dynamic assessment” tries to measure whether a learner has the potential of change. In a DA context, the examiner mediates the rules and strategies for solving specific problems on an individual basis, and assesses the level of internalization (i.e., deep understanding) of these rules and strategies as well as their transfer value to other problems of increased level of complexity, novelty, and abstraction (Rahbardar et al, 2014). They further stated that, the aim of dynamic assessment is the finding the highest level (symbol-concept-visual and visual-motor) that the child is able to do deductive reasoning after understanding the way to solve it.

2.2 The Concept of Differentiated Instruction

Differentiated instruction is a teaching theory based on the premise that instructional approaches should vary and be adapted in relation to individual and diverse students in classrooms (Tomlinson, 2001). In differentiated classrooms, teachers begin where students are, not the front of a curriculum guide. They accept and build upon the premise that learners differ in important ways. Thus, they also accept and act on the premise that teachers must be ready to engage students in instruction through different learning modalities, by appealing to differing interests, and by using varied rates of instruction along with varied degrees of complexity (Tomlinson, 2000)

Differentiated instruction can be looked at as an instructor‘s response to learner differences by adapting curriculum and instruction on six dimensions, including how

the instructor approaches the (1) content (the what of the lesson), (2) process (the how of the les-son), and (3) expected product (the learner-produced result), and takes into consideration the learner's (4) interest, (5) profile (their learning strengths, weak-nesses and gaps), and (6) readiness. These adaptations can be planned to happen simultaneously, in sequence, or as needed depending on the circumstance and goals of instruction (TEAL center staff, 2010).

2.2.1 Conceptual Framework

Figure 1 shows the conceptual framework of differentiated Instruction

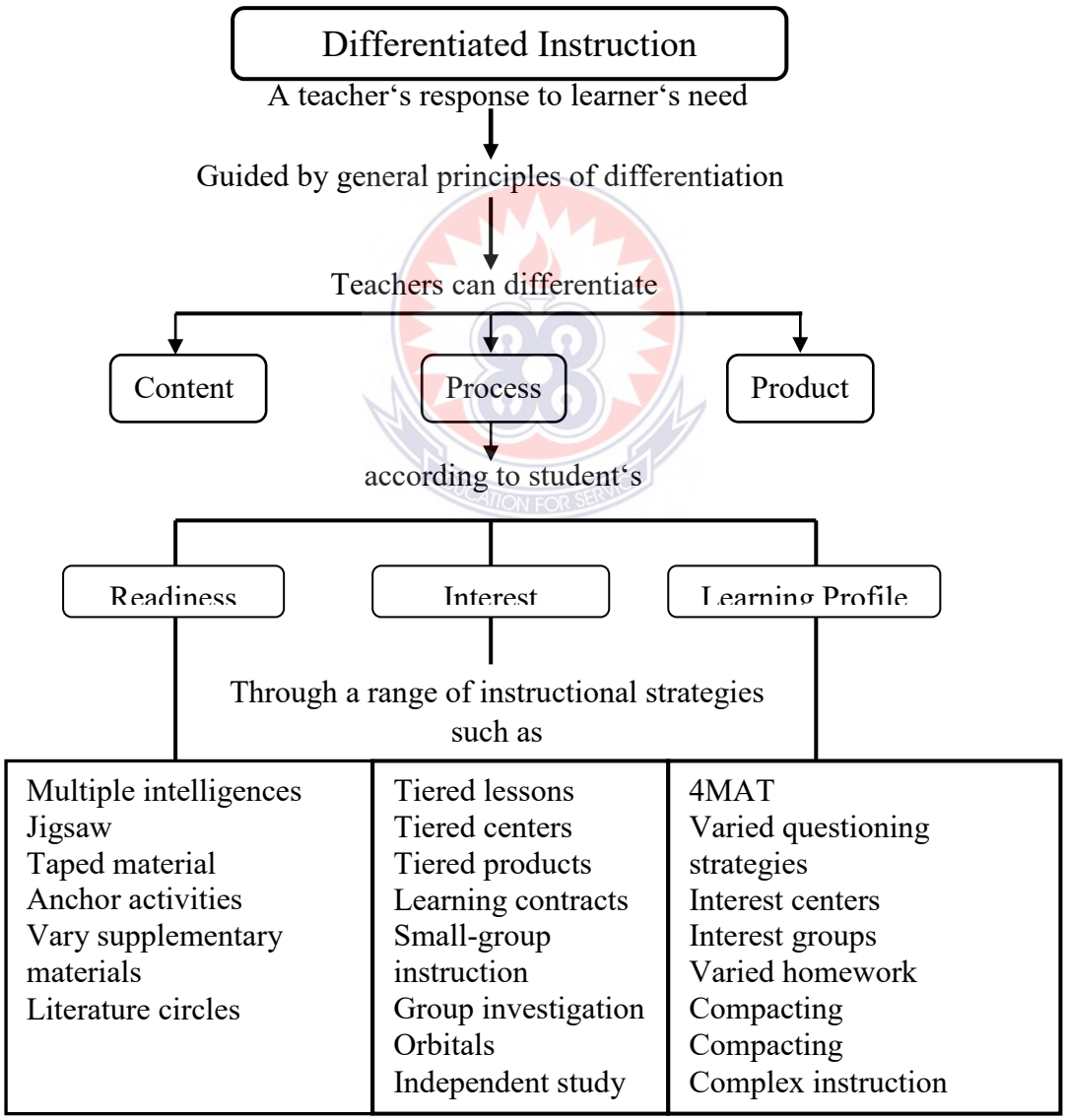


Figure1: Conceptual framework of differentiated instruction

It can be deduced from the illustration in Figure 1 that, Differentiated Instruction is teachers‘ response to learner needs. And these responses are guided by the readiness, interest and learning profile of learners. According to Tomlinson and Allan, (2000), the goal of a differentiated classroom is maximum student growth and individual success. As schools now exist, our goal is often to bring everyone to ―grade level" or to ensure that everyone masters a prescribed set of skills in a specified length of time. We then measure everyone's progress only against a predetermined standard. Such a goal is sometimes appropriate, and understanding where a child's learning is relative to a benchmark can be useful. However, when an entire class moves forward to study new skills and concepts without any individual adjustments in time or support, some students are doomed to fail.

As observed from Figure 1, some key principles guide differentiation. Understanding and adhering to these principles facilitate the work of the teacher and the success of the learner in a responsive classroom. Among the fundamental principles that support differentiation (not all of them shown on the concept map) are the following. (Tomlinson & Allan, 2000).

A differentiated classroom is flexible. Demonstrating clarity about learning goals, both teachers and students understand that time, materials, modes of teaching, ways of grouping students, ways of expressing learning, ways of assessing learning, and other classroom elements are tools that can be used in a variety of ways to promote individual and whole-class success(Tomlinson & Allan, 2000).

They further elaborated that, differentiation of instruction stems from effective and ongoing assessment of learner needs. In a differentiated classroom, student differences are expected, appreciated, and studied as a basis for instructional planning.

This principle also reminds us of the tight bond that should exist between assessment and instruction. As teachers, we know what to do next when we recognize where students are in relation to our teaching and learning goals.

Flexible grouping allows for the movement of students between groups, which is unlike ability grouping, where students remain in fixed groups based on their ability. Flexible grouping is not based only on readiness. A flexible group for reading could include the teacher placing students in groups in a variety of ways (Koeze, 2007). According to Tomlinson and Allan (2000), flexible grouping helps ensure student access to a wide variety of learning opportunities and working arrangements. In a flexibly grouped classroom, a teacher plans student working arrangements that vary widely and purposefully over a relatively short period of time. Such classrooms utilize whole-class, small-group, and individual explorations.

Tomlinson and Allan (2000), asserts that, teachers can also differentiate the elements of the curriculum. First of all a teacher can differentiate content. Content consists of facts, concepts, generalizations or principles, attitudes, and skills related to the subject, as well as materials that represent those elements. Content includes both what the teacher plans for students to learn and how the student gains access to the desired knowledge, understanding, and skills. Differentiating content refers to a change in the material being learned by the student (Tomlinson, 2010).

Process is how the learner comes to make sense of, understand, and ―own" the key facts, concepts, generalizations, and skills of the subject. A familiar synonym for process is activity. An effective activity or task generally involves students in using an essential skill to come to understand an essential idea, and is clearly focused on a learning goal. A teacher can differentiate an activity or process by, for example,

providing varied options at differing levels of difficulty or based on differing student interests(Tomlinson & Allan, 2000). Differentiating process allows students to access the material they are learning in multiple ways. For example, students can conduct research on the Internet, read books about a topic, or interview a local expert (Tomlinson, 2010).

Tomlinson (2010) points out that, differentiating product provides students opportunities to show their learning in various ways. We use the term products to refer to the items a student can use to demonstrate what he or she has come to know, understand, and be able to do as the result of an extended period of study. A product can be, for example, a portfolio of student work; an exhibition of solutions to real-world problems that draw on knowledge, understanding, and skill achieved over the course of a semester; an end-of-unit project; or a complex and challenging paper-and-pencil test. A good product causes students to rethink what they have learned, apply what they can do, extend their understanding and skill, and become involved in both critical and creative thinking (Tomlinson & Allan, 2000).

Students are characterized by some traits that serve as bases for teachers to differentiate. According to Tomlinson and Allan (2000) Students vary in at least three ways that make modifying instruction a wise strategy for teachers: Students differ (1) in their readiness to work with a particular idea or skill at a given time, (2) in pursuits or topics that they find interesting, and (3) in learning profiles that may be shaped by gender, culture, learning style, or intelligence preference.

Knowledge of a student‘s readiness to learn a particular concept is critical when preparing to differentiate instruction. For example, some students may be ready to work with complex fractions; others may require more practice with simple fractions

before moving on. Readiness is different from ability and much more helpful to our work. If we have some prior knowledge, a point of connection, or even a positive feeling about the new material, our potential to learn is enhanced. Readiness varies for each of us whenever we are learning something new (Educators Guide, 2016).

To differentiate in response to student interest, a teacher aligns key skills and material for understanding from a curriculum segment with topics or pursuits that intrigue students. For example, a student can learn much about a culture or time period by carefully analyzing its music (Tomlinson and Allan, 2000). One thing that helps us in our teaching is knowledge of our students‘ interests so that we can plan for engaging and meaningful learning opportunities. Attending to students‘ interests ignites their motivation to learn. Meaningful learning happens when new ideas are personally relevant, and relevance occurs when new information links to something the student already knows (Educators Guide, 2016).

According to Tomlinson and Allan (2000) attending to learner variance and need historically has made common sense in a classroom. This approach also reflects decades of proliferating knowledge about the brain, learning styles and varieties of intelligence, the influence of gender and culture on how we learn, human motivation, and how individuals construct meaning. Teachers and school leaders who spend time in a classroom see the significant array of learner differences. People who study the scholarship of this field understand differences and the need to attend to them, if we are to serve properly the children and families who trust us.

2.3 Elements of Differentiated Instruction

According to the authors of differentiated instruction, several key elements guide differentiation in the education environment. Tomlinson (2001) identifies three

elements of the curriculum that can be differentiated and other key components that make it possible for teachers to differentiate. These elements are described in detailed under the following headings:

2.3.1 Content Differentiations

According to Tomlinson (2001), differentiating the content is to provide multiple ways to approach the ~~–f~~acts, concepts, generalizations or principles, attitudes, and skills related to the subject, as well as materials that represent those elements". Content refers to what students need to learn: the major concepts, principles, and skills that are taught. Teachers should adjust the degree of complexity

using diverse instructional processes to teach the content. In this way, all students learn the same concepts but in different ways (Corley 2015). Tomlinson (as cited by Joseph et al 2013) explains that content comprises not only what is taught, but how students access the material taught. It was suggested that to a large extent, what is taught should remain relatively constant across learners, with teachers varying how students get access to specified content to address learners‘ needs (Heacox, as cited by Borja et al, 2015). The content refers to the topics and concepts students are to learn. Content differentiation can be developed by looking at the students‘ readiness through pre-assessment, by providing students‘ choices to explore topics more deeply, and by providing students with resources and materials that are in accordance with their‘ knowledge level. This emphasis can greatly benefit both the fast and the slow learner, since the amount and depth of the content can be adjusted according to the different learning paces. We can vary the content without losing sight of the course curriculum Levy, (as cited by Vargas-Para et al, 2018). Anderson (2007) suggests that teachers may choose to differentiate content by using flexible grouping where students can work in pairs, small groups or alone, using books or tapes or Internet as a means of developing understanding and knowledge of the topic or concept. It is important to note that while all students should be encouraged to work at their own pace, each student has the responsibility for meeting specified deadlines for class projects.

2.3.2 Process Differentiation

The way we teach the content to the students refers to the process. When differentiating the process teachers should take into consideration the students learning profiles and preferences (Heacox, 2012). In addition, Tomlinson (2005) stated that, theProcess can be thought of as the ―sense making‖ activities that allow

students to begin thinking about, working with, and personalizing the content, either in class or at home. According to Anderson (2007), differentiating the process within a lesson refers to ―how the learners come to understand and assimilate facts, concepts, or skills". It is important to note that the process is differentiated not only by how the teacher decides to teach (lecture for auditory learners; centers for tactile learners; small group and whole group), but by the strategies the teachers encourage students to use to facilitate thorough exploration of the content taught(Joseph et al, 2013). Walqui and Lier (2010) noted that within a lesson, teachers should consider three moments and different strategies to approach those lesson moments. Those moments refer to the students' preparation to approach the content, the students' interaction with the text and the students' application or extension of the knowledge acquired within the lesson. The focus of teaching the process is on how students get the information. ―To differentiate the process of learning, choices should be provided in expressing the concepts and facts" Therefore, students are exposed to activities in which they can maximize their potential according to their learning style(Tomlinson, 2001). The key to differentiating process is flexible grouping, in which learners are sometimes grouped by readiness levels, sometimes by interest, and sometimes by learning profiles. For example, an instructor might group learners with a similar readiness level for reading instruction and then regroup them by interest to discuss current events or a movie they have all viewed. This approach also supports the growth of a strong community of learners among everyone in the class. It would be difficult to differentiate instruction without using flexible grouping (Corley, 2015).

2.3.3 Product Differentiation

Products are vehicles through which students demonstrate and extend what they have learned (Tomlinson 1999). Products are culminating assessments that allow students

to demonstrate how much they understand and how well they can apply their knowledge and skills after a significant segment of instruction (Tomlinson,as cited by Joseph et al, 2013). Product differentiation should offer students multiple pathways to show mastery of common learning goals. Effective product differentiation assignments should offer students clear and appropriate criteria for success; focus on real-world relevance and application; promote creative and critical thinking; allow for varied modes of expression (Joseph et al, 2013). Products allow students to demonstrate whether they have learned the key concepts and skills of a unit and to apply the learning to solve problems and take action. Different students can create different products based on their own readiness levels, interests, and learning preferences (Tomlinson, 2001).Students should be given a choice of four or five products from which they may select to demonstrate mastery of learning. Students also may elect to work alone or in small groups on their products (Corley, 2015). Bailey and Williams-Black (as cited by, Joseph et al, 2013) suggest that differentiating the product allows students to self-select a way to show they have learned the material that was taught. They argue that when students self-select their product, they normally choose a method that will provide them success which most likely will coincide with their own learning profiles. In order to differentiate the product within their class, teachers should have their students demonstrate their spoken skills through a menu of different activities which should be based on what they have learned within a content unit. Students should have the choice to present their learning results individually, pairs, or in small groups regarding their interests and speaking levels. The menu of activities can include the performance of role plays, sketches, conducting debates or discussions, interviews or dialogue modeling, using

songs to demonstrate their learning, explanation of situations based on visual representations, story-telling accompanied by pictures, etc (Borja, et al, 2015).

2.4 Differentiating by Student Differences

The previous examples of differentiation deal with ways that teachers can differentiate the learning process by varying curricular activities. Curriculum can also be differentiated according to student‘s readiness, interest and learning profiles.

2.4.1 Readiness

Readiness refers to a student‘s knowledge, understanding, and skill related to a particular sequence of learning. It is influenced by a student's cognitive proficiency as well as prior learning, life experiences, and attitudes about school. Readiness can vary widely over time, and according to topic and circumstance. Tomlinson (as cited by Corley, 2015) points out that, if readiness levels in a class vary, so must the complexity of work provided. Tiered activities are one way to address readiness effectively; for example, all students study the same concept but complete activities appropriate to their readiness levels. Readiness also can bead dressed through small group sessions or the provision of one-to-one teacher and peer support or coaching (Corley, 2015). Readiness is a student‘s entry point relative to a particular understanding or skill (Tomlinson, as cited by Vargas-Parra et al, 2015). In our Ghanaian context, this can be termed as the relevant previous knowledge of the learner. (R.P.K). Corley (2015) argues that "teachers should be able to discern the evolving readiness levels of students in their care and accommodate them by providing tasks that are neither too easy nor too challenging. Teachers should consciously adjust curriculum and instruction in response to student readiness, interest, and learning profile. Vygotsky‘s (1978) theory relating to learner readiness,

for example, suggests that teachers should teach within a child's zone of proximal development – the difference between what a child can do alone without guidance and what the child can do with scaffolding or support (Joseph et al, 2013).

2.4.2 Interest

According to Tomlinson (1998), Interests refer to a child's affinity, curiosity, or passion for a particular topic or skill.(Vargas-Parra et al, 2015). Bearing students' interests in mind will likely help teachers to create more suitable conditions for both teaching and learning processes. MacGillivray and Rueda (as cited in Subban, 2006) proposed that teachers should find ways to engage students by tapping into what interests them, and by involving students in the daily running of the classroom. These procedures confirm the principles of Differentiated Instruction towards a more learner-centered approach.

In a classroom setting, for example, teachers may choose to differentiate key skills and materials to be learned by aligning them with particular students' interests in several areas such as music, sports, or wildlife. Interest-based differentiation is directly linked to studies in motivation which show enhanced student engagement with the task, greater evidence of student creativity and productivity, as well as higher level of intrinsic motivation when instruction is modified to cater to student interest (Amabile; Bruner; Sharan & Sharan, as cited in Joseph et al, 2013). Interest arises from topics that evoke curiosity and passion in students and in which they want to invest time and energy to learn about. When a student's interests are tapped, that student is more likely to be engaged and to persist in learning (Maslow; Sousa; Wolfe, as cited by Corley, 2015).

2.4.3 Learning Profile

Learning profile refers to how a student learns best. Preferences for learning are shaped by learning style, intelligence preference, culture, and gender. Teachers differentiate by learning profile when they provide learning activities that offer students choices for demonstrating mastery of learning: journals, videotape presentations, role plays, oral histories, or project-based learning (Corley, 2015). According to Joseph et al (2013), students often have different learning preferences. While some students prefer to interact with groups or the whole class, others feel more comfortable working alone. Many students are visual or kinesthetic learners; others are verbal or auditory learners. When differentiation is based on learning profiles, students are provided with opportunities to learn in ways that are natural and efficient. The goals of learning-profile differentiation are to help individual learners understand the modes of learning that work best for them, and to offer a plethora of options so that each student maximizes his or her learning potential in the classroom (Tomlinson as cited by Vargas- Para et al, 2018)

2.4.4Differentiating through Affect and Learning Environment

Learning environment refers to the physical space and the way it is arranged. Affect is the social and emotional factors that influence learning Wormeli (as cited by Abora, 2015). The learning environment includes the overall layout of the classroom, the way you use that space, and elements such as lighting. Although some aspects of the learning environment will be beyond the individual teacher‘s control, it is possible to make alterations to help ensure the classroom is supportive and comfortable for all students factor that can be modified by the teacher in order to better assist students (Alberta Education, 2015). The teacher incorporates elements into the classroom to influence and expand students‘ learning (Vargas-Para et al, 2018). Tomlinson (2001)

stated that the learning environment is of significant importance in promoting students‘ achievement.

Differentiation of the learning environment promotes the respect to the individuals, the materials, space, and time. It also promotes the students support, cooperation, and collaboration among one another. The availability of resources for class work considering the different factors that make each student different is another factor to consider within the differentiation of the environment. When differentiating the learning environment teachers and students share their responsibility for teaching and learning and teachers provide individual attention to the students as they need it (Tomlinson (cited by Borja et al, 2015).

2.5 Empirical Review

2.5.1 Teacher Knowledge of Differentiated Instruction

Whipple (as cited by Abora, 2015) states that it is important to note that, the extent to which teachers understand differentiated instruction is consequential to its implementation and practice by them. Teacher quality itself is an important factor in determining gains in student achievement. In fact, the main motive for investigating teacher knowledge is to improve student outcomes. On the other hand, to improve teacher quality, it is crucial to understand what teacher professionalism involves (Guerrero, n.d.). it was further elaborated that, investigating the knowledge of teachers as _learning specialists‘ involves understanding how this knowledge functions in the teaching-learning process; more specifically, how teachers apply their knowledge in making decisions, for example, about lesson design or making on-the-spot judgments in the classroom.

According to Guerriero (n.d.), a review of the different models describing teachers' decision-making shows that factors influencing teachers' decisions include antecedent conditions such as the nature of the instructional task, the classroom, and the school environment, which combine with teachers' characteristics and cognitive processes to impact the pedagogical decision made. Decision-making is a cyclic process as pedagogical decisions in turn impact antecedent conditions.

Shulman (1986) suggested three types of knowledge a competent teacher must possess in other teach effectively. These are content Knowledge, pedagogical knowledge and pedagogical content knowledge. Content knowledge, includes knowledge of the subject and other related organizing structures. Pedagogical knowledge, is the full range of programs designed for the teaching of particular subjects and topics at a given level, the variety of instructional materials available in relation to those programs, and the set of characteristics that serve as both the indications and contraindications for the use of particular curriculum or program materials in particular circumstances" (Shulman, as cited by Ball, Thames, & Phelps n.d.). The last of the three is pedagogical content knowledge. Shulman defined pedagogical content knowledge as the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations, the most useful ways of representing and formulating the subject that make it comprehensible to others. Pedagogical content knowledge also includes an understanding of what makes the learning of specific topics easy or difficult (Ball, Thames,& Phelps, n.d.).

A part from this Ball, Thames, and Phelps, (n.d.) opines that, teachers need to understand different interpretations of the operations in ways that students do not.

They need to know the difference between –take away" and –comparison" models of subtraction. They also need to know features of mathematics that they may never teach to students, such as a range of non-standard methods or the mathematical structure of student errors.

A descriptive survey conducted by Melesse (2015) focused on assessing the perceptions, practices and challenges of differentiated instruction by primary school teachers gathered data from 232 randomly selected teachers via questionnaire and focus discussion. It was revealed from the study that, the perception of teachers on differentiated instruction is low. The statistical analysis showed that, they obtained a mean of 2.44 which was less than the expected mean of 2.5. Again 96.55% of the number of primary school teachers portrayed that they have low perceptions.

A mixed method study conducted by Abora (2015) to investigate primary school teachers' knowledge and practice of differentiated instruction with a sample of 100 randomly selected teachers revealed that, there were variations in the level of knowledge of teachers on the key components of differentiated instruction. Whiles some teachers who took part in the study showed a high level of knowledge, others showed average and some also showed low level of knowledge on the key components of differentiated instruction. The level of the teachers' knowledge determined on the key components of differentiated instruction and assessment was in an ascending order as process, product/ assessment, learner diversity, learner interest, learning environment, lesson planning, general differentiation concepts, content and learning styles.

In support of these findings, the findings from a mix method study conducted by James (2009) to investigate teachers' perceptions of differentiated instruction and its

implementation in day-to-day teaching within the classroom revealed that, teachers share adequate knowledge about differentiated instruction, also emphasize the need for different methods that are needed for optimum learning to be employed, giving students the best opportunity to succeed. On the study, participants also agreed to the assertion that, differentiated instruction is not another passing fad but a fundamentally different way of teaching students with diverse learning needs.

2.5.2 Practices of Differentiated Instruction in Schools

The findings from a quantitative study conducted by Whipple (2012) to explore teachers' understanding and implementation of differentiated instruction in elementary schools in Southeast Massachusetts revealed that, among the four survey items rated one a one to four scale, there was a mean score of 14.47 (SD = 1.67). Teachers obtained average per item rating of 3.62 out of 4.00, which indicates that teachers often implement differentiated instruction. The study revealed that, teachers often implemented process differentiation as it obtained an average per item rating of 3.32 out of 4.00, meaning teachers often implement process differentiation. Teachers obtained an average per item rating of 3.62 out 4.00 on content differentiation which means teachers implemented content differentiation. Also product differentiation also had four items to rate on a one to four scale for possible total score of 4 to 16. The average per item rating on product differentiation was 3.03 out of 4.00 making differentiation of product the least implemented.

James (2009) conducted a mixed study to investigate teachers' perceptions of differentiated instruction and its implementation in day-to-day teaching within the classroom. 37 middle school teachers were sampled for the study. The survey examined the teachers as to whether they individualize instruction as much as

possible; teach to the middle; teaching practices match the needs of students; and the use cooperative learning. The mean scores for statements; teaching practices match the needs of students; and the use cooperative learning attracted high means of 2.94 (SD = 0.71) and 3.00 (SD = 0.79) respectively. Again the findings of the study indicated that 97% of the teachers marked that they sometimes, often or very frequently use individualized instruction. It was also revealed that, 85% of teachers sometimes, often or very teach to the middle. However, Tomlinson (2001) argues that differentiated instruction is not individualized instruction.

The findings of a descriptive survey study conducted by Melesse (2015) which employed a sequential explanatory design to assess the perceptions, practices and challenges of differentiated instruction among primary school teachers revealed that, majority of the primary school teachers were not familiar with various strategies of differentiated instruction.

Owusu (2016) also conducted a case study that employed the mixed method approach to investigate how the different elements of learning experiences are differentiated in the classroom to cater for the varied learning needs in State Experimental Basic One School. 174 students, 2 headmistresses and 6 teachers were sampled for the study making a total of 182 participants. With a mean of 3.649 and co-efficient of variation of 39.6% students agreed to the assertion that, teachers were able to adjust content to meet their readiness, interest and learning profile. With a mean of 3.5 and a co-efficient of variation of 45.7% on the average, students agreed that their teachers knew their individual interest and related content accordingly.

The study also revealed that, the average student scored neutral on the statement that investigated whether teachers know individual learners learn best (learning profile)

and adjust content to meet their individual learning needs with a mean of 3.345 and coefficient of variation of 38.4%. With regards to process differentiation, students agreed that teachers varied pace of instruction to cater for individual learning needs with a mean of 3.879 and coefficient of variation of 35.1%. Students were also asked to indicate the extent to which they agreed to the statement on how assessment was conducted to give room for differentiated learning experience in the classroom. The results revealed that teachers did not give differentiated assessments to learners.

2.5.3Challenges Associated with Differentiated Instruction

Differentiated approach towards instruction is meant to fill the gap between teaching and learning in order to push students as far as possible on their educational path (Nicolae, 2013). Despite the impact of differentiated instruction to students' achievement, a study conducted by Joseph et al (2013) some challenges involved in its implementation. Among these challenges are that differentiated instruction is a very time consuming exercise with long hours of planning, organizing and scheduling individuals and groups in a large classroom. Other challenges encountered were difficulty in catering for individual needs and preferences especially those individuals who preferred to work alone.

A study conducted by Owusu (2016) revealed that, large class sizes pose a threat to the implementation of differentiated instruction and assessment. Other studies like that of Shin &Raudenbush (2011) shows that implementation of differentiated instruction in a class with a small size is quite smooth and possible. This proves that a large class size poses a threat on the implementation of differentiated instruction and assessment. It was further stated in the study that, inadequate professional development courses or training and limited administrative support systems add up to

some of the challenges confronting teachers in differentiating instruction and assessment.

Melesse (2015) conducted a study to assess the perceptions, practices and challenges of differentiated instruction by primary school teachers and it was revealed in the study that, lack of knowledge and experience on how to differentiate instruction. The other factors identified were large class size and lack of interest and commitment on the part of the teachers. Again lack of administrative support was added as one of the challenges.

Many researchers (Amadio, 2014; Seigliano & Hipsky, 2010; Joseph & John, 2014) conducted on differentiated instruction enumerates time as a major challenge to the implementation of the concept in classroom setting. According to Amadio (2014), finding extra time on top of already demanding schedules and daily requirements was among the greatest challenges. It was further stated that, lessons often took longer to complete, which interfered with other schedule activities and responsibilities such as grading of scripts and other administrative duties. As revealed by Seigliano&Hipsky's (2010) study, finding activities, trying out new ideas, developing the assessment for each lesson and working with so many different learning styles is very difficult for teachers.

The academic calendar in contemporary education demand teachers to cover a certain amount of topics within some time. It is sad that teachers are evaluated based on these times but not how students learn well. The time consuming nature of differentiated instruction makes it burdensome and sometimes overwhelming for teachers to implement differentiated instruction (Joseph & John, 2014).

Good (2006) revealed that, teachers in heterogeneous classrooms do not automatically know how to address the diverse needs of learners in those setting and often see no need to change their behavior, hence, sticking to the traditional way of instructing. It was further stated that, teachers were unsure as to how best they should begin this extensive process. Most teachers lack the knowledge on how to address academic diversities.

A study conducted by Ali (2014) to explore the challenges of using the differentiated instruction strategy revealed that the challenges with the highest average were density of students per classroom, failure to prepare the teacher before service in a way that suits the requirements of differentiated instruction, lack of availability of educational equipment and Instruments to apply the differentiated instruction strategy, weakness of students‘ conviction in using the differentiated instruction strategy, and students are used to traditional teaching strategies.

According to Westwood (2013), differentiated teaching is a complex framework that demands continuous convoluted multitasking leading to excessive workload for teachers. This is rather concerning, as an approach that leads to excessive workload for teachers is likely to become unsustainable overtime. Trying to differentiate can be tedious for teachers exasperated by large class sizes, inadequate funding, negative attitude towards peers among students and lack of materials for effective differentiation. Tomlinson (as cited in Abora, 2015) discloses that a common barrier to DI is the heavily standardized curriculum which puts teachers under tremendous pressure to teach to the curriculum, at the expense of learners‘ need.

According to Joseph (2013), Planning for differentiated instruction requires time, support, and adequate learning spaces for group interaction. If these requirements are

not adequately met, then one can understand the challenge teachers face in attempting to integrate differentiation instruction in their classrooms. The study by Joseph (2013) further revealed that, while teachers generally understand the concept of differentiation, the majority of participants do not engage in content and product differentiation. Part of the reason is that teachers find it difficult to implement differentiation because of limited time and resources. The other part of the reason has to do with uncertainty among teachers about how to integrate content and product differentiation, given the preference by school officials for standardized testing at the primary and secondary levels. And while many teachers demonstrated ability to vary activities, they admitted that they did not consciously engage in process differentiation.

Again, if not closely monitored, differentiation may block learning opportunities for teachers and students, therefore, a more critical approach for curriculum development should be considered. The most appropriate use of differentiation remains largely uncertain. In some cases, teachers use it as a scaffolding mechanism for weaker students with gifted learners not being fully challenged, but seen as anchors to ensure all tasks are completed (Hertberg-Davis, as cited in Taylor, 2017).

Even though key enthusiasts of differentiation argue it is distinctly different from grouping, they are still unable to separate the two. For example, Tomlinson, a strong advocate of differentiation, admitted to that grouping is a component of differentiation. Tomlinson also suggested that it was important that teachers are given time to develop an understanding to fully analyse how students‘ progress academically However, it would appear lack of funding, and the pressures of training students for exams to enable them to meet societal expectations, means that schools

are unable to afford that extra time for teachers. This is despite the fact that what is often required to aid learners‘ success is additional support and encouragement (Westwood;Wu; as cited in Taylor 2017).

Another challenge of differentiation relates to ideas associated with theories of knowledge. Meeting the needs of a differentiated classroom requires teachers to draw tacitly from experience and practice to be able to react to individual student needs. In this sense, knowledge is used as an _instrument‘ developed through _trial and error, imitation, or model learning‘ as in teacher-training exercises (Toom as cited in Taylor, 2017). However, this is contrasted with teachers, who, under instructions from their school‘s hierarchy, often have to use information or differentiated techniques drawn from educational bodies that are too codified or theoretically driven for implementation in the heterogeneous and ever-changing setting of a classroom (Taylor, 2017).

2.6 Summary of Literature Review

Throughout the literature, there is an advocate that learners‘ diverse needs should be catered for by teaching learners at their particular readiness level with their interest in mind. Students show range of abilities and learning needs in the classroom and are not homogeneously equal and should not be treated as such in instructional delivery. Therefore, teachers are required to prepare for these differences and adapt curriculum and instruction to meet each student‘s needs. Many authors of differentiated instruction indicate that some key elements guide differentiation of instruction. These elements were identified as content, process and product. Teachers differentiate instruction to students‘ base on their learning profile, interest and readiness which define the way students learn best.

Differentiated instruction is an approach to instruction that offers teachers the means to meet the diverse learning needs of students by identifying and taking their readiness, interest and learning profile into consideration. Differentiated instruction is an instructional approach that facilitates students learning according to their interest and abilities. All learners are given the opportunity to be successful in the differentiated classroom regardless of their differences.

Differentiated instruction is underpinned by the socio-cultural and multiple intelligence perspectives, and adheres to the belief that optimal learning occurs when students are given the opportunity to create their own meaning through collaborative learning. Though some teachers possess some knowledge on differentiated instructional approach, they rarely implement it in their classrooms. Literature indicates that, several factors hinder the implementation of differentiated instruction in classrooms. Some of the challenges that were discussed in the literature include limited time, lack of professional training programmes that discuss differentiated instruction, lack of materials to implement the instructional approach and also demands from standardized curriculum.

CHAPTER THREE

METHODOLOGY

3.0 Overview

This chapter reveals the research design, population for the study, the sample and sampling techniques. It also entails the discussion of the instruments used for the data collection. This chapter further explores the procedure for data analysis and then the chapter ends with details on the limitations of the methodology employed in conducting the study.

3.1 Research Design

Research design can be considered as the structure of research. It is the ―Glue" that holds all of the elements in a research project together in short it is a plan of the

proposed research work (Akhtar.2016) According to Creswell (2009), the selection of a Research Design advances the framework for research design, including philosophical world views (e.g, post positivism, constructivism, advocacy/participaty and pragmatism), research methods (i.e., qualitative, quantitative, and mixed methods), and strategies of inquiry within each paradigm (i.e., grounded theory, non/experimental designs, and transformative)

A research design addresses different aspects of the research procedure, from philosophical assumptions to data analysis. A design might be considered mixed if it employs qualitative and quantitative approaches at any stage, including research questions development, sampling strategies, data collection approaches, data analysis methods, or conclusions (Creswell & Garrett, 2008; Tashakkori & Creswell, 2007).

The study employed a sequential explanatory design within the mixed method approach due to the multi-face nature of the study. This type of design was chosen because it allows the researcher to Collect and analyze two independent strands of quantitative and qualitative data the prioritize the methods equally, keep the data analysis independent, mix the results during the overall interpretation and finally try to look for convergence, divergence, contradictions, or relationships of two sources of data (Creswell & Plano Clark, 2011). The researcher will create questions for the research qualitative and quantitative studies. Data will be collected from sources using then one-on-one interviews with the targeted population on the perceptions and practices of differentiated instruction and assessment.

3.2 Researchers' Methodological Position

According to Terrell (2009), the researcher‘s choice of method is said to be chiefly driven by the philosophical assumptions (ontological and epistemological) that frame

the research. These philosophical positions influence decisions regarding the research approach, choice of method and frame for analysis, and guide to research design. The study adopted the pragmatist paradigm which combines the quantitative and qualitative approaches within different phases of the research process. Leedy and Ormrod (2013) asserts that, the choice of research methods should follow research questions in a way that offers best chances to obtain useful answers.

The study employed the mixed method approach due to the nature of the research questions and advantages derived from applying two different approaches in gathering the required data. Creswell (2014) posit that this design involves combining or integration f qualitative and quantitative research data in a research study. It was further stated that, a mixed method design is useful when the quantitative or qualitative approach, each by itself, is inadequate to best understand a research problem and strengths of both quantitative and qualitative research can provide the best understanding. Yin (2014) argued that, no single approach either qualitative or quantitative methods can perfectly be effective or so each method can be improved significantly through triangulation of data from various sources.

3.3 Setting

The Mampong Municipal is one of the 260 Metropolitan, Municipal and District Assemblies (MMDAs) in Ghana, and forms part of the 43 MMDAs in the Ashanti Region with Mampong as its administrative capital. It is located within longitudes 00 05W and 10 30W and latitudes 60 55N and 7 0 30N and covers an area of about 23.9km2. Mampong Municipality was created following the splitting and upgrading of the former Sekyere West District into Mampong Municipal and Sekyere Central District by Legislative Instrument (L.I.) 1908. It is bounded to the south by Sekyere

South District, to the east by Sekyere Central District and the north by Ejura Sekyedumase Municipal. The population of the Municipality according to the 2010 Population and Housing Census stands at 88,051 with 42,653 males 45,398 females (www.ghanadistricts.com)

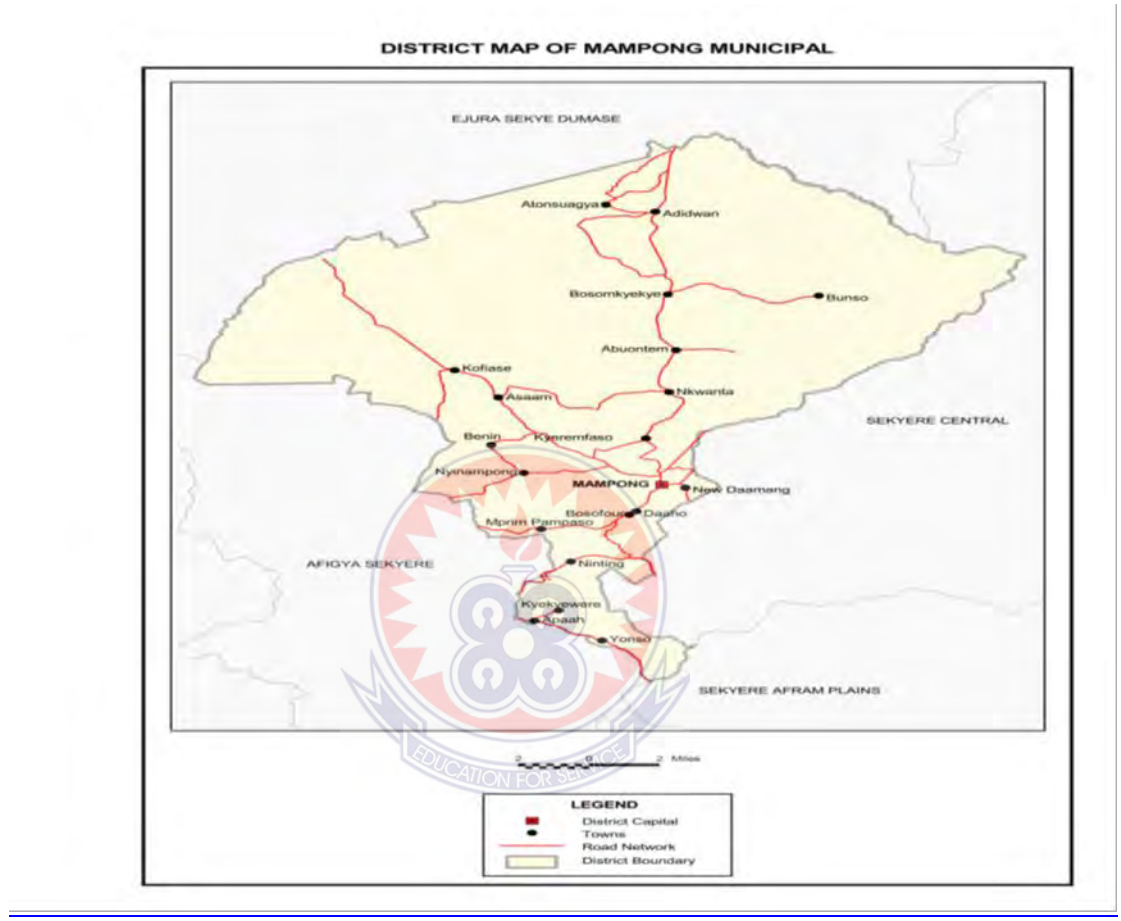


Figure 2: District map of Mampong Municipal

Source : Ghana Statistical Service, GIS (2014)

3.4 Population

A research population refers to all of the events, items, individuals or entities that are to be represented in a study (Christensen, 1991). The target population of the study was all public primary school teachers in the Mampong Municipality. There are 65 public primary schools in the municipality. The accessible population of the study

was 512 primary school teachers within the 65 public primary schools in the Mampong Municipality of Ghana.

3.5 Sample

A sample is a small portion of target population and sampling means selecting a given number of a defined population as a representative of that population or is a means of selecting a sample from the population by reducing it to a more manageable size (Kothari, 2004). The study employed a size of 135 primary school teachers in the Mampong Municipality. Asamoah-Gyimaha nd Duodu (2007) assert that, a sample of 10% - 30% of the accessible population is deemed appropriate for the study. Therefore 26.4% (n= 135) of the target population is appropriate for the study.

The qualitative phase employed a sample of 9 primary school teachers with at least one teacher representing a circuit. According to Yin (2014), at least six sources of evidence can be recommended for a qualitative study.

3.6 Sampling Technique

The study employed stratified sampling to select the sample of teachers for the study. Stratified sampling is where the population is divided into strata (or subgroups) and a random sample is taken from each subgroup. A subgroup is a natural set of items. Subgroups might be based on company size, gender or occupation (to name but a few). Stratified sampling is often used when there is a great deal of variation within a population. Its purpose is to ensure that every stratum is adequately represented (Ackoffas cited by Hamed, 2016).

The researcher chose Mampong Municipality because of accessibility and proximity to the researcher. There were 9 circuits and 65 public primary schools in the municipality. Using stratified sampling, twenty seven (27) public primary schools

were selected out of the 65 public primary schools with. Three schools were selected from each circuit. Five teachers were randomly selected from each school. Numbers were written on pieces of paper for teachers to pick and those who picked from 1 to 5 were selected for the study.

Nine containers were used to represent each circuit and within the containers, numbers were written to represent each school in the municipality and placed in their rightful container. One number was picked randomly from each container and recorded. The schools that were picked represents the schools that will be visited for the qualitative data collection. One teacher was picked from each of the nine schools selected for the qualitative study. This was done by random sampling where teachers in the school were asked to pick numbers from 1 to 6 in a container and teachers who picked the number 1 were sampled for the qualitative study.

3.7 Research Instruments

The researcher used questionnaire, observation and interview guides as the instruments for obtaining accurate and reliable data from respondents for the study.

3.7.1 Questionnaire

A differentiated instruction questionnaire was given out to respondents to solicit in-depth information from them. Zohrabi (2013) is of the view that questionnaires are one of the efficient means of collecting data on a large-scale basis. They can be sent simultaneously to a great number of people and the inquirer can fairly easily gather data in field sites. Also respondents‘ anonymity makes it possible for them to share information more easily. When similar questions are administered simultaneously to a large number of people the acquired data are more identical, correct and standard. The questionnaire on the knowledge and challenges of differentiated instruction was

adopted from the work of Abora (2015) and Kyeremeh (2018) (Appendix A). The questionnaire consisted of four sections: A, B, C and D. Section A comprised demographic items such as age, gender, education level and class taught. Section B was 19 items that used a five point Likert scale (labeled 1= strongly disagree, 2 = disagree, 3 = neither disagree nor agree, 4 = agree and 5 = strongly agree) with items related to teachers‘ level of knowledge about the three elements of differentiated instruction identified by Tomlinson (2001). Section C used a four point Likert scale (labeled 1 = never occurs, 2 = rarely occurs, 3 = often occurs and 4 = always occurs) with 19 items related to teachers‘ level of practice of differentiated instruction in regards to the three elements (content, Process and Product) identified by Tomlinson (2001). Section D also used items with a five point Likert Scale (labeled 1= strongly disagree, 2 = disagree, 3 = neither disagree nor agree, 4 = agree and 5 = strongly agree) with 13 items related to the challenges teachers encounter in differentiated instruction.

According to Lokan, Holligsworth and Hacklingn (2006), questionnaires are economical and very simple to administer to sample large groups of respondents; give better potential to generalize findings because samples are larger, ensure efficient gathering of large quantities of baseline data; and also the responses gathered can usually be transformed easily by coding into data files that are ready for statistical analysis.

3.7.2 Interview Guides

According to Patton (2002), interviews are methods of gathering information through oral quiz using a set of pre-planned core questions. Patton further stated that, interviews provide a means to find out from people those things we cannot directly

observe. To gain insight into primary school teachers‘ knowledge and practice of differentiated instruction in the Mampong municipality, the researcher used semi-structured interviews (Denzin & Lincoln, 2005) with nine teachers, sampled for the one on one interview with one teacher representing an educational circuit in the Mampong Municipality. The interview guide was adopted from the work of Abora (2015) (Appendix C). The interview guide was divided into two main parts. Part One of the items sought to find out the background of participants with items such as age, gender, education level and class taught. Part Two of the items consisting of ten items prepared to explore participants‘ knowledge on differentiated instruction, how often they attend professional development courses or programs that discussed differentiated instruction, how they determine the readiness and learning profile of learners, the strategies they employ in differentiating instruction and how they know how well students learn. It also explored the challenges teachers face when implementing differentiated instruction. Burns (1999) as cited by Zohrabi (2013) is of the view that, interviews are a popular and widely used means of collecting qualitative data. It was further stated that, interviews are useful for exploration and confirmation of a phenomenon.

3.7.3 Observation Schedule

Flick (2006) opines that observation ―is an attempt to observe events as they naturally occur.” More importantly, observation enables the researcher to combine it with questionnaires and interviews to collect ―relatively objective firsthand information” (Johnson & Turner, 2003). The researcher used observations to observe the pedagogical practices of teachers and how they assess learners with respect to differentiated instruction and assessment. Observation is more accurate when a researcher needs an on-the-spot evidence of information and where the researcher

cannot acquire accurate information by just questioning respondents. The researcher adopted an observational checklist from the works of Hellman (2007), Hobson (2008) and Whipple (2012) and modified it to suit the context of this study (Appendix B). It is more appropriate for studying learning interactions and behaviours of people in a naturally occurring environment (Abora, 2015).

The observation schedule had two parts. The first part of the observation sought the demographic information of respondents. The second part had 19 items prepared to explored teachers‘ practices of differentiated instruction according to content, process and products. Content had six items, process had seven items and six items for product with weightings Scarcely/No = 1, Little = 2, Often = 3 and Steady = 4).

3.8 Validity and Reliability of the Quantitative Instrument

The test instruments used in the study by the researcher was checked for quality accuracy by making sure they are valid and reliable.

3.8.1 Validity

According to Heale and Twycross, (2015), an instrument is considered valid when there is confidence that it measures what it is intended to measure in a given situation. The researcher presented a draft of the questionnaires to the research supervisor from the Department of Mathematics Education, University of Education, Winneba to assess the questions for face and content validity. in order to determine the clarity and relevance of the questions in gaining information about teachers‘ knowledge and practice of differentiated instruction in primary schools in the Mampong Municipality, the questionnaire and interview guide were pilot tested on primary

school teachers who were not part of the sample. This was done to ensure the reliability of the instruments.

3.8.2 Reliability

According to Boakye-Akomea (2015), reliability refers to a measure being consistently reproducible. This can be estimated in four ways that is; inter-rater reliability, split half-reliability, test-retest reliability and internal consistency reliability. This study used SPSS to determine the internal consistency of the questionnaire given to participants to gather data. According to Tayakol and Dennick (2011), Cronbach Alpha is the best means of testing the internal consistency of a research questionnaire instrument. The Cronbach Alpha for the questionnaire is as follows Knowledge differentiated instruction and assessment ($\alpha = 0.995$) practice of differentiated instruction and assessment ($\alpha = 0.975$) and challenges of differentiated instruction and assessment ($\alpha = 0.969$). According to Tayakol and Dennick (2011) explains the values of Cronbach Alpha to mean: $\alpha < 0.50$ (unacceptable), $0.50 \leq \alpha < 0.60$ (poor), $0.60 \leq \alpha < 0.70$ (questionable), $0.70 \leq \alpha < 0.80$ (acceptable) $0.80 \leq \alpha < 0.90$ (good), $\alpha \geq 0.90$ (excellent). The Cronbach's Alpha reliability co-efficient obtained for the internal consistency of the questionnaire of Abora (2015) was 0.74. The Cronbach's Alpha reliability coefficient for the five sub-scales using the individual teacher as the unit of analysis, ranged from 0.682 to 0.799 and with a satisfactory mean value of 0.741Thevalues obtained in the study indicate an excellent internal consistency of the items.

3.9 Data Trustworthiness of the Qualitative Instrument

The truthfulness of an instrument in a qualitative study depends on the instruments' ability to produce findings that are worthy of receiving attention (Sinkovic, Penz &

Ghuari, 2008). Issues of credibility, conformability, dependability and transferability were established to ensure the trustworthiness of the instrument.

3.9.1 Credibility

To ensure credibility in the study, some of the interviews conducted were audio-taped in order to serve as a reference when there was the need for the researcher to cross-check for clarity. Credibility of an instrument is how confident the qualitative researcher is in the truth of the research study‘s findings. This boils down to the question of ~~h~~how do you know that your findings are credible (Simon & Goes, 2016)

3.9.2 Dependability

Dependability is the extent that the study could be repeated by other researchers and that the findings would be consistent (Simon & Goes, 2016). In this study, dependability was established by having prolonged and concentrated engagement with the participants about the study.

3.9.3 Confirmability

Confimability is the degree of neutrality in the research studies findings. In other words, this means that the findings are based on participants‘ responses and not any potential bias or personal motivations of the researcher ((Simon & Goes, 2016). This involves making sure that researcher bias does not skew the interpretation of what the research participants said to fit a certain narrative. An audit trial was done by independent critical readers whom the researcher contacted to assess the methods used in gathering data.

3.9.4 Transferability

Simon and Goes (2016) indicates that, transferability is how a qualitative researcher demonstrates that the research findings are applicable in other context. The researcher gave detailed information on the findings so that readers could decide whether the study is transferable to their own context.

3.10 Data Collection Procedure

The researcher obtained an introductory letter from the University of Education, Winneba (Appendix C) which explained the purpose of the research and was used to seek permission from the Municipal Director of Mampong of the Ghana Education Service. The letter obtained from the Municipal Director was used to seek permission from the selected schools heads to select respondents for the study. The data were collected in two phases. The first phase was used to administer the introductory letter and administer the questionnaire for the quantitative study which lasted for two weeks. Each school was visited at least twice. The first visit was used to administer the introductory letters and was used to seek participants‘ consent and also fix a date for the administration of the questionnaire. The other visit was used to administer the and collect the questionnaire. Participants were assured of their privacy and confidentiality. The questionnaire was personally administered by the researcher in order to have the opportunity to clarify things to participants who find it had to understand some items on the questionnaire.

The second phase of the study involved the collection of the qualitative data through semi-structured interview and observation of the learning environment and practice of differentiated instruction with a sub-sample of 9 teachers. The interview was guided by ten items. The observation schedule was also guided by 27 items. Two visits were

made during this phase. The first phase was used to seek participants‘ consent and to explain the purpose of the study to them. The second phase was used to conduct the interviews to clarify some claims in the quantitative study. The interview span lasted not less than 40 minutes in each case. The responses from the interview were audio-taped and transcribed. According to Gall, Gall and Borg, (2007), audio taping of interviews avoids bias. The transcripts were read over and over again to identify the themes that best corresponds to research questions for further analyses.

3.11 Data Analysis

The data collected were analysed using both qualitative and quantitative methods. Data from the teacher questionnaire was analyzed using descriptive statistics. This was done using SPSS version 22 to find the extent to which teachers strongly agree, agree, undecided, disagree and strongly disagree on their knowledge and practice of differentiated instruction. Descriptive statistics involving mean, standard deviation, percentages and frequency was used to provide counts of the factors underpinning the analysis of the questionnaire data and the demographic responses.

In order to analyse the transcripts from the interviews, the researcher the researcher used thematic analysis. Thematic analysis is the process of identifying patterns or themes within qualitative data. it is a method rather than a methodology (Braun & Clarke 2006). This means that, unlike many qualitative methodologies, it is not tied to a particular epistemological or theoretical perspective. The descriptive function of the SPSS was used to analyze classroom observations on how primary school teachers in the Mampong municipality practice the three components of differentiated instruction. The results were analyzed using mean, Standard deviation, frequency and percentages (Table 4.3.1, 4.3.2, and 4.3.3). Results from the interview were transcribed and was

later read thoroughly to identify themes which was related to the study. The transcription was done by listening attentively to participants and making sure the actual things they said were transcribed. Questions that demanded a lot of explanations were audio-taped and played back to ensure that the transcription was accurate and exact from the respondents. The results from the responds helped the researcher to make comparisons on participants' knowledge and practice of differentiated instruction.

3.12 Ethical Consideration

In order to ensure higher ethical consideration and standard for the study, the researcher acquired an introductory letter from the University of Education, Winneba to seek permission from the Mampong municipal Education Directorate to gain permission to collect data from teachers in the municipality. Verbal consent was obtained from all participants in the study. Participation was voluntary. The purpose of the study was clearly explained to participants and they were assured of confidentiality and anonymity of their responses. In reporting the findings, the participants were also assured that the information obtained from the study was solely for academic purposes and would be held confidentially. The participants were assured of their right to participate; to decline or to withdraw from the study at any time should they feel uncomfortable. All participants were acknowledged and given a summary of the report.

CHAPTER FOUR

RESULTS ANDF DISCUSSION

4.0 Overview

This chapter presents the results and the discussion of the findings of the study. The chapter reports the demographic data of the participants, analysis of the questionnaire, observation and interview data and answers the research questions.

4.1 Results from Questionnaire

The results to the research questions are presented in the study as follows. The research questions were analysed using the SPSS version 22. The researcher used frequencies, percentages, mean and standard deviation on a 5-point scale (1= strongly disagree, 2= disagree, 3= undecided, 4 = agree and 5= strongly agree) of the questionnaire response on knowledge and challenges of differentiated instruction. Again frequencies, percentages, mean and standard deviation of responses on questionnaire of the knowledge and practice of differentiated instruction were used on 4-point scale (1= never occurs, 2= rarely occurs, 3= often occurs 4= always occurs).

4.2 Background Information of Participants

Teachers sampled for the study were 135 from public primary schools in the Mampong Municipality of Ashanti Region, Ghana. The demographic characteristics of 135 participants (teachers) in public primary schools that were considered in the study included class level taught, gender, highest educational qualification and the

years they have taught since their first postings. The details are shown in Table 4.1.

Table 4.1: Demographic Characteristics of Participants

Variable	Category	Frequency	Percentage
Gender	Male	86	63.7
	Female	49	36.3
	Total	135	100.0
Professional qualification	Diploma	87	64.4
	Bachelor's Degree	48	35.6
	Master's Degree	0	0.0
	Total	135	100.0
Number of years taught since first posting	1 – 5 years	46	34.1
	6 – 10 years	62	45.9
	11 – 15 years	18	13.3
	16 years and above	9	6.7
	Total	135	100.0
Class/Level taught	1	28	20.7
	2	23	17.1
	3	15	11.1
	4	22	16.3
	5	25	18.5
	6	22	16.3

Total	135	100.0

Source: field data (2019)

From Table 4.1, 86 (63.7%) of the participants selected for the study were males and 49 (36.3%) were females. The table also shows varied professional qualifications of respondents with 87 (64.4%) obtaining Diploma in Education and 48 (35.6%) obtaining Bachelor's Degree in Education. The results from the Table 4.1 show that, 46 (34.1%) had taught for a period between 1 – 5 years, 62 (45.9%) of the respondents had taught for a period of 6 – 10 years. Eighteen of the participants (13.3%) had taught for a period of 11 – 15 years and 9 of them (6.7%) had taught for a period of 16 years and above.

The demographic accounts of the participants showed that, 28 (20.7%) of them taught in Class One, 23 (17.1%) of them taught in Class Two, 15 (11.1%) of them taught in Class Three, 22 (16.3%) of them taught in class Four, 25 (18.5%) taught in Class Five and the remaining 22 (16.3%) taught in Class Six.

Results by Research Questions

Below are the presentations of the discussions of the data gathered from the research questions.

4.3 Research Question 1: What knowledge do primary school teachers have about differentiated instruction in Mampong Municipality?

This research question sought to ascertain primary school teachers' knowledge of differentiated instruction. Knowledge of the participants in the study was sought under eight major concepts of differentiation namely;content, process, product,learner diversity, learner interest, lesson planning, environment and general differentiation

ideologies. A five-point Likert scale questionnaire with 46 items, grouped under 8 sub-headings was used to collect information on primary school teachers‘ knowledge of DI. Participants Frequencies, percentages, means and standard deviations were taken on the major concepts of differentiated instruction. The five-point likert scale was grouped again into 3 categories (by combining strongly disagree and disagree to be one category labeled _Disagree‘, leaving the undecided category to be _Neutral‘ and combining strongly agree and agree to be another category labeled _Agree‘. in analyzing response from a five point likert scale at a clinical area or higher level, such as hospital, region, and country, we can expect valid results from an instrument with a dichotomous or trichotomous measurement scale(Heon-Jae &Wui-Chiang, 2016).The overall mean scores and the standard deviations of the teachers‘ responses under sub-categories are of the analysis are presented in Table 4.2.

Table 4.2: Primary School Teachers' Level of Knowledge on the Major Concepts of Differentiation.

Sub Group	Overall Means of sub groups	Standard Deviation	Disagree overall (%)	Neutral Overall (%)	Agree overall (%)
Content(5 items)	19.49	3.70	3.5%	25.6%	70.9%
Process (9 items)	32.33	5.86	9.2%	33.6%	57.2%
Product (5 items)	18.65	3.05	2.8%	31.1%	66.4%
Diversity (6 items)	22.98	4.08	1.1%	31.9%	67.0%
Interest (4 items)	14.60	3.16	6.3%	38.3%	55.4%
Environment (4 items)	16.84	2.86	0.0%	18.2%	81.8%
Lesson planning (4 items)	16.64	2.84	0.0%	14.0%	86.0%

General concepts (4 items)	14.94	3.24	7.1%	26.4%	66.3%

Table 4.2 shows results of teachers knowledge on differentiated instruction based on the three main elements of differentiated instruction (content, process and product) and other essential concepts (diversity, interest, learning profile, lesson planning, general concepts of differentiated instruction) that makes implementation of the approach possible. Overall means ranged from 14.60 to 32.33 and standard deviation from 2.84 to 5.86. The sub group with the highest mean is on the item that sought information from participants on the knowledge of process differentiation. The item from the sub groups with the highest mean was on process differentiation (with 7 items) with an overall mean of 32.33 and standard deviation of 5.86 57.2% of the participants agreed to the statements, 33.6% were neutral while 3.5% disagreed, an indication that more than half of the participants had knowledge of process differentiation.

The second most understood item from the sub groups is _diversity' (with 6 items) which implies knowing that every student is different and should be treated as such during instructional periods.67.0% of the respondents agreed to the statements under the sub group, 31.9% were neutral while 1.1% disagreed. This is an indication that more than half of the participants have knowledge of learners having diversities in their abilities and needs. The next sub group item with a high mean was content (with 5 items) differentiation with an overall mean of 19.49 and standard deviation of 3.70. An overall percentage of 70.9% of the participants agreed to statements under the subgroup, 25.6% were neutral while the remaining 3.5% disagreed. This shows that more than half of the number of participants have knowledge of content

differentiation. Product differentiation (with 5 items) was understood by participants as an overall percentage of 66.4% of the participants agreed to statements in the sub group, 31.1% being neutral while 2.8% had no knowledge with an overall mean of 18.65 and standard deviation of 3.05.

Participants‘ knowledge on the effects of the learning environment on differentiation of instruction (with 4 items) comes with an overall mean of 16.84 and standard deviation of 2.86. an overall percentage of 81.2% of the respondents agreed to statements, 18.2% were neutral while none of the respondents agreed which is an indication that participants assessed with the four items were quiet knowledgeable of the fact that the learning environment plays a role in differentiation of instruction. Participants were also quite knowledgeable of the fact that, learners‘ differences should be taken into consideration when planning lessons (with 4 items) with an overall mean of 16.64 and standard deviation of 2.84. 86.0% of the participants agreed to statements under the sub group, 14.0% were neutral while none of the participants agreed to the statement. This indicates that, most of the participants had knowledge of taking differentiated instruction into consideration when planning lessons.

Another sub group of the categories sought the knowledge of participants on the general concepts of differentiated instruction (with 4 items) with an overall mean of 14.94 and 3.24. An overall percentage of 66.6% of the respondents agreed to statements under the subgroup, 26.4% were neutral while 7.1% disagreed. This is an indication that more than half of the participants had knowledge of the general concepts of differentiated instruction. The least rated sub group item on the table (with 4 items sought participants knowledge on identifying the interest of individual

learners with an overall mean of 14.60 and standard deviation of 3.16. an overall percentage of 55.4% of the participants were knowledgeable of identifying and acknowledging the differences in interest of every individual learner.

The details of the results of participants on their knowledge of differentiated instruction based on content are shown in Table 4.2.1 with an overall mean of 19.49 and standard deviation of 3.7 (see Table 4.2.1).

Table 4.2.1: Primary School Teachers' knowledge of Differentiation based on Content

Item	Mean	Standard Deviation	Disagree f(%)	Neutral f(%)	Agree f(%)
1. Content can be varied for pupils in the same classroom	3.96	0.72	3(2.2%)	28(20.0%)	104(77.1%)
2. Specifically, contents can be reduced for pupils with learning difficulties and upgraded for gifted learners (in the same class)	4.01	0.70	1(0.7%)	29(21.5%)	105(77.7%)
3. All learners in the same classroom must learn the same content no matter their learning differences or learning needs	3.97	0.66	1(0.7%)	28(20.7%)	106(78.6%)
4. Content must satisfy the curriculum needs or examination requirements instead of individual pupil's needs	4.16	0.72	1(0.7%)	23(17.0%)	111(82.2%)
5. It is mandatory for teachers to clearly articulate what they	3.40	0.88	18(13.3%)	65(48.2%)	52(38.5%)

want learners to know, understand and be able to do.	

From Table 4.2.1, the means for the items ranged from 3.40 to 4.16 and Standard Deviation ranged from 0.66 to 0.88 With the highest mean of 4.16 and Standard Deviation of 0.72, 82.2% of the participants agreed to the statement that content must satisfy curriculum needs or examination requirements instead of individual pupil's needs, 0.7% disagreed and 17.0% were neutral. This is a clear indication that participants placed priority on curriculum requirements than individual needs. Participants obtained the lowest mean on the item which inquired teachers being mandated to clearly articulate what they want learners to know, understand and do (Mean = 3.40, SD = 0.88). 38.5% of the respondents agreed to the statement, 48.2% were neutral and 13.3% disagreed.

From the table, 78.6% of the respondents agreed to the statement that all learners in the same classroom must learn the same content no matter their learning differences or needs, 20.7% were neutral and 0.7% disagreed. It is also clear from the table that 77.7% of the respondents agreed to the statement that, Specifically, contents can be reduced for pupils with learning difficulties and upgraded for gifted learners (in the same class), 21.5% were neutral and 0.7% disagreed. This is a clear indication that participants are knowledgeable of the fact that contents can be differentiated to suit learners' differences. Also, 77.1% of the respondents agreed to the statement that, content can be varied for pupils in the same classroom, 20.7% were neutral and 2.2% disagreed. This also shows that participants understood the need to differentiate to suit learners' needs.

The detail of the results of participants‘ knowledge on process differentiation is shown in Table 4.2.3 with an overall mean of 32.33 and standard deviation of 5.86.

Table 4.2.2: Primary School Teachers' Knowledge of Differentiation based on Process

Item	Mean	Standard Deviation	Disagree f(%)	Neutral f(%)	Agree f(%)
1. Teaching/Learning activities should mainly/primarily be based or centered on individual pupil's needs during lesson delivery	3.39	0.56	5(3.7%)	72(53.3%)	58(43.0%)
2. I am familiar with entering into learning contracts with pupils	3.47	0.74	9(6.7%)	64(47.4%)	62(45.9%)
3. I am familiar with giving learners tiered activities/lesson	3.36	0.69	10(7.4%)	73(54.1%)	52(38.5%)
4. I am familiar with scaffolding learners in teaching	2.34	0.75	78(57.8%)	51(37.8%)	6(4.4%)
5. Students should be provided with the choice to work alone, in pairs or in small groups during teaching/learning	3.51	0.67	7(5.2%)	58(43.0%)	70(51.8%)
6. Some pupils can be given individual attention during teaching	4.21	0.59	1(0.7)%	9(6.7%)	125(92.6%)
7. A variety of teaching methods should be used during teaching	3.99	0.59	0(0.0%)	24(17.8%)	111(82.2%)
8. Learner groups in the classroom should be formed based on learners' abilities, interests, styles and learning preferences	4.03	0.59	0(0.0%)	23(17.1%)	112(82.9%)
9. Each learner in the classroom should be allowed to choose his/her own preferred way of learning	4.00	0.63	1(0.7%)	35(25.9%)	99(73.3%)

Key: f= Frequency (%) = Percentage

It can be seen from Table 4.2.2 that, the means ranged from 2.34 to 4.21 and the SD ranged from 0.56 to 0.75. The respondents obtained the lowest mean (2.34, SD =

0.75) on the item which inquired about, teachers using the scaffolding method in teaching. 57 of the respondents disagreed to the statement, 37.8% of them were neutral and the remaining 4.4% agreed. This indicates that more than half of the respondents were not knowledgeable of scaffolding. the highest mean (4.21, SD = 0.59) inquired about some learners being given individual attention during teaching with 92.6% of the respondents agreeing to the statement, 6.7% neutral and 0.7% disagreeing.

Apparent from Table 4.2.2, most of the participants were familiar with making learners choose their preferred way of learning with a mean of 4.00 and SD = 0.63. 73% of the respondents agreed to that statement, 25.9% were neutral about it and 0.7% disagreed. Again, the table indicates that 82.2% of the participants agree to the statement which inquired about varying teaching methods to satisfy learner needs, 17.8% were neutral and none of them disagreed to it (Mean = 3.99, SD = 0.59). A cursory look at the table shows that, participants were highly knowledgeable in putting learners into learning groups based on their interest, ability, style and learning preferences as 82.9% of the respondents agreeing to the statement and the remaining 17.1% being neutral. (Mean = 4.03, SD = 0.59). With a mean of 3.36 and a standard deviation of 0.69on the statement of giving learners tiered activities during lesson delivery, 38.5% of the participants agreed, 54.1% were neutral and 7.4% disagreed. 43.0% of the Participants agreed to the statement which inquired about basing teaching and learning activities on learner needs, 53.3% of them were neutral and 3.7% of them disagreed (Mean = 3.39. SD = 0.56). Furthermore, 51.8% of the respondents agreed to the statement that inquired students being provided with the choice to work alone, in pairs or in small groups, 43.0% were neutral and 5.2% disagreed with a mean of 3.51 and standard deviation of 0.67.

Participants were assessed on their level of knowledge of differentiation based on product which yielded an overall mean of 18.65 and standard deviation of 3. Details of the items assessing the participants' knowledge of differentiation based on product are presented in Table 4.2.3.

Table 4.2.3: Primary School Teachers' Knowledge of Differentiation based on Product

Item	Mean	Standard Deviation	Disagree f(%)	Neutral f(%)	Agree f(%)
1. Questions asked during teaching should only measure pupils' understanding and progress on the content being taught	4.09	0.60	0(0.0%)	19(14.1%)	126(85.9%)
2. Pupils should be provided with the choice to work alone, in pairs or in small groups during classroom assessment	3.41	0.59	6(4.4%)	68(50.4%)	61(45.1%)
3. Provide variety of assessment tasks for pupils to choose from	3.93	0.62	3(2.2%)	22(16.3%)	110(81.4%)
4. A variety of assessment tools/strategies should be employed before, during, and after teaching and learning	3.53	0.62	6(4.4%)	54(40.0%)	75(55.5%)
5. Every learner must work on the same assessment tasks	3.69	0.62	2(1.5%)	47(34.8%)	86(63.7%)

Key: f= Frequency (%) = Percentage

The means of the items in Table 4.2.4 ranged from 3.41 to 4.09 and standard deviation from 0.59 to 0.62. The item that recorded the lowest mean (3.41, SD = 0.59) inquired about pupils being provided with the choice to work alone, in pairs and in small groups during classroom assessment 45.1% agreed to the statement, 50.4% were

neutral and 4.4% disagreed to the statement. The item that obtained the highest mean (4.09, SD = 0.60) was on teachers asking questions during teaching to only measure learners‘ understanding and progress on the content being taught. 86.0% of the respondents agreed to the statement, 14.1% were neutral and none of the respondents disagreed to the statement.

Table 4.2.3 also indicates that with a mean of 3.93 and SD = 0.6281.4 participants agreed on the statement that, teachers should provide varieties of assessment tasks for pupils to choose from, 16.3% were neutral and 2.2% of the participants did not agree. 63.7% of the participants on the statement that, every learner must work on the same assessment task, 34.8% were neutral and 1.5% disagreed (mean = 3.69, SD = 0.62). 55.5% of the participants agreed that variety of assessment tools/strategies should be employed before, during and after instruction. 40.0% were neutral on the statement and 4.4% disagreed with a mean of 3.53and standard deviation of 0.62.

Participants showed a high level of knowledge on differentiation based on the diversities learners are likely to show in class with an overall mean of 22.98 and a standard deviation of 4.08. Details of the items assessing participants‘ knowledge of differentiated instruction based on learner diversity are presented in Table 4.2.4.

Table 4.2.4: Teachers' Knowledge of Differentiation based on Diversity

Item	Mean	Standard Deviation	Disagree f(%)	Neutral f(%)	Agree f(%)
1. I see all pupils in my classroom as homogeneously the same	3.72	0.70	1(0.7%)	51(37.8%)	83(61.5%)
2. Pupils in my classroom have the same learning characteristics	3.59	0.70	3(2.2%)	63(46.7%)	69(51.1%)
3. Every classroom has pupils with learning disabilities/abilities	3.67	0.60	1(0.7%)	51(37.8%)	83(61.5%)
4. Gifted learners are also special pupils who need extra attention	3.74	0.74	2(1.5%)	53(39.3%)	80(59.3%)
5. Lessons must be taught to satisfy each learner in the classroom	4.17	0.68	1(0.7%)	18(13.3%)	116(86.0%)
6. Lessons must be taught to all pupils generally in the same way	4.11	0.65	1(0.7%)	19(14.1%)	106(85.2%)

Key: f= Frequency (%) = Percentage

From Table 4.2.4, it can be seen that, the means for the items ranged from 3.59 to 4.17 and the Standard Deviation from 0.65 to 0.74. The item that recorded the lowest mean (3.59, SD = 0.70) inquired about learners having the same learning characteristics in the classroom.51.1% of the participants agreed to the statement, 46.7% were neutral and 2.2% disagreed. This means that a little over average of participants were of the view that learners in the same classroom do not have the same learning characteristics. 59.3% of participants agreed to the statement I see all learners in my class as homogenously the same. 40.0% were neutral and 0.7%'

disagreed with a mean of 3.72 and standard deviation of 0.70. This means that a little more than half of the participants agree to the statement but rather agreed to the fact that learners in the classroom come with their own differences. The table also indicates that 61.5% of the participants agreed to the statement that, _every classroom has learners with learning abilities/disabilities‘. 37.8% were neutral and the remaining 0.7% disagreed to the statement with a mean of 3.67 and standard deviation of 0.60.

A cursory look at the table also shows that, most participants believed lessons must be taught to all pupils generally in the same way with a mean of 4.11 and standard deviation of 0.65. 85.2% of the participants agreed to the statement, 14.1% were neutral and 0.7% disagreed. 59.2% of participants also agreed to the statement that, _Gifted children are also special and must be given extra attention‘. 39.3% were neutral and 1.5% disagreed with a mean of 3.74 and standard deviation of 0.74.

From the table, 86.0% of the participants agreed to the statement that _lessons must be taught to satisfy each learner in the classroom regardless of their differences‘. 13.3% were neutral and 0.7% disagreed with the highest mean of 4.17 and standard deviation of 0.68.

Participants were further assessed on their knowledge of differentiated instruction based on interest of learners whose overall mean is of 14.60 and standard deviation of 3.16. The items that assessed pupils‘ knowledge of differentiated instruction are presented in Table 4.2.5.

Table 4.2.5: Teachers' Knowledge of Differentiation based on Interest

Item	Mean	Standard Deviation	Disagree f(%)	Neutral f(%)	Agree f(%)
1. Every pupil in the classroom has his/her own learning interest	3.96	0.66	2(1.5%)	26(19.3%)	107(79.2%)
2. Individual pupils' life situations impact their learning greatly	3.40	0.79	11(8.1%)	74(54.8%)	50(37.0%)
3. Every pupil's interest, cultures and expectations should be considered when teaching	3.47	0.82	14(10.4%)	58(43.0%)	63(46.6%)
4. Every individual learner has learning culture and expectations	3.76	0.87	7(5.2%)	49(36.3%)	79(58.5%)

Key: f= Frequency (%) = Percentage

As evident in Table 4.2.5, the means on the items ranged from 3.40 to 3.96 and standard deviation from 0.66 to 0.87. The item that obtained the lowest mean was on the statement "Individual pupils' life situations impact their learning greatly" with a mean of 3.40 and standard deviation of 0.79. 37.0% of the participants agreed to the statement, 54.8% were neutral and the remaining 8.1% of the participants disagreed. 46.7% of the participants agreed to the statement "every pupils' interest, culture and expectations should be considered when teaching'. It is observed that 43.0% were neutral and 10.3% disagreed with a mean of 3.47 and standard deviation of 0.82.

Apparent from the table, a mean of 3.76 and standard deviation of 0.87 was obtained on the item that inquired individual learners having different learning cultures and expectations in the classroom. 58.6% of the participants agreed to the statement, 36.3%were neutral and 5.2% disagreed. This means that, a little over half of the participants were of the view that each classroom comes along with learners with diverse cultures and learning expectations. The statement _every pupil in the classroom has their own learning interest' yielded the highest mean of 3.96 and standard deviation of 0.66. 79.2% of the participants agreed to the statement, 19.3% were neutral and only 1.5% disagreed. This means that most participants were of the view that, each learner in the classroom has his/her own learning interest.

Details of the items that assessed participants knowledge on differentiation on learning environment whose overall mean is 16.84 and standard deviation is 2.86 is presented in Table 4.2.6.

Table 4.2.6: Teachers' Knowledge of Differentiation based on Learning Environment

Item	Mean	Standard Deviation	Disagree f(%)	Neutral f(%)	Agree f(%)
1. Classroom environment should be structured to support a variety of activities like flexible grouping or individual work	4.01	0.69	0(0.0%)	31(23.0%)	94(77.0%)
2. Materials should be varied to satisfy pupils' interest/abilities	4.02	0.69	0(0%)	30(22.2%)	105(77.7%)
3. Learning environment should favor every learner	4.47	0.63	0(0.0%)	10(7.4%)	125(92.6%)
4. Normal classroom environment should include special children or pupils with disability (physical, emotional, mental etc)	4.34	0.65	0(0.0%)	5(3.7%)	130(96.3%)

Key: f= Frequency (%) = Percentage

Table 4.2.6 shows means of items that ranged from 4.01 to 4.47 and standard deviation from 0.55 to .0.69. A cursory look at the table indicates that the item that obtained the lowest mean (4.01) and its standard deviation of 0.69 inquired about classroom environment being structured to support varieties of activities like flexible grouping or individual work. The table also indicates that 77.0% of the number participants agreed to the statement, 23.0% were neutral while none of the respondents agreed to the statement. This indicates that most of the participants agree

to the statement. The statement; _materials should be varied to satisfy pupils interest and abilities _attracted a mean of 4.02 and standard deviation of 0.69 with 77.7% of the respondents agreeing to the statement, 22.3 being neutral and none of the participants disagreeing to the statement.

The table also indicated that the item _learning environment should favor each learner' obtained a mean of 4.47 and standard deviation of 0.69. 92.6% of the participants which is a clear majority agreed to the statement while the remaining 7.4% being neutral. This indicated that, most participants were knowledgeable of the view that, learning environment should be conducive and favorable to every learner in the classroom. 96.3% of the participants also agreed to the statement that _normal classroom environment should include special pupils and learners with disability (physical, emotional, mental etc), the remaining 3.7% were neutral with mean of 4.34 and standard deviation o f 0.55. This is a clear indication that majority of the participants agreed that a normal classroom should include special children or pupils with disability.

Details of the items that assessed the teachers' level of knowledge on differentiation of lesson planning with an overall mean of 16.64, and standard deviation of = 2.84 are presented in Table 4.2.7.

Table 4.2.7: Teachers' Knowledge of Differentiation based on Lesson Planning

Item	Mean	Standard Deviation	Disagree f(%)	Neutral f(%)	Agree f(%)
1. Every pupil's needs must be considered when planning lessons	4.24	0.72	0(0%)	23(17.0%)	112(82.9%)
2. Lesson objectives should consider individual leaner's needs	4.18	0.64	0(0.0%)	18(13.3%)	117(86.7%)
3. Lessons should be planned considering pupils' differences	4.20	0.67	1(0.7%)	16(11.9%)	118(87.4%)
4. The same lesson plan must satisfy all learners in the same class	4.03	0.80	0(0.0%)	41(30.4%)	94(69.6%)

Key: f= Frequency (%) = Percentage

From Table 4.2.7, the means for the items ranged from 4.03 to 4.24 and the *SD* ranged from 0.64 to 0.80. The item which obtained the lowest mean (4.03, SD= 0.80) inquired about the same lesson plan being able to satisfy all learners in the same classroom. 69.6% of the participants agreed to the statement whiles the remaining 30.4% were neutral, none of the respondents disagreed. The highest mean 4.24 was obtained on the item that inquired about pupils needs being taken into consideration while planning lesson (SD = 0.72). 82.9% of the research participants agreed to the statement, 17.1% were neutral while none of the participants disagreed.Thestatement which inquired about considering pupils differences whiles planning the lesson also obtained a high mean of 4.20 and standard deviation of 0.67 with 87.4% of the participants agreeing to the statement, 11.9% being neutral while 0.7% disagreed.

Apparent from Table 4.2.7, the statement: ‗lesson objectives should consider individual learners‘ needs‘ obtained a mean of 4.18 and standard deviation of 0.64 with 86.7% agreeing to the statement, 13.3% being neutral while none of the respondents disagreed. This means most participants agreed to that statement.

With a mean of 14.94 and standard deviation of 3.24, participants were assessed knowledge on the general concepts of differentiated instruction. Details of the items assessing teachers‘ knowledge on general basic theories of differentiation are presented in Table 4.2.8.

Table 4.2.8: Teachers' Knowledge on the General Concepts of Differentiation

Item	Mean	Standard Deviation	Disagree f(%)	Neutral f(%)	Agree f(%)
1. I have enough knowledge on Differentiated	3.62	0.90	18(13.3%)	36(26.7%)	81(60.0%)
2. Instruction 3. I know much about equity and accessibility for all learners	3.69	0.79	12(8.9%)	34(25.1%)	89976.0%)
4. I have enough knowledge on Inclusive Education	3.75	0.83	9(6.7%)	40(29.6%)	86(63.7%)
5. 4. I have enough knowledge on Special Education	3.92	0.70	2(1.5%)	33(24.4%)	110(74.1%)

Key: f= Frequency (%) = Percentage

The means for the items in Table 4.2.8 ranged from 3.62 to 3.92 and standard deviation ranged from .70 to 0.90. The item that obtained the lowest mean (3.62, *SD* = 0.90) inquired about participants knowing much about the concept of differentiation

of instruction with 60.0% of the respondents agreeing to the statement, 26.7% being neutral while 13.3% disagreed to the statement. This indicates that more than half of the participants had knowledge on the concept of differentiated instruction. The item that obtained the highest mean (3.92, SD= 0.70) was on teachers‘ knowledge on the concept of Special Education with 74.1% of the participants agreeing to the statement, 24.4% of them being neutral while only 1.5 % of the respondents disagreed to it.

A mean of 3.75 was obtained on the item that assessed teachers‘ knowledge on the concept of inclusive education with a standard deviation of 0.83. 63.7% of the respondents agreed to the statement 29.6% being neutral while 6.7% of the participants disagreed. 76.0% Participants agreed to the statement _I know much about equity and accessibility for all learners‘ with a mean of 3.69 and standard deviation of 0.79. 25.1% were neutral while 8.9% disagreed.

4.4 Research Question 2: To what extent do primary school teachers practice differentiated instruction in Mampong Municipality?

This research question sought to investigate the extent to which primary school teachers in Mampong municipality practice differentiated instruction. The teachers‘ practice of differentiated instruction was sought under three major elements of differentiated instruction (content, process and product). A four point likert scale was used to observe teachers pedagogical practices of differentiated instruction (1= never occur, 2= rarely occur, 3= often occur and 4= always occur).

The means scores and standard deviation, frequency and percentage of the participants observed are shown in Table 4.3. The four-point scale was further dichotomized (1= never occurs and 2= rarely occur combined and 3= often occur and 4 = always occur also combined) so 1 and 2 becomes ―rarely occur‖ and 3and 4

becomes –often occur". The rationale behind this dichotomization is for the study to gain more interpretation and simplicity (Beamish, 2004).

Table 4.3: Descriptive Statistics of Primary School Teachers' Practice of the Main Elements of Differentiated Instruction

Elements of Differentiated instruction	Overall means	Standard Deviation	Rarely Occur Overall (%)	Often Occur overall (%)
Content (4)	8.40	3.22	72.2%	27.8%
Process (6 items)	11.70	3.21	66.7%	33.3%
Product(8 items)	13.80	4.81	93.1%	6.9%

From Table 4.3, the results from primary school teachers' level of practice of differentiated instruction based on process differentiation was practiced most as compared to the rest with a total mean of 11.70 and standard deviation of 3.21. 33.3% of the participants observed often practice process differentiation whiles the remaining 66.7% rarely practice process differentiation. This is a clear indication that, most participants observed did not practice process differentiation.

The next item with a total mean of 8.4 and standard deviation of 3.22. is the item that assessed participants' level of practice of content differentiation with only 27.8% of participants practicing content differentiation while the remaining 72.2% rarely practice content differentiation. Table 4.3 also indicate that, product differentiation was the least practiced element of differentiated instruction by participants in the Mampong municipality with a total mean of 13.8 and standard deviation of 4.81 with only 6.9% of respondents often practicing product differentiation while the remaining 93.1% rarely practice it.

Participants observed rarely practiced content differentiation with only 27.8% of them practicing it. Details of the items that assessed participants practice of content differentiation is shown in Table 4.3.1.

Table 4.3.1: Descriptive Statistics on Teachers'' Practice of Content Differentiation

Item	Mean	Standard Deviation	Rarely Occurf(%)	Often Occurf(%)
1. Materials/resources supports the standards and topics	2.22	0.95	4(44.4%)	5(55.6%)
2. Materials/resources are age appropriate	2.11	0.78	6(66.6%)	3(33.3%)
3. Materials/resources are available in adequate number for the class size	1.88	0.60	8(88.9%)	1(11.1%)
4. Teacher differentiates the content of instruction to suit pupils' differences	1.77	0.67	8(88.9%)	1(11.1%)

Key: f= Frequency (%) = Percentage

Table 4.3.1 shows means of items ranging from 1.77 to 2.2and standard deviation from 0.60 to 0.95. The item that attracted the highest mean was the item that assessed teachers' pedagogical practices on how they use materials and resources to support the standards and topics with a mean of 2.30 and standard deviation of 0.95. 55% of the participants often use materials/resources that support the standards and topics taught while the remaining 44.4% rarely practice it. This is an indication that most participants rarely use materials/resources that support the standards and topics taught. The item that attracted the lowest mean assessed teachers' pedagogical practices on how teachers differentiate content to suit pupils' differences (M = 1.77 and SD = 0.67). 11.1% of the participants have materials/resources available and adequate in number for the class size. The remaining 88.9% showed little or no evidence of such materials.

The item that assessed teachers on how materials/resources used during instruction are appropriate to their age with a mean of 2.11 and standard deviation of 0.78with 33.3% of the respondents showing evidence of such practice while the remaining 66.7% rarely practice it. The item ―materials/resources are available in adequate number for the class size" attracted a mean of 1.88 and standard deviation of 0.60 with only 11.1% of the participants showing evidence of materials/resources that are available in adequate number for the class size and the remaining 88.9% showing no evidence of it.

Table 4.3.2 shows that primary school teachers rarely practiced process differentiation with average per item rating of 2.34 and standard deviation is 0.64.

Table 4.3.2: Descriptive Statistics of Teachers Practice of process Differentiation

Item	Mean	Standard Deviation	Rarely Occurf(%)	Often Occur f(%)
1. Teacher uses a variety of materials other than the standard textbooks during instruction delivery	2.22	0.67	6(66.6%)	3(33.3%)
2. Teacher provides time for students to actively process information during lesson delivery	2.44	0.53	5(55.6%)	4(44.4%)
3. Teacher applies assessment information to guide instruction	2.22	0.44	7(77.8%)	2(22.2%)
4. Teacher differentiates using the general concepts	2.22	0.67	6(66.7%)	3(33.3%)
5. Teacher differentiates process to suit pupils‘ differences	2.33	0.70	5(55.6%)	4(44.4%)

Key: f= Frequency (%) = Percentage

Table 4.3.2 shows means of items ranging from 2.22 to 2.44and standard deviation from 0.44 to 0.70. The item that obtained the highest mean was the item that assessed teachers on how often teachers provide time for students to actively process information during lesson delivery with a mean of 2.44 and standard deviation of 0.53. 44.4% of the participants observed showed evidence of providing time for students to actively process information during lesson delivery. The remaining 55.6% rarely showed evidence of it. Again, 44.4% of the respondents observed showed evidence of differentiating process to suit pupils‘ differences whiles the remaining 55.6% showed little or no evidence with a mean of 2.33 and standard deviation of

0.70. 33.3% of the participants observed showed evidence of using a variety of materials other than the standard textbooks during instruction delivery while the remaining 66.7% showed little or no evidence with a mean of 2.22 and standard deviation of 0.67. Again, 33.3% of participants showed evidence of participants observed showed little evidence of differentiating using the general concepts while the remaining 66.7% showed little or no evidence with a mean of 2.22 and standard deviation of 0.67. 22% of the participants observed showed evidence of applying assessment information to guide instruction while 77.8% of them showed little or no evidence. This indicates that, most participants observed did not apply assessment information to guide instruction most of the time.

Table 4.4.3 shows teachers' pedagogical practice of product differentiation which yielded an average per item rating of 1.75 and standard deviation of 0.60.

Table 4.3.3: Descriptive Statistics of Teachers' Pedagogical Practice of Product Differentiation

Item	Mean	Standard Deviation	Rarely Occurf(%)	Often Occur f(%)
1. Teacher uses both formative and summative evaluation	2.44	0.52	4(44.4%)	5(55.6%)
2. Teacher provides opportunities for student products to be based upon the solving of real life and relevant problems	2.44	0.72	9(100%)	0(0.0%)
3. Teacher uses variety of assessment tools before, during and after learning	1.56	0.53	9(100.0%)	0(0.00%)
4. Assignments necessitates that students conduct research	1.67	0.50	9(100.0%)	0.(0.0%)
5. Teacher works with individual students or groups to determine the form of product	1.44	0.53	9(100%)	0(0.0%)
6. Teacher allows for a wide range of product alternatives (oral, creative, visual etc)	1.33	0.50	9(100.0%)	0(0.0%)
7. Composition of groups changes base on the activity of the lesson	1.11	0.33	9(100%)	0(0.0%)
8. Learners are assessed based on their learning style	1.11	0.33	9(100%)	0(0.0%)

Key: f= Frequency (%) = Percentage

Table 4.3.3 shows the means of the items ranging from 1.11 to 2.44 and standard deviation from 0.33 to 0.72.

The item that yielded the lowest mean (1.11, SD = 0.33) inquired about learners being assessed based on their learning style. All the participants observed showed little or

no evidence of assessing their learners based on their learning style. . The item that obtained the highest mean was on the item that inquired about teachers using both formative and summative forms of assessment during teaching with a mean of 2.44 and standard deviation of 0.52. 55.6% of the participants observed showed evidence of using formative and summative evaluation while the remaining 44.4% showed little or no evidence of using both forms of evaluation. This indicated that participants often use both forms of evaluation during instructional periods.

The table also showed a mean of 1.33 and standard deviation of 0.50 for the statement, _teacher allows for a wide range of product alternatives (oral, creative, visual etc)‘. None of the participants observed showed enough evidence of allowing wide range of product alternatives. The items that inquired about teachers using varieties of assessment tools during, before and after teaching attracted the mean of 1.56 and standard deviation of 0.53.All the participants observed showed little or no evidence of using varieties of assessment tools.

The statement that inquired about teachers providing opportunity for students‘ products to be based on solving real life and relevant problems attracted a mean of 2.44 and standard deviation of 0.72. Again, none of the participants observed showed enough evidence of providing opportunity for students‘ products to be based on solving real life and relevant problems.

Apparent from Table 4.3.3, the participants observed did not make learners perform much of research based tasks with a low a mean of 1.67 and standard deviation of 0.50. None of the participants observed showed enough evidence of performing much of research based tasks. Also the item _teacher works with individual students or groups to determine the form of product‘ attracted a mean of 1.44 and standard

deviation of 0.53. None of the participants observed showed enough evidence of working with individual students or groups to determine the form of product.This is an indication that, most participants imposed their forms of product expected from a particular task or assignment.

Another item was on teachers changing the composition of groups for a particular task based on the activity with a mean 1.11 and standard deviation of 0.33.All the participants observed showed little or no evidence of changing the composition of groups for a particular task based on the activity

4.5 Research Question 3: What challenges do primary school teachers experience in differentiating mathematics instruction and assessment in Mampong municipality?

A questionnaire was designed to seek issues that were challenging to participants with regards to the implementation of differentiated instruction and assessment. Views from respondents on each item about the challenges they face are presented in the descriptive statistics in Table 4.4 with the mean and standard deviation on each item.

Table 4.4: Descriptive Statistics of Challenges faced by Primary Schools Teachers in Differentiating Instruction in Mampong Municipality

Item	Mean	Standard Deviation	Disagreef (%)	Neutralf(%)	Agree f(%)
1. It is difficult to determine each learners learning style and the appropriate instruction tool to match with	3.44	0.70	9(6.7%)	64(47.4%)	62(45.9%)
2. Teachers lack knowledge on how to address academic diversity in Differentiated Instruction.	3.74	0.75	12(8.9%)	24(17.8%)	99(73.3%)
3. Differentiated Instruction and assessment is one of the bureaucratic mandate leaped upon teachers	3.94	0.58	4(3.0%)	15(11.1%)	116(85.9 %)
4. Teachers can not differentiate if professional development resources are absent	3.82	0.57	7(5.2%)	15(11.1%)	113(83.7 %)
5. As a teacher, adjusting teaching practice as Differentiated instruction is disheartening and upsetting	3.79	0.52	2(1.5%)	30(22.2%)	103(76.3 %)
6. It is very difficult to access the readiness level of learners	2.96	0.62	26(19.3%)	89(65.9%)	20(14.8%)
7. How to match the appropriate resource with teaching is a major challenge	3.81	0.56	1(0.7%)	33(24.4%)	101(74.8 %)

Table 4.4 continues

8.	Teachers are limited to practice differentiated instruction due to limited space for group work.	3.88	0.52	2(1.5%)	21(15.6%)	112(83.0 %)
9.	Time factor always poses a threat to differentiated instruction.	4.30	0.51	0(0.0%)	3(2.2%)	132(97.8 %)
10.	Lack of administrative support hinders the practice of differentiated.	4.04	0.42	0(0.0%)	9(6.7%)	126(93.3. %)
11.	Large class size is one of the threats to Differentiated instruction and assessment	4.05	0.54	0(0.0%)	16(11.9%)	119(88.1 %)
12.	Teachers fear that, there are no models to talk about differentiated instruction.	4.11	0.55	0(0.0%)	13(8.6%)	122(91.4 %)
13.	Teachers are apprehensive for the concept based teaching with the pressure of standardized test in Differentiated Instruction	4.29	0.45	0(0.0%)	0(0.0%)	135(100%)

Key: f= Frequency (%) = Percentage

Table 4.4 shows means of items on the challenges primary school teachers in Mampong municipality face in differentiating instruction with means ranging from 2.96 to 4.30 and standard deviation from 0.42 to 0.75. A cursory look at the table shows high means which indicates participants faced quite a lot of challenges when implementing the concept of differentiated instruction. The item that yielded the

lowest mean was on the statement ―It is very difficult to access the readiness level of learners". It is clear that most participants were familiar with how to access the readiness level of learners with a mean of 2.96 and standard deviation of 0.62. 14.8% of the participants agreed on the statement, 65.9% were neutral and 0.7% disagreed on the statement.

The item that attracted the highest mean (4.30., SD = 0.51) was on the statement _Time factor always poses a threat to differentiated instruction and assessment'. This shows that most participants were restricted by time when they implement the differentiated instruction with 97.8% of the participants agreeing to the statement and the remaining 2.2% being neutral while none of them disagreed.

Another item that obtained a high mean (4.29, SD = 0.45) inquired about teachers being apprehended for the concept based teaching with the pressure of standardized test in differentiated instruction with all the participants (100%) agreeing to the statement. This is a clear indication that expectations from standardized test hindered the implementation of differentiated instruction. The statement _Large class size is one of the threats to differentiated instruction' also yielded a mean of 4.05 and standard deviation of 0.54. 88.1% of the participants agreed to the statement, 11.9% were neutral while none of the participants disagreed to the statement. This means that a large class population apprehends participants from implementing differentiated instruction. With a mean of 4.04 and standard deviation of 0.42, 93.3% of participants agreed to the statement, _Lack of administrative support hinders the practice of differentiated instruction' with the remaining 6.7% being neutral. None of the participants agreed to the statement. The statement _Teachers fear that, there are no models to talk about differentiated instruction' attracted a mean of 4.11 and standard

deviation of 0.55. 91.4% of the participants agreed to the statement, 8.6% were neutral while none of them disagreed to the statement.

The table shows that 85.9% of the participants agreed that differentiated instruction and assessment is one of the bureaucratic mandate leaped upon teachers as the statement attracted a mean of 3.94 and standard deviation of 0.58. 11.1% were neutral while only 5.2% disagreed to the statement.83.0% of the participants agreed that they were not limited when it comes to engaging learners in group activities and task, 15.6% were neutral while only 1.5% disagreed to the statement with a mean of 3.88 and standard deviation of 0.52. This could probably be because group task and activities are part of the requirements of the School base assessment (SBA). 83.7% of participants agreed to the statement, _Teachers can not differentiate if professional development resources are absent', 11.1% were neutral while 3.0% disagreed to the statement with a mean of 3.82 and standard deviation of 0.57. The statement _How to match the appropriate resource with teaching is a major challenge' attracted a low mean of 3.81 and standard deviation of 0.56 with 74.8% of the respondents agreeing to the statement, 24.5% being neutral while 0.7% disagreed to the statement. This shows that most of the participants agreed to that statement. 73.3% of the participants agree to the statement _Teachers lack knowledge on how to address academic diversity in differentiated instruction', 17.8% were neutral while 8.9% disagreed to the statement with a mean of 3.74 and standard deviation of 0.7.

The table indicates that 45.9% of the number of participants agreed to the statement that _It is difficult to determine each learners' learning style and the appropriate instruction tool to match with' 47.4% were neutral while 6.7% disagreed to the statement.

4.6 Qualitative Results from the Interview

The interview conducted after the questionnaire accounted for response from nine participants who were spread across the municipality with each participant coming from one of the nine circuits (T1, T2, T3, T4, T5, T6, T7, T8 and T9.). The interviews explored issues with 10 items which were based on the results of the questionnaire on primary teachers' knowledge and practices of Differentiated instruction. The purpose of the questions were to explore participants knowledge on differentiated instruction, how often they attend professional development courses or programs that discussed differentiated instruction and assessment, how they determine the readiness and learning profile of learners, the strategies they employ in differentiating instruction and how they know how well students learn. It also explored the challenges teachers face when implementing differentiated instruction.

When participants were asked how often they attended professional courses or events, inside and outside the school, it was revealed that 3 of the respondents said (T3, T5 and T6.) they hardly attend such events outside the school throughout the academic year but do attend some in the school at least twice in an academic year. The remaining six (T1, T2, T4, T7, T8, and T9) said they have never attended professional events/courses outside the school but at least once inside the school every academic year. The following are some of the comments made by the participants.

> T1: we always attend in-service programs in the school at least once every academic year to address topics that teachers find it hard to teach in the class but I have never attended any professional course or event outside the school since my six years of teaching in this school.

When teacher 8 was asked the same question, he said,

> T8: –we organise programs in our schools and sometimes we invite resource personnel to discuss ways of improving teaching and sometimes we discuss topics that we find difficult in the syllabus at least every term. A part from that, I have never attended any professional course or event outside the school.

Teacher 9 answered the same question by saying;

> T9: –we organize professional courses or events inside the school at least twice an academic year and I have attended three professional events/courses ever since my 8 years of service".

Participants were further asked if these professional courses they attended discussed differentiated instruction and all of the respondents said No.

This confirms the results from the quantitative study that, some of the participants did not practice differentiated instruction.

An insight into participants knowledge of differentiated instruction resulted in five (T2, T4, T5, T7 and T9) of them having a little idea about the concept and the remaining four (T1, T3, T6, and T8) having no knowledge about the concept. These were their response.

> T2: –Let me see if I can try. Is it a way of teaching and assessing that suits every learners way of learning?"

T4 Answered the same question by saying;It is the way of teaching and assessing that makes sure that each learner in the classroom has taught and assessed based on each learners' difference.

T5 commented that; Differentiated instruction is a way of making sure each learner has a fair share in the entire learning process.

T7 added that: It is a process of teaching that employs many strategies to make sure that each learner understands the lesson taught in their own way.

T9 also commented that: "Differentiated instruction is a way of teaching and assessing that makes sure that each learner in the classroom has a clear understanding despite of their differences in learning".

Teachers will be able to differentiate instruction and assessment only when they have pre assessed learners to know their readiness level. This made the researcher ask question to find out if participants pre assess learners before the main instructional process. All the participants said they did access learners before every instructional process. Below are some of the comments from the respondents.

T3 commented that: "I always ask questions before I teach so that I can determine what my pupils already know about the topic we are going to treat. Most times it makes the work easier because you can determine the right channel to go so that pupils can understand the lesson".

T7 added that: ―I don't joke with my R.P.K. I always assess pupils to know what they know and how far they can go with what I am about to teach them. It helps me to use the appropriate strategy.

T9 commented that: ―I review my pupils' relevant previous knowledge on the lesson I am about to teach. That alone informs me the period it will take me to compete the lesson. Most of my pupils are above average. Sometimes most of them know little of what I am about to teach."

Participants were asked if they differentiate content and almost all respondents said _No' because they said learners are supposed to learn the same thing and are examined the same way, except T1 and T4 who pointed out to the fact that unavailability of resources makes it impossible for them to fully differentiate content so most at times they just go by the standard textbooks but they sometimes differentiate content when there see the need to. A summary of some of their responses are shown as follows.

T1: I do not usually do that. I vary the content sometimes when I find out that, it might be difficult for some pupils to understand it but it all has to come to what the syllabus is expected of us.

T4: I do not do that frequently. I only vary the content when I notice that it is possible to do so. Sometimes I find it hard to differentiate the content of what pupils are supposed to learn.

Participants were further asked if they differentiate process and all of the ten respondents said they differentiate the process sometimes. They were further asked

why they did not differentiate instruction sometimes and below is a summary of their response is in the excerpts below:

> T2: I sometimes differentiate instruction. I don‘t do it all the times because I might be restricted by time.

> T5: the major problem of this school is that we lack a lot of materials to make teaching and learning much easier. This also hinders us from implementing differentiated instruction in the classroom. I mostly use one effective way to save time and energy.

There are many ways teaches can adopt to differentiate instruction so that students can learn best through their learning style. This can be successful only when teachers have been able to determine the various learning styles. This made the researcher ask question about participants being aware of the different learning styles their pupils possess. All of the respondents stated that, they are aware their pupils have different learning styles. Below are some of their comments.

> T8: I have noticed one boy in my class. Any time I put them in a group, he contributes a lot to whatever task I give to them but on a normal day, this boy will hardly talk or answer questions in the classroom.

> T5 also commented that: ―Some pupils in my class will never understand a mathematics sentence during teaching unless it is framed in a real life story form I always have to translate for their sake.”

T2 stated that: "I have also noticed that some of the pupils in my class enjoy peer teaching. I noticed this when I paired and grouped them for activities"

The fifth item on the interview guide asked about what were the ways of differentiating instruction. The common strategy most of the respondents were mentioning was grouping, individualized teaching and peer teaching. The response from the participants indicated that most participants were aware of some of the strategies of differentiating instruction.

The sixth item on the interview guide was an inquiry about how well participants know their pupils learn and how they got to know. The summary of the comments they made is captured as follows.

T3: my pupils learn best when I repeat instruction in diverse ways for very learner to understand what is being taught and more than average of the class answer questions well when I repeat instruction in diverse ways. I get to know this through the exercises I give to them.

T4: my students learn best when I give them manipulative materials that supports the content of the instruction. It makes them understand the concepts well. In the absence of these materials, I have to repeat the instruction severally before they understand the lesson and that takes a lot of time.

T7: I can boldly say that more than half of pupils in my class are good. But I have to repeat the instruction over and over again before

> they can understand. Most of them are slow learners so in order to achieve proficiency, I have to bring it low to their level and repeat the instruction severally so that they can get the concepts.

The next item on the interview list asked teachers whether the size of the class did pose a threat to differentiated instruction. All respondents said yes. A few of their comments are captured as follows.

> T2: I have 43 pupils in my class. About 13 of them are good learners. The rest are below average sometimes I have to attend to those below average individually. This makes the instructional process stressful and boring for me. So sometimes I put those below average in small groups and attend them.

> T3: it is very difficult to attend to a lot of pupils individually especially when you are assessing them. Sometimes there is no time for the teacher give pupils feedback after assessing and use the feedback to design a good way to instruct them again.

Participants were further asked if time also pose a threat on differentiated instruction. All respondents responded yes to the question. This proves the data obtained in the quantitative aspect. A summary of their responses are in the following excerpts.

> T2: Time is a major challenge when it comes to differentiated instruction. You might not get the ample time to attend to slow learners individually. Our district organises a standardized test for all primary schools so we teach to meet that limit which is also the

requirement of the syllabus. So time is not on our side to attend to only few students individually all the time.

T6: time places a major threat to differentiated instruction. Most times, time is not on my side to attend to individual learners or even use various strategies to teach on particular lesson.

The next item on the interview list asked teachers whether they differentiate instruction or not and if they do, how do they go about it? All the respondents said they sometimes differentiate instruction but not all the times and almost all of them based their reason of time factor, except T8 and T9, who added that sometimes some lessons need not to be differentiated. Most learners get the concept through the same way. When they were asked how they go about it, some responded saying:

T7: I sometimes group pupils according to their ability and prepare an instructional approach for each group and I also attend to individual learners who find it hard to understand the concept.

T9: I attend to pupils who are slow in getting the concept individually. I also vary the way I teach sometimes so that both slow and fast learners will get what I am putting across at the same time.

T4: After evaluating, I get to know those who did not get the concept so I plan a different instructional approach to suit their deficiency.

The next item on the interview list asked teachers how they differentiate instruction in the class. As mentioned above in the interview item 5, most respondents claimed they

mostly small groupings and individualized teaching. A summary of their response is captured as follows.

> T5: I sometimes group pupils according to their ability so that I can assign the appropriate instructional approach to every group. Sometimes I try to attend to slow learners individually.

> T6: I vary the methods I use to teach so that all learners in the class will get their fair share. Sometimes I attend to pupils individually, that is when I identify that, a particular student is finding it hard to get a concept. But I don‘t do this all the time.

Participants were further asked if they differentiate product in their class. If they do, how they go about it. If they don‘t, why don‘t they? Six of the respondents (T1, T2, T4, T6, T7 and 0T8) answered no. Three out of the six (T1, T2, and T6) based their reason on time. The remaining three (T4, T7 and T8) based their reason on the fear of not meeting the standards. Some of their comments are captured in the following excerpts.

> T1: I cannot get ample time to design a different assessment task for some pupils in the classroom. We always have a general task ahead so you cannot not risk that time assessing some few students differently. It might make them reluctant or even lazy. They might use that as an opportunity and stop focusing whenever lessons are going on because they know they will be assessed in a different way from the main assessment task.

T7: The district organizes a standardized test for all schools so we always make sure we teach to meet those standards and that of the syllabus because they are somehow the same. You cannot deviate from the standardized way and assess pupils differently. It might make the learners fall short or not meet standards.

T3: I don‘t differentiate assessment because all pupils are supposed to learn the same content so I think it is appropriate to assess them the same way so that the expected outcome can be obtained.

The remaining three of the respondents commented that they sometimes differentiate assessment in the class. They were further asked how they go about it and some of their responds are captured as follows.

T5: sometimes if I notice that some of the pupils are slow in getting the concepts, especially in mathematics lessons, I give the task that have a low difficulty level compared to that of the entire class. Gradually they keep up to the standard.

T9: I challenge some of my good learners sometimes with task that are a above their level. For the slow learners, I sometimes give slow learners task that are easier than the standard task for them to gradually cope and get the concepts. I do this when I am giving the homework but not class work

T4: I only do that when I‘m giving them homework. I have some selected pupils that always give a difficult task to and some; I have to make it easier else they will score nothing. If I do that in the

> classroom, some learners might feel they are superior over the others.

The lasts item on the interview list asked teachers to mention any challenge they face when they are differentiating instruction. Most of their response was that, time and class size did post a major threat to differentiated instruction. All of the respondents did mention that, they lack resources to make teaching and learning easier. All they rely on is the textbooks and chalkboard illustrations and sometimes cardboards. Seven (T1, T3, T4, T6, T7, T8 and T9) of the respondents commented that, lack of professional training makes the implementation of differentiated instruction difficult. Some of their responds a captured in the following excerpts.

> T3: I don‘t remember I was taught anything like differentiated instruction and assessment in college. We just practice some of these things base on experience. There should be organization of courses to train us on some of these things. It is very important.

> T6: you need to be well learned and skillful before you can help some learners because their learning style is hard to cope with. They can make you waste the entire period on them. We need to be trained before we can practice this always and appropriately.

A summary of the interview results indicates that almost all of the respondents did not attend any professional program inside or outside the school that discussed differentiated instruction and how it could be implemented. Although there was no sign of participants being trained on differentiate instruction, the interview revealed that most of the participants had a fair knowledge of the concept of differentiated instruction. Teachers‘ knowledge on the components of differentiation of instruction

varied and there was quite low evidence of its practice. Participants faced the challenge of large class size, time factor, lack of resources and training. It was also revealed that all participants assess the readiness level of their pupils before teaching and was aware that, pupils in their classrooms have different learning styles. The interview also revealed that participants did not practice differentiated assessment frequently due to the fear of no meeting standards and being limited by time.

4.7 Discussion of Findings

The discussions of the findings obtained from the study on primary school teachers' knowledge and practices of differentiated instruction are presented as follows.

1. Primary school teachers' knowledge of differentiated instruction.
2. Primary school teachers' pedagogical practices of differentiated instruction. .
3. Challenges primary teachers experience in differentiating instruction.

4.7.1 Primary School Teachers' Knowledge of Differentiated Instruction

Knowledge refers to awareness of or familiarity with various objects, events, ideas, or ways of doing things (Henrique, 2013). The extent of teachers knowledge on a particular concept its influences the way it is implemented. Guerriero (n.d) supports this assertion with the view that, teaching is knowledge-rich profession with teachers as _learning specialists.' As professionals in their field, teachers can be expected to process and evaluate new knowledge relevant for their core professional practice and to regularly update their knowledge base to improve their practice and to meet new teaching demands. This indicates that teachers are supposed to be knowledgeable on differentiated instruction before they can implement it well.

Teachers can implement differentiated instruction when they are knowledgeable of its process, theoretical framework and ways through which the theory is translated into action (Franz, 2009). Primary school teachers in the Mampong Municipality participated in the study exploring their knowledge of differentiated instruction on 8 components that include: process differentiation, content differentiation, product/assessment differentiation, learner diversity, learner interest, lesson planning, learning environment and general concepts of differentiated instruction.

The findings from the study (Table 4.2 and Table 4.2.2) revealed that, more than half of the participants had knowledge of content differentiation. 5 items that were used to assess participants‘ knowledge in content differentiation showed an overall percentage of 70.9% having knowledge of content differentiation with 25.6% of them having little or not enough while 3.5% of the participants had no knowledge of content differentiation. This is an indication that most participants are of the knowledge that the content of instruction should be differentiated to learners.

The findings from the study (Table4.2 and Table 4.2.2) also revealed that, more than half of the participants had knowledge in process differentiation. 9 items were used to assess participants‘ level of knowledge in process differentiation with an overall percentage of 57.2% of the participants having knowledge of process differentiation. 33.6% of them were neutral while 9.2% of the participants had no knowledge of process differentiation. This indicates that, a little over half of the participants had knowledge of differentiating the process of instruction.

It was clear from the findings that most participants of the study had knowledge of product differentiation. An overall percentage of 66.4% of the participants agreed to 5 statements which were used to assess participants‘ knowledge of product

differentiation. This indicated that, most of the participants had knowledge of product differentiation. 31.1% of the respondents were neutral while 2.8% of the participants had no knowledge of product differentiation. This indicated that most teachers agreed to the fact that, product should be differentiated to learners with respect to their individual differences.

Findings from the study (Table 4.2 and Table 4.2.4) revealed that, most of the participants are aware of the fact that each classroom has learners with different individual learning needs and abilities and should be treated as such. 6 items were used under this category to assess participants‘ level of knowledge in identifying and acknowledging learners‘ diversities to inform how instructions are being differentiated. An overall percentage of 67.0% of the participants agreed to the statements which is an indication that they had knowledge of diversity of learners. 31.9% of them were neutral while only 1.1 % showed no knowledge of it. This is an indication that, more than half of the participants were knowledgeable of the fact that individual learners have diversities in abilities and needs.

The findings from the study (Table 4.2 and 4.2.5) revealed that a little more than half of the participants agreed that individual learners in every classroom have their own learning interest which teachers should consider when differentiating instruction. An overall percentage of 55.4% agreed that individual learners in every classroom have their own learning interest which teachers should consider when differentiating instruction. 38.3% were neutral while 6.3% of the participants disagreed. This is an indication that more half of the participants had knowledge of their each of their learners having different learning interest.

The study also revealed that, most of the participants were knowledgeable of the fact that the environment of the learner should be considered when differentiating instruction. 4 items were used to assess participants‘ level of knowledge on the environment of the learner being considered when differentiating instruction. An overall percentage of 81.8% of the respondents agreed that the environment of the learner should be considered when differentiating instruction. 18.2% of the participants were neutral while none of the participants disagreed. This is an indication that most of the participants had knowledge of the environment of the learner playing a major role in making differentiation of instruction possible.

The findings of the study (Table 4.2 and Table 4.2.6) revealed that, most of the participants were highly knowledgeable of having the diverse needs and abilities of learners in mind when planning lessons. 4 items were used under this sub group to assess the level of knowledge of the participants. 86.0% of the participants agreed to this, 14.0 were neutral while none of the participants disagreed. This is an indication that most of the participants of the study were knowledgeable of the fact that teachers should have differentiation of instruction in mind when planning lessons.

The study also revealed that (Table 4.2 and Table 4.2.7), more than half of the participants were knowledgeable of general concepts of differentiated instruction. 4 items were used to assess the level of knowledge of participants on the general concepts of differentiated instruction. An overall percentage of 66.5% of the participants agreed to the statements, 26.4% were neutral while 7.1% disagreed. This indicates that more than half of the participants had knowledge of the general concepts of differentiated instruction.

The varying level of primary school teachers' knowledge of the eight differentiated instruction components used in the study is consistent with the findings of Abora (2015) and that of Whipple (2012) just that Whipple revealed similar variations of teachers understanding among six components. This is in disparity with other studies (Whipple, 2012) which indicated that teachers were knowledgeable of differentiated instruction because they were given special education training. This was affirmed from the interview conducted when teachers were asked whether they attend professional development courses on differentiated instruction and all of the respondents responded "No". Most of the respondents claimed they adopted this method of teaching through experience and some claimed they learnt some of its concepts in the "Special Education Course" in their various colleges. This affirms the findings of the study conducted by Abbati (2012) which revealed that the exceptionally high implementers of DI were evidenced by personal factors such as willingness to persevere and grow professionally, relatively long experience of teaching the same grade level or class, and solid classroom management skills.

The knowledge teachers possess on a particular concept makes them able to implement it well. Hence differentiated instruction cannot be fully implemented if teachers lack knowledge on it. Teachers will be able to move differentiated instruction from abstract terms to fundamental and practical way of life in the classroom. Whipple (2012) supports this with the notion that, the extent of teachers' knowledge on differentiated instruction affects its practice. Therefore, teachers are supposed to possess enough knowledge on the best pedagogical practices in order to fully implement it.

4.7.2 Primary School Teachers' Pedagogical Practices of Differentiated Instruction

The quality of teaching practices has strong effects on children's experiences of schooling, their attitudes and their learning outcomes (Musanti & Pence, 2010). Further studies prove that students are more successful in school and are more engaged if they are taught in ways that are responsive to their readiness levels (Vygotsky, 1986), their interests and their learning profiles (Sternberg et al., 1998). According to Tomlinson (2001, 2003), in adopting differentiated instruction, teachers try to address these three characteristics for each student. A good pedagogy, likely to effectively transform teaching and learning for quality education, is one in which teacher develops the habit of examining given situations/contexts, be smart enough to anticipate his/her students' needs within the situation, and on the basis of those needs, to invent appropriate teaching practices (Ntim, 2017). This supports the assertion that, traditional methods of teaching and learning does not ensure effective learning in today's classroom (Tomlinson et al., 2003). This assertion has called for researchers (Dorleku, 2013; Kuyini & Abosi, 2014; Sakyi, 2014; Carlson, 2014) to adopt differentiated to address the learning needs of the diverse learners in the Ghanaian basic school classrooms.

Observation results obtained from the study indicate that, despite participants proved that they were knowledgeable of the concept of differentiated instruction; there was little evidence of its implementation and practice in the classroom. Results from the observation indicated that, most materials and resources participants used are not up to the standards and sometimes did not much the level of the topic.55.6% of the participants showed evidence of this while the remaining 44.4% showed little or no evidence of it. Also most of the materials participants used in instructing was not age

appropriate and were scarcely available. The findings from the study revealed that 33.3% of the participants observed showed evidence of the materials/resources being available and age appropriate while the remaining 66.7% showed little or no evidence. The results from the observation also revealed that participants did not use varieties of materials other than the standard textbooks with 33.3% of the participants observed showing evidence while the remaining 66.7% showed little or no evidence.

This could be the reason that, participants were restricted by time and non-availability of resources to fully implement differentiated instruction because results shown from the qualitative study proved that most participants were knowledgeable of differentiated instruction.

This confirms the findings from Abora's (2015) study in which the teachers were knowledgeable of DI but refused to employ it for the argument of its feasibility, difficulty, complexity, examination pressures and curriculum demands.

Observation results obtained from the study indicated that most participants did not differentiate the content with an overall percentage of 72.2% of the participants (Table 4.3 and 4.3.1) observed showing little or no evidence of it while the remaining 27.8% showed evidence of practicing content differentiation.

The result from the observation indicates that, participants gave students much time to process information and give feedback with 44.4 % of the participants observed showing evidence of practicing it while the remaining 55.6% showed no evidence of practicing it. Participants also proved that they did use small groups and monitored their progress. This can be confirmed from the interview when participants were asked about the type of strategies they employed in differentiating instruction and almost all of the respondents agreed to using individualized teaching and small

groupings. Results from the study also prove that, teachers did apply assessment information to guide instruction.

Studies conducted (Dotse, 2012; Gyasi, 2011; Henne, 2013; Thomas, 2012; Kuyini & Abosi, 2014) indicates that, in the Ghanaian education system do not effectively cater for the needs of pupils with learning difficulties in the regular classrooms. This affirms to the findings of the study where it was shown that most participants did not practice differentiated instruction The results generally show that, participants scarcely differentiate instruction. Most of the reasons they gave was on that there were not enough resources available for teachers to fully implement differentiated instruction and also class size and hindered them. This affirms the study conducted by Agbenyega and Deku (2011) which revealed that teachers in Ghanaian basic schools' refusal to differentiate to cater for the diverse learning needs of different category of learners in their classrooms due to conditions such as large class size.

Whipple (2012) sees product as a major component in differentiated instruction. Tomlinson (2009) sees differentiated instruction as an ongoing process through which teachers gather data before, during, and after instruction from multiple sources to identify learners' needs and strengths. Gangi (2011) is of the view that Differentiated assessment intends to measure what each learner produces as evidence of their learning. Assessment takes several forms and should be differentiated from learner to learner in order to allow every learner to exhibit what he/she has learnt (Tomlinson & Allan, 2000).

The elements of differentiated assessment can be described under when, what, how, and why headings. _When' refers to the time of assessment, _what' refers to the elements that can be differentiated, _how' refers to the differentiation based on

students‘ profile and _why‘ refers to the reasons for differentiation (Tomlinson and Imbeau 2011; and Tomlinson and Moon 2013; as cited by Kaur et al, 2018).

The results from the findings show that participants were knowledgeable of product differentiation. Results from participants‘ practices of product differentiation indicated that participants regularly use formative and summative forms of assessment during instruction. Participants also provide the opportunity for learners‘ product to be based on solving real life issues and relevant problems. Apparent form the results, most participants also uses variety of assessment tools before, during and after learning and also participants allowed for a wide range of product alternatives (oral, creative, visual etc).

In contrast with participants high level of knowledge in differentiated assessment, participants assessment task did not necessitate learners to undertake research which can help each individual learner to explore his or her own way of under covering the truth or learning. Also, there was no evidence of participants working with individuals and groups to determine the form of product. Again there was no evidence of compositions of groups being changed based on the activity of the lesson and assessment task were not differentiated based on the learning style of pupils. This indicated that most participants did not practice differentiated assessment. This was affirmed when participants were interviewed.

The findings of the study are similar to the work of Abora (2015) and Whipple (2012) in which teachers were highly knowledgeable of differentiated assessment but showcased the least level of its practice. Few teachers who claimed to differentiate assessment only did that when they were giving pupils home work but not classroom task.

Results from the findings revealed that most of the participants did not practice differentiation of assessment despite showing a high level of knowledge on product differentiation.

4.7.3 Challenges Primary School Teachers Experience in Differentiating Instruction

Education continues its dynamic evolution in the contemporary society of knowledge. Differentiated approach towards instruction is meant to fill the gap between teaching and learning in order to push students as far as possible on their educational path (Nicolae, 2013). Despite the effectiveness of Differentiated Instruction in promoting and enhancing learning, it comes with some practical challenges (Joseph et al, 2013). This concept was built by Tomlinson and McTighe (2006) from use in gifted classrooms to use in all classrooms. Differentiated Instruction is seen as modern way of teaching so replacing the traditional way of instruction makes teachers think the instructional approach is one of the fads in instructional approaches (Subban, 2006).

One of the minor challenges that confront the approach of instruction is this study is that, most participants agree to the assertion that, it is difficult to determine the learning styles of learners with 45.9% of the participants agreeing to the statement, 47.4% were neutral while 6.7% disagreed. The best way differentiated Instruction can be practices is when teachers are able to determine the learning styles of their students. It stems from the assumption that teaching strategies need to be diversified and adapted to suit the diversity of students‘ needs in the classroom. Furthermore, this diversity in teaching methods requires knowledge of the students‘ needs and their preferred learning patterns (Ali, 2018). Even if there was evidence of participants being able to determine the learning styles of learners, it was revealed from the study

that, most participants agreed to the assertion that, ―Teachers lack knowledge on how to address academic diversity in Differentiated Instruction". This can be affirmed from comments from the interview when participants revealed that there was no professional course to train them on the instructional approach hence it will be difficult for participants to accommodate the ways of differentiating instruction when they have not undergone any training on it. The qualitative study also proved that 73.35 of the respondents agreed that this was a challenge, 17.8% were neutral while 8.9% disagreed.

One of the most threatening challenges teachers experience in differentiating instruction is time factor and size of the class. Participants also agreed to the assertion that it took a lot of time in grouping learners for activities 97.8% of the participants agreed to this while the remaining 2.2% were neutral. None of the participants disagreed to this. This can be confirmed by a study conducted by Amadio (2014) where it was revealed that, extra time on top of already demanding schedules and daily requirements was among the greatest challenges. Lessons took more time to complete which interfered with other classroom and administrative duties.

Another challenge participants experience in implementing differentiated instruction is that, most participants agree to the assertion that Differentiated Instruction and assessment is one of the bureaucratic mandate leaped upon teachers and aside that the required support and resources to make its implementation smooth and possible seem not to be available. From the qualitative study, 85.9% of the participants agreed to this, 11.1% were neutral while 3.0% did not agree. Participants in the study also agreed to the assertion that ―Lack of administrative support hinders the practice of differentiated instruction and assessment". Weber et al (2013) confirm this with the

assertion that, implementation of differentiated Instruction requires three main factors. Among these factors are the supports teachers need to enhance all attributes which improve or impede its implementation.

It was revealed from the study that participants were apprehensive for the concept based teaching with the pressure of standardized test in Differentiated Instruction. Some participants also feared that there were no models to talk about the concept based teaching.

Many teachers lack the resources to make the implementation of Differentiated instruction and assessment possible so the solely rely on textbooks and teacher guides. However, in this case, participants agreed to the assertion that, the Teachers‘ Guide does not specifically outline the ways to differentiate instruction. Participants were of the view that, the poor achievement of some students makes them prefer traditional methods. This confirms the reason why many teachers stick to the traditional method of teaching.

These outlined challenges should be addressed differentiated instruction in the municipality can be fully implemented. The study revealed that most participants lacked the skill or strategy to differentiate instruction hence, did not show evidence of practicing it. According to Good (2006), teachers in heterogeneous classrooms do not automatically know how to address academic diversity in those setting and often see no need to change their behaviours to do so because most teachers are unsure of how to begin this extensive process.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Overview

The chapter presents the summary of the findings, conclusions and recommendations on the study.

5.1 Summary of Findings

The study set out to explore primary school teachers‘ knowledge and practices of differentiated instruction. It was conducted in the Mampong Municipality in the Ashanti Region of Ghana. The study employed the mix method approach to build understanding about primary school teachers‘ knowledge of Differentiated Instruction. The sample size used for the study was 135. The researcher used questionnaire, observation and interview to obtain data for the study. The questionnaire was used to collect the quantitative data while observation and interview were used to collect the qualitative data. The quantitative data were analysed using SPSS version 22 and the qualitative data were analyzed thematically.

5.1.1 Major Findings

The major findings of the study revealed that:

1. There level of primary school teachers‘ knowledge on Differentiated Instruction varies on its major component. The findings from the study reveal that, most of the participants are knowledgeable of the major components of differentiation of Instruction. The level of the teachers‘ knowledge determined was in an ascending order as process, learner diversity, content, product/ assessment, learning environment, lesson planning, general differentiation concepts and learner interest. There were variations in the level of Teachers

knowledge in differentiated instruction and assessment. Whiles some participants were seen to be highly knowledgeable, others were neutral while some had low level of knowledge in the concept of differentiated instruction and assessment.

2. It was found out from the study that majority of primary school teachers did not differentiate instruction most of the times despite their high level of knowledge on the concept. Participants scarcely teach to address the individual needs of the learners and also failed most at times to differentiate the content and process of the instruction to suit learners' differences.
3. It was found out from the study that some challenges served as a barrier for participants to differentiate instruction. Majority of the participants revealed time and size of the class as a major threat to the practice of differentiated instruction. Also, majority of the teachers were apprehended by standardized test for pupils' assessment.

5.2 Conclusion

The study revealed that primary school teachers in the Mampong Municipality are knowledgeable of differentiated instruction but however, there are disparities in the level of their knowledge in the components of differentiated instruction with regards to knowledge, participants were knowledgeable of process differentiation, diversities in learners and content differentiation. They also seem to be averagely knowledgeable of product differentiation, learning environment and product differentiation. Learning interest, General concepts of Differentiated instruction and learning style of learners were the components of differentiated instruction that participants were less knowledgeable of.

However, despite the study revealed that participants were knowledgeable of differentiated instruction and assessment; there were very little evidence of its practice in the classroom. The study revealed that participants only practiced a bit of process differentiation maybe because they were aware of differences amongst pupils as revealed by the study. Participants also lacked the skill to address different learning styles probably because there was no or little training to make it easier for participants to implement the concept.

Moreover, majority of the participants showed no evidence of differentiated assessment in their classroom. Learners were generally assessed the same way because participants felt all learners were supposed to take the same standardized test hence they saw no need to differentiate and that, learners might become lazy or reluctant when they assessed differently from the standards.

Again, participants revealed that time serves as a major threat to the practice of differentiated instruction. Majority also indicated class size as one of the major challenges to the participants. Other challenges were the pressure from standardized test and non-availability of resources to make the implementation of the concept.

5.3 Recommendations

The following recommendations were made from the findings of the study for considerations by the reseaercher:

1. Despite the importance and relevance of differentiated instruction in our educational system, Participants revealed disparities of level knowledge on the major components of differentiated instruction. Although participants showed some high level of knowledge on some of the major components of

differentiated instruction, it was revealed that they scarcely practice the concept in the classroom probably because they lack the skill and the know how to implement the concept. Hence, it is recommended that, all institutions that educate teachers tune the curriculum to encourage teacher trainees to practice differentiated instruction at the basic level of education.

2. It is recommended that the Ghana Education Service and headteachers of basic schools frequently organise courses and professional development programs to expose basic school teachers in the municipality to the concept and practices of differentiated instruction to encourage and motivate them. This could be done through in-service trainings organised inside or outside the school.

3. Participants‘ revealed time and size of the classroom as some of the major challenges they experience in implementing differentiated instruction and also, schools were not resourced enough to ensure the practice and implementation of the concept. It is therefore recommended that the Ghana Education Service give ample time to teachers to engage learners and also make it possible for at least each class at the primary level to have two professional teachers to reduce the workload on teachers and also make the implementation of the concept smooth.

5.4 Implications for Further Research

The study revealed that majority of teachers did not differentiate instruction despite they showed high level of knowledge in some of the major components of differentiated instruction probably because there is no trace of intense training on the concept in their teaching experience. Since the study did not explore a large sample, it

is suggested that further research can be conducted in different settings in the country with a larger sample size.

Another direction for further research would be to explore how teacher trainers instruct teacher trainees to impact the concept of Differentiated Instruction in them to practice. If teacher trainees are properly trained on the concept before they pass out as professional teachers, implementing it would not be of a great challenge to them.

Lastly, an experimental research can be conducted to reveal the extent to which differentiated instruction impacts knowledge on learners.

REFERENCES

Abbati, G. D. (2012). *Differentiated Instruction: Understanding the Personal Factors and Organizational Conditions that Facilitate Differentiated Instruction in Elementary Mathematics Classrooms.* Berkeley, USA: University of California.

Ableeva, R. (2008). TheZA effects of dynamic assessment on L2 listening comprehension. *Sociocultural Theory and the Teaching ofSecond Language.*pp.57-86.

Abora, O. S. (2015). Investigating Teachers' Knowledge and Practices of Differentiated Instruction in Ghanaian Primary Schools.University of Education, Winneba.

Adu-Agyem J. & Osei-Poku, P. (2012). Quality Education In Ghana: The Way Forward. *InternationalJournalof Innovative Research and Development.* 1(9) pp. 169 – 170.

Agbenyega, J. & Deku, P. (2011). Building New Identities in Teacher Preparation for Education in Ghana. *Current Issues in Education,* 14(1). Retrieved: September 8, 2014. Website: http://cie.asu.edu & www.googleadvancedsearch.com

Ajideh, P., Farrokhi, F., & Nourdad, N. (2012). Dynamic assessment of EFL reading: Revealing hidden aspects at different proficiency levels. *World Journal of Education*, 2(4), 102

Akhtar, I. (2016). Research Design.Faculty of Sciences, JamiaMilliaIslamia, New Delhi.

Alberta Education. (2005). *Differentiated Instruction*. Elements of Effective Teaching Practice. Canada (www.LearnAlberta.ca)

Aldossari A. I. (2018). The Challenges of Using the Differentiated Instruction Strategy: A Case Study in the General Education Stages in Saudi Arabia. International Educational Studies.11 (4).

Ali, S. A. (2014). Chapter five mixed ability classes in English language teaching: challenges and opportunities. *Issues in English Education in the Arab World, 110.*

Alvi, M. H. (2016). *A manual for selecting sampling techniques in research.*Karachi, Pakistan: University of Karachi.

Amadio, R. (2014). *Differentiated instruction in secondary mathematics.*Unpublished master's thesis submitted to Graduate Faculty, University of Wisconsin-Superior U.S.A.

Anderson, K. M. (2007). Tips for teaching: Differentiating instruction to include all students. *Preventing School Failure, 51*(3), 49-53. http://dx.doi.org/10.3200/PSFL.51.3.49-54

Asiegbor, I., Fincham, K M., Nanang, E.e.k. Gala (all of crdd) & Britwum O. A. (2001). *Rights and Equity in the Classroom: A Case Study of Classroom Interactions in Basic Schools in Ghana.* The Research and Evaluation Unit of theCurriculum Research And Development Division (CRDD),Ghana Education Service.

Ball, D.L., Thames, M. H., & Phelps , G. (n.d.) *Content knowledge for teaching: What makes it special?*

Battista, M. (February, 1999). *The Mathematical Miseducation of America's Youth*.

Bavali, M., Yamini, M., & Sadighi, F. (2011). Dynamic assessment in perspective: Demarcating dynamic and non-dynamic boundaries. *Journal of Language Teaching and Research, 2*(4), pp. 895-902.

Bayali, A. (2018). Government Intensifies Efforts To Enhance Basic And Second Cycle Education. Government of Ghana. Retrieved from: http://www.ghana.gov.gh/index.php/media-center/features/2480-government-intensifies-efforts-to-enhance-basic-and-second-cycle-education on 2nd September 2018

Beamish.W.(2004). *Consensus about program quality: An Australian study in early childhood special education.*Unpublished PhD dissertation, Griffith University, Queensland, Australia.

Bianchini, J. A. & Brenner M. E. (2009). *The Role of Induction in Learning to Teach Toward Equity: A Study of Beginning Science and Mathematics Teachers.*WileyInterScience (www.interscience.wiley.com).

Billings, E. Walqui, A. (n.d). *The Zon e o f Proximal Development: An Affirmative Perspective in Teaching E LLs/M LLs*. Office of Bilingual Education and World Languages. NYSED.

Boakye-Akomea, E. (2015). Perception of Teachers in Inclusive Education in Selected Basic Schools in the Cape Coast Metropolis of Ghana.University of Cape Coast.

Boakye-Akomea, E. (2015). Perception of Teachers on Inclusive Education in Selected Basic Schools in the Cape Coast Metropolis of Ghana.University of Cape Coast.

Borja, L. A., Soto, S, T., Sanchez. T. X. (2015). Differentiating Instruction for EFL Learners.*International Journal of Humanities and Social Science* Vol. 5, No.8(1).

Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology,* 3, 77-101.

Brimijoin, K., Marquissee, E., & Tomlinson, C. A. (2003).Using data to differentiate instruction.Educational Leadership, 60(5), 70 -73.

Burkett, J. A. (2013). *Teacher perception on differentiated instruction and its influenceon instructional practice,* Unpublished Ph.D Thesis, Oklahoma State University, Oklahoma

Cambridge, MA: Harvard University Press.

Casely-Hayford, L. (2011) *The Political Economic Analysis of Ghana's Education System.*The Implications for STAR –Ghana, Commissioned by STAR Ghana.

Casely-Hayford, L., Campbell, S., Seidu, A., Quansah, T., Gyabaah, K. O. & Adams, R. (2013). *The Quality and Inclusivity of Basic Education across Ghana's Three Northern Regions: A Look At Change, Learning Effectiveness And Efficiency.* Research under the Tackling Education Needs Inclusivity (TENI) Project.Retrieved: September 1, 2014. Website: www.associatesforchange.org

Christensen, L. B. (1991). *Experimental Methodology.* (5th Ed.). London. Allyn and Bacon.

Classen, S., D. S. Lopez, E. Winter S., Awadzi, K. D. &Ferree N. (2007).Population-based health promotion perspective for older driver safety: Conceptual framework to intervention plan. Clinical Interventions in Aging. 2. pp. 677-693.

Computing Technology for Math Excellence. (2006). *"Math Methology."*Retrieved

Corley, M. (2015). Differentiated Instruction Adjusting to the Needs of All Learners. Retrieved from: https://www.researchgate.net/publication/265047853

Coyne, T. I. (1996). Sampling in qualitative research. Purposeful and theoretical sampling; merging or clear boundaries?.Journal of Advanced Nursing. 26, pp.623–630.

Creswell, J. (2009). Research Design: *Qualitative, Quantitative, and Mixed Methods Approaches*. Canadian Journal of University Continuing Education 35 (2).

Creswell, J. W. & Plano Clark, V. L. (2011). Designing and conducting mixed methods research (2nd ed.). Thousand Oaks, CA: Sage Publications, Inc. 3

Creswell, J. W. (2009). *mapping the field of mixed methods research. Journal of Mixed Methods Research* 3(2), 95 – 108

Creswell, J. W. (2014). *Research design: Qualitative, quantitative and mixed methods approaches.* (4thed.). U,S,A:SAGE Publications, Inc.

Creswell, J. W., & Garrett, A. L. (2008).The "movement" of mixed methods research and the role of educators.South African Journal of Education. 28(3), pp. 321–333.

Curriculum Research and Development Division. (2012). National Syllabus for Mathematics (for Basic Schools).Accra, Ghana

Curriculum Research and Development Division. (2012*). National Syllabus for English Language, Mathematics, Natural Science, Integrated Science, Ghanaian Language and Culture, RME, Environmental and Social Studies (for Basic Schools).*Accra, Ghana.

Curriculum Research and Development Division. (2012). National Syllabus for Mathematics (for Basic Schools).Accra, Ghana

Davis, K. Christodoulou, J., Seider S.& Gardner, H. (n.d.) *The Theory of Multiple Intelligences*. Harvard Graduate School of Education, Harvard University.

Denhere, C. Chinyoka, K. &Mambeu, J. (2013) .Vygotsky's Zone of Proximal Development Theory: What are its Implications for Mathematical Teaching? *Greener Journal of Social Sciences.* Vol. 3 (7), pp. 371-377

Denzen, N. K., & Lincoln, Y. S. (2005). *The Sage handbook of qualitative research* (3rd ed.). thousand Oaks, CA: Sage Publications.

Doolittle, P. E. (1997). Vygotsky's zone of proximal development as a theoretical foundation for cooperative learning.*Journal on Excellence in College Teaching.8 (1).Pp 83- 103.*

Dotse, N. (2012). Teachers' Low Morale Leads to Poor Results. *Ghana News Agency. The Citizen Newspaper.* Accra, Ghana.

Educators Guide (2016). Knowing and Responding to Learners-Differentiated Instruction.

Edwards, C. J., Carr, S., & Siegel, W. (2006).Influences of experiences and training on effective teaching practices to meet the needs of diverse learners in schools.*Education, 126*(3), 580-592.

Eyiah, J. K. (2013). *The Full Implementation of FCUBE in Ghana.*Retrieved from:https://www.ghanaweb.com/GhanaHomePage/features/The-Full-Implementation-of-FCUBE-in-Ghana-263327 on 4th December 2018

Feldon, D. F. &Kafai, B. Y. (2008).Mixed methods for mixed reality: understanding users' avatar activities in virtual worlds. Educational Technology Research and Development. 56. pp. 575-593

Flick, U. (2006).An introduction to qualitative research. London: Sage.

Franz, C. (2009). *Running Ahead: Differentiated Instruction.* La Verne; California, USA: University of La Verne.

Gall, M., Gall, P. J. & Borg, R. W. (2007). *Educational research: An introduction.* United States of America: Pearson Education Inc.

Gangi, S. (2011).*Differentiating Instruction using Multiple Intelligences in the Elementary School Classroom: A Literature Review*. The Graduate School, University of Wisconsin-Stout

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences.* New York: Basic Books.

Gardner, H. (2006). *Multiple intelligences; New horizons*. New York, NY. Basic Books

Gardner, H. E., & Hatch, C. T. (1989). *Multiple Intelligences Go to School*: Educational Implications of the Theory of Multiple Intelligences. Technical Report No. 4.

Ghana Ministry of Education. (2003). Government of Ghana education strategic plan 2003 to 2015 volume 1 policies, targets and strategies ministry of education. Accra, Ghana: Government Publication.

Ghana Statistical Service (2014). *2010 population Census 2012-2013: Twenty Fourth Round*. Acra: Ghana Statistical Service, GIS.

Good, M. E. (2006). *Differentiated instruction strategies: Principles and techniques for the elementary grades*. Unpublished master's thesis, Dominican University of California, San Rafael, U.S.A.

Gregory, G. H. & Chapman, C. (2002). *Differentiated instruction strategies: one size does not fit all.* Thousand Oaks, C. A: Corwin Press.

Guerrero, S. (n.d.). Teachers' Pedagogical Knowledge and the Teaching Profession.

Guskey, T. R. (2000). *Evaluating professional development.*Thousand Oaks, California: Corwin Press.

Gyasi, I. K. (2011). *The massive BECE failures: The whys and Wherefores*. The Chronicle. Retrieved: July 2, 2014. From: http://thechronicle.com.gh

Hall, T. & Strangman, N. Meyer, A. (2003). Differentiated Instruction an Implicat ions for UDL Implementation. *NCAC Effective Classroom Practices*

Hall, T., Strangman, N. & Meyer, A. (2003).*Differentiated instruction and implication for UDL implementation.*Wakefield, MA: National Center on Accessing the General Curriculum.

Hamed, T. (2016). Sampling Methods in Research Methodology; How to Choose a Sampling Technique for Research.*SSRN Electronic Journal.* Harvard University Press.

Haywood, C. H. (2012).Dynamic Assessment: A History of Fundamental Ideas.*Journal of Cognitive Education and Psychology.*Volume 11, Number 3.

Heacox, D. (2002), *Differentiating Instruction in the Regular Classroom*

Hean-Jae & Wui-Chiang (2016). The level of collapse we are allowed: Comparison of different response scales in Safety Attitudes Questionnaire. *Biometrics & Biostatistics International Journal Vo.4:4.*

Heendricks, K. B. (2008). *The impact off ability-grouping on achievemen, self efficacy and classroom perceptions of gifted elementary students.* Unpublished doctorial dissertation, Walden University, Canada.

Henne, A. (2013).*Teacher Absenteeism Cause of BECE Failure.* The Ghana News Agency. Retrieved: October 2, 2014. Website: www.ghanaweb.com

Hobson, M. L. (2008). *An Analysis of Differentiation Strategies Used by Middle School Teachers in Heterogeneously Grouped Classrooms.* A Thesis Submitted to Watson School of Education. University of North Carolina, Wilmington.

Holi, I. & Holi, A. (2015).Toward Differentiated Assessment in a Public College in Oman.*English Language Teaching; Vol. 8, No. 12.*

http://www.ct4me.net/math_methodology.html

Jahan, K. Kahn, A. I., & Anif, F. (2017). Relevance of Differentiated Instructions in English Classrooms: An Exploratory Study In The Saudi Context. *International Research Journal of Human Resources and Social Sciences.*4 (9).

James, D. (2009). Differentiated Instruction: One school's survey analysis. *The Corinthian, 10*(13), 169-190.

Johnson, B. & Turner, L. A. (2003). Data collection strategies in mixed methods research Handbook of mixed methods in social and behavioral research. Thousand Oaks, CA: Sage.

Johnson, B. (2009). *Differentiated Instruction Allows Students to Succeed. George Lucas Educational Foundation.*Retrieved From: https://www.edutopia.org/blog/differentiated-instruction-student-success.

Joseph, S. (2013). Differentiating Instruction: Experiences of Pre-Service and In-Service Trained Teachers.*CaribbeanCurriculum.*Vol. 20. Pp. 31–51.

Joseph, S. Thomas, M. Simonette, G. & Ramsook, L. (2013). The Impact of Differentiated Instruction in a Teacher Education Setting:Successes and Challenges. *International Journal of Higher Education Vol. 2, No. 3*

Joseph, S., John, Y. J. (2014). Practicum experiences of prospective teachers in differentiating instruction. *Advances in Social Sciences Research Journal, 1*(3), 25-34.

Kadum-Bošnjak, S. & Buršic-Križanac, B. (2012).*Impact of Differentiated Instruction on Achievenment in Teaching Mathematics to Lower- Stage Grades.*JurajDobrila University of Pula. Croatia

Kadum-Bošnjak, S.& Buršic-Križanac, B. (2012).Impact of differentiated instruction on achievement in teaching mathematics to lower-stage grades.*Metodickiobzori*7(2).

Kahn, I. A. & Anif, F. (2017). Relevance of Differentiated Instruction in Special Education for Anxiety Affected Learners: A Theoretical Analysis Of Learning Problems And Some Strategies. *European Journal of Special Education Research*.2 (4).

Kaur, A., Mohammad, N. & Awang-Hashim, R. (2018): Exploring and evaluating differentiated assessment practices of in-service teachers for components of differentiation, *Teaching Education*, DOI: 10.1080/10476210.2018.1455084

Koehler, S. (2010). *Effects of Differentiating for Readiness, Interest and Learning Profile on Engagement and Understanding*. School of Arts and Sciences.St.John Fisher College.

Koeze, P. A. (2007). *Differentiated Instruction: The Effect on Student Achievement in an Elementary School.*Eastern Michigan University.

Konstantinou-Katzi, P., Tsolaki, E., Meletiou-Mavrotheris, M. & Koutselini, M. (2013). Differentiation of teaching and learning mathematics: an action research study in tertiary education.*International Journal of Mathematical Education in Science and Technology*. 44:3.pp 332-349.

Kothari, C. R. (2004). *Research methodology methods and techniques* (2nd ed.). New Age International Publisher, New Delhi.

Kozulin, A. (2002). Sociocultural theory and the mediated learning experience. *School Psychology International, 23(1),* 7-35.

Kuyini, A. A. R. & Abosi, O. (2014).Primary Schools in Ghana Teacher Effectiveness in Adapting Instruction to the Needs of Pupils with Learning Difficulties in Regular Primary

Kyeremeh, P. (2018). *Junior high school mathematics teachers' knowledge and practice of differentiated instruction in Tano South District.* Unpublished Masters' thesis, University of Education, Winneba.

Least, S. K. (2014).*Differentiated Instruction: Its effect on Zone of Proximal Development.*The College at Brockport: State University of New York

Leedy, P. D. & Omrod, J. E. (2013). *Practical research palnning and design.* Upper Saddle River, New Jersey: Pearson Education Inc.

Lewis, S. G. & Batts, K. (2005). How to implement diff0erentiated instruction? Adjust, adjust, adjust. *Journal of Staff Development, 26*(4), 26-31. Retrieved from: http://myaccess.library.utoronto.ca/login?url=http://search.proquest.com/docview/620020

Logan, B. (2008). Examining Differentiated Instruction: Teachers Respond. *Research in Higher Education Journal. Page 14.* Georgia: Armstrong Atlantic State University.

Logsdon, A. (2018). *Using Multiple Teaching Styles to Meet the Needs of Diverse Students*.Pros and Cons of Differentiated Teaching in School.Retrieved from https://www.verywellfamily.com/differentiated-instruction-vs-traditional-methods-2162351 on 25th August 2018.

Lokan, J., Hollingsworth, H., & Hackling, M. (2006). *Teaching science in Australia: Results from the TIMSS1999 video study.* Camberwell, Vic.:Australian Council for Educational Research.

Lunsford, K. J. (2017). *Challenges to Implementing Differentiated Instruction in Middle School Classrooms with Mixed Skill Levels*.Walden University ScholarWorks.

Madeez, A., Liv, E., Michael, F. & Tamer, S. (2007*). Achieving Universal Primary Education in Ghana by 2015.A Reality or a Dream?*Unicef Division of Policy and Planning.

Maker, C. J. (1982). *Curriculum development for the gifted*. Rockville, MD: Aspen.

McCarrin, A. P. (2007). Does Differentiated Instruction and Student Choice Affect Retention Rate of Students? *Coursework for Leadership for Middle Level Science EDUC 545-631.*University of Pennsylvania.

Melesse, T. (2015). Differentiated Instruction: Perceptions, pratices and challenges of primary school teachers. *Science, Technology and Arts Research Journal, 4*(3), 253 -264.

Mereku, D. (2008). *Methods in Ghanaian primary mathematics textbooks and teachers' classroom practice.*Research in Mathematics Education. 6. 10.1080/14794800008520135

Merhrnoosh, L. & Rassaei, E. (2015). Dynamic Assessment: From Underlying Constructs to Implications for Language Teaching. *Journal of Studies in Learning and Teaching English*.Vol 4, No. 2

Ministry of Education. (2003). *Government of Ghana Education Strategic Plan 2003 to 2015 Vol. 1 Policies, Targets and Strategies Ministry of Education*. Accra, Ghana: Government Publication.

Musanti, S. I., Pence, L. (2010). Collaboration and Teacher Development: Unpacking Resistance, Constucting Knowledge and Navigating Identities. *Teacher Education Quarterly, 37*(1), 73-89.

Nabere, A. (2018). Leave no child behind, a God-given assignment.*JoyOnline.*Retrievedfrom: https://www.myjoyonline.com/opinion/2018/June-27th/leave-no-child-behind-a-god-given-assignment.php *on 10th October 2018*.

National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring Mathematical success for all.* Reston, VA.

National Science Foundation Statewide Systemic Initiative (*1994)*. *Equity Framework in Mathematics, Science and Technology Education.*Washington, DC.

New Jersey Department of Education.(n.d.).*New Jersey Mathematics Curriculum Framework — Standard 16*. New Jersey student learning standards.

Nicolae, M. (2014). Teachers beliefs as the differentiated instruction starting point: Research basis. *Procedia-socioal and behavioural Sciences 128*, 426-431

Ntim, S. (2017). Transforming Teaching and Learning for Quality Teacher Education in Ghana: Perspectives from Selected Teacher Trainees and Stakeholders in Teacher Education. *International Journal of Education Vol. 9, No. 3.*

Owusu, O. K. (2016). *Differentiated instruction: Practice and challenge in an elementary school.* Unpublished Masters' thesis, Kwame Nkrumah University of Science and Technology, Kumasi-Ghana.

Painter, D. (2009). Providing Differentiated Learning Experiences through Multigenre Projects. [Electronic version].*Intervention in School and Clinic*, 44, 288-293.

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.) Thousand Oaks, CA: Sage Publications.

Poehner, M.E. (2008). *Dynamic assessment: A Vygotskian approach to understanding and promoting L2 development* (Vol. 9). Springer.

Rahbardar, H. Abbasi, A., M. &Talaei, A. (2014). Dynamic Assessment (DA) and Evaluation of Problem-solving Skills in Children.*International Journal of Pediatrics (Supplement 5),* Vol.2, N.3-3, Serial No.9.Retrieved from: https://www.researchgate.net/publication/319998246

Ruthven, K. (2001). Issues of cultural diversity in school mathematics.*International Journal of Mathematical Education in Science and Technology*.pp 32, 355 – 364.

Ryan, K., & Cooper, J. (2007). Those who can, teach. Boston:MA Wadsworth Cenage Learning.

SAGE Open Publications. (2014). *Schools in Ghana* .Retrieved: September 2, 2014. Website: http://www.sagepublications.com

Sakyi K. A. (2014). Towards Quality Delivery of Science and Mathematics Education in Schools and Colleges in Ghana. *Retrieved: August 12, 2014. Website: www.ghanaweb.comm*

Santangelo, T., & Tomlinson, C. (2009). The application of differentiated instruction in post-secondary environments: Benefits, challenges, and future directions. *International Journal of Teaching and Learning in HigherEducation, 20*(3), 307-323.

Seigliano, D. & Hipsky S. (2010). 3 Ring circus of differentiatd instruction. *Kappa Delta Pi Record, 46*(2), 82-86.

Shabani,K. Khatib, M. & Ebadi, S. (2010). Vygotsky's Zone of Proximal Development: Instructional Implications and Teachers' Professional Development. *English Language Teaching*. Vol. 3, No. 4

Simon, J., & Goes, J. 2016). Survey /*Interview validation rubric for an expert panel*. Dissertation Recipes.

Sinkovic, R. R., Penz, E. & Ghauri, P.N. (2008). Enhancing the trustworthiness of a qualitative research in international businesss. *Management Intermnational Review, 48(6),* 689-714.

Small, M. (2009). Why and How to Differentiate Mathematics Instruction. NCTM

Sreenidhi, S. K. & Tay, C. H. (2017). Multiple intelligence assessment based on Howard Gardner‘s research.*International Journal of Scientific and Research Publications. 7, (4).*

Sternberg, j. R., Ackerman, P. L., Glasser, R. E. (1989). *Learning differences: Advances in theory and research.* American Psychological Association.

Subban, P. (2006). Differentiated instruction: A researchbasis. *International Education Journal*.*7*(7).Pp 935–947.

Sun-Geun, B. & Kyoung, J. K. 2003). The Effect of Dynamic Assessment Based Instruction on Children‘s Learning. *Asia Pacific Education Review*. Vol. 4, No. 2, pp. 189-198.

Tashakkori, A., & Creswell, J. W. (2007).Exploring the nature of research questions in mixed methods research.Journal of Mixed Methods Research. 1(3), pp. 207–211.

Tayakol, M., & Dennick, R. (2011). Making sense of Cronbach‘s Alpha. *International Journal of Medical Education, 2,* 53-55.

Taylor, S. (2017). Contested Knowledge: A Critical Review of the Concept of Differentiation in Teaching and Learning. Retrieved from: http://journals.warwick.ac.uk/index.php/wjett/issue/view/3

Teamwork for Empowerment Advocacy and Learning center staff. (2010). Differentiated Instruction. *Focus on the Basics* articles, Vol. 7 Issue C and Vol. 8 Issue D.

Terrell, S. (2011). Mixeed-Methods research methodologies. *The Qualitative Report. 17*(1), 254-280.

The Education Alliance. (2006). Closing the Achievement Gap; Best Practices in Teaching Mathematics. www.educationalliance.org

Thirteen ed online (2004). *Tapping into multiple intelligences. Retrieved from:* http://www.thirteen.org/edonline/concept2class/mi/index.html

Thomas, Z. (2012). *Improving Educational Outcomes: The Leadership Imperative.* Ghana News Agency. Available from www.ghanaweb.com

Tieso, C. (2005). The effects of grouping practices and curricular adjustments on achievement.*Journal for the Education of the Gifted*.pp 29, 60 – 89.

Tigest, A. A. (2012). *The zone of proximal development in early childhood education*.Laurea University of Applied Sciences

Tobin, R. & Tippett, C.D. (2014). Possibilities and potential barriers: Learning to plan for differentiated instruction in elementary science. International Journal of Science andMathematics Education, 12(2).

Toffler A. (n.d). *Why Differentiation of Instruction Now?* .Retrieved from: https://www.corwin.com/sites/default/files/upm-binaries/67615_Pages_from_Thousand_1_Differentiating_Instruction_2e_3.pdf

Tomlinson C. A. & Allan D. S. (2000). *Leadership for Differentiating Schools and Classrooms.*ASCD Express. Retrieved from: http://www.ascd.org/publications/books/100216/chapters/Understanding-Differentiated-Instruction@-Building-a-Foundation-for-Leadership.aspx

Tomlinson, C. A. & Javius, E. (2012). Teach up for excellence. *Educational Leadership,*

Tomlinson, C. A. (1999). *The differentiated classroom:Responding to the needs of all learners*. Alexandria,VA: Association for Supervision and CurriculumDevelopment.

Tomlinson, C. A. (2000). *Differentiation of instruction in the elementary grades*. ERIC Digest. ERIC Clearinghouse on Elementary and Early Childhood Education.

Tomlinson, C. A. (2001). *How to differentiate instruction in mixed-ability classrooms.*

Tomlinson, C. A. (2009). *Differentiated Assessment Strategies: Identifying Learners' Strengths and Needs.*Quality Educational Programs, Inc.

Tomlinson, C. A. (2010). *Leading and Managing a Differentiated Classroom.* ASCD.

Tomlinson, C. A., & Moon, T. R. (2013).*Assessment and student success in differentiated classroom*. Alexandria, VA: Association for Supervision and Curriculum Development (ASCD).

Tomlinson, C. A., Moon, T. & Imbeau, M. B. (2015). Assessment and Student Success in a Differentiated Classroom.ASCD Professional Learning Services.

Tomlinson, C. A. (2005). Grading and differentiation: Paradox or good practice? TheorPract. 44(3) pp. 262–269.

Tomlinson, C. A. (2014). *The differentiated classroom: Responding to the needs of all learners*

Tomlinson, C. A. (2004). Sharing Responsibility for Differentiating Instruction.*Roeper Review, 26(4), 188-189.*

Tomlnson, C. A. (2000). *Differentiated Instruction: Responding to needs of all learners*. Association for Supervision and Curriculum Development Alexandria, VA USA

United Nations Educational Scientific and Cultural Organization. (2015) .*Education for All 2015 National Review*. Retrieved from :http://unesdoc.unesco.org/images/0023/002314/231429e.pdf on 21st August 2018.

United Nations International Children Emergency Fund-Ghana.(2013). *Students at School for Life, a Complementary Basic Education Program.*Unicef Retrieved from : http://www.unicef.org/ghana/education.html

Vargas-Parra, M. A., Rodríguez-Orejuela, J. A. & Herrera-Mosquera, L. (2018), Promotion of Differentiated Instruction through a Virtual Learning Environment. *Segundaépoca* • N.o 47 Primer semester. pp.. 165-174

Vygotsky, L. (1962). *Thought and language (E. Hanf-mann& G. Vakar, Trans.)*..Cambridge, MA: MIT Press.

Vygotsky, L.S. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA:

Walqui, A., & Lier, L. v. (2010). *Scaffolding the academic success of adolescent English language learnersapedagogy of promise*. San Francisco: WestEd.

Weber, C., Johnson, L., & Tripp, S . (2013). Implementing differentiation: A School's Journey. *Gifted Child Today, 36*(3), 79-186.

Wells, G. (1999). *Dialogic Inquiry: Towards a Sociocultural Practice and Theory of Education.* New York: Cambridge University Press.

Wertsch, J. V. (1997). *Vigotsky and the formation of the mind.* Cambidge, MA: Harvard University Press.

West African Examination Council (2015). BECE The Chief Examiners report on Mathematics. Retrieved from: https://thesisexamples.blogspot.com/2017/09/bece-2015-chiefexaminersreport-mathematics.html on 2nd September 2018.

Westwood, P. (2016). Teaching and learning difficulties 2nd ed. *ACER Press*

Whipple, K. A. (2012). *Differentiated Instruction: A Survey Study of Teacher Understanding and Implementation in A Southeast Massachusetts School District.* Education Doctoral Theses. Paper 61. Retrieved: August 11, 2014. Website: http://hdl.handle.net/2047/d20002903

Zohrabi, M. (2013). Mixed Method Research: Instruments, Validity, Reliability and Reporting Findings.Theory and Practice in Language Studies. 3(2), pp. 254-262.

APPENDIX A

QUESTIONNAIRE GUIDE

Section A: Background Demographic Data – please fill in or check the appropriate item below.

This questionnaire is designed to investigate primary teachers' knowledge and practice of differentiated instruction in mathematics in Mampong Municipality. The first section of the questionnaire intends to obtain personal information, and in the second, third and fourth sections, there are questions that will find your knowledge, practice and challenges of differentiated instruction respectively. Please respond honestly to the items and you can be assured that your responses will be kept confidential.

School: ……

Date:……

1. Which class level do you teach?

   (1) BS1☐ (ii) BS2☐ (iii) BS3☐ (iv) BS4 ☐ (v) BS5 ☐ (vi) BS6 ☐

2. Gender?

   (i) Male ☐ (ii) Female ☐

3. Highest educational qualification

   (i) Cert "A" ☐ (ii) Diploma ☐ (iii) Bachelor's Degree ☐ (iv) Masters Degree ☐

   (v) other ☐

4. As a teacher, choose the range of years for which you have been teaching.

   (i) 1 – 10 years ☐ (ii) 11 – 20 years ☐ (iii) 21 – 30 years ☐ (iv) 30 years and above

SECTION B: Teachers' Knowledge of Differentiated Instruction

Indicate your level of agreement about differentiated instruction using the scale below:

1= strongly disagree 2 = disagree 3 = undecided 4 = agree 5 = strongly disagree

STATEMENT	1	2	3	4	5
Content can be varied for pupils in the same classroom					
Specifically, contents can be reduced for pupils with learning difficulties and upgraded for gifted learners (in the same class)					
All learners in the same classroom must learn the same content no matter their learning differences or learning needs					
Content must satisfy the curriculum needs or examination requirements instead of individual pupil's needs					
It is mandatory for teachers to clearly articulate what they want learners to know, understand and be able to do.					
Teaching/Learning activities should mainly/primarily be based or centered on individual pupil's needs during lesson delivery					
I am familiar with entering into learning contracts with pupils					
I am familiar with giving learners tiered activities/lesson					
I am familiar with scaffolding learners in teaching					
Students should be provided with the choice to work alone, in pairs or in small groups during teaching/learning					
Some pupils can be given individual attention during teaching					
A variety of teaching methods should be used during teaching					
Learner groups in the classroom should be formed based on learners' abilities, interests, styles and learning preferences					
Each learner in the classroom should be allowed to choose his/her own preferred way of learning					
Questions asked during teaching should only measure pupils' understanding and progress on the content being taught					
Pupils should be provided with the choice to work alone, in pairs or in small groups during classroom assessment					
provide variety of assessment tasks for pupils to choose from					
A variety of assessment tools/strategies should be employed before, during, and after teaching and learning					

Every learner must work on the same assessment tasks					
I see all pupils in my classroom as homogeneously the same					
Pupils in my classroom have the same learning characteristics					
Every classroom has pupils with learning disabilities/abilities					
Gifted learners are also special pupils who need extra attention					
Lessons must be taught to satisfy each learner in the classroom					
Lessons must be taught to all pupils generally in the same way					
Every pupil in the classroom has his/her own learning interest					
Every individual learner has learning culture and expectations					
Every pupil‘s interest, cultures and expectations should be considered when teaching					
Individual pupils‘ life situations impact their learning greatly					
Classroom environment should be structured to support a variety of activities like flexible grouping or individual work					
Materials should be varied to satisfy pupils‘ interest/abilities					
Learning environment should favor every learner					
Normal classroom environment should include special children or pupils with disability (physical, emotional, mental etc)					
Every pupil‘s needs must be considered when planning lessons					
Lesson objectives should consider individual leaner‘s needs					
Lessons should be planned considering pupils‘ differences					
The same lesson plan must satisfy all learners in the same class					
I have enough knowledge on Differentiated Instruction					
I know much about equity and accessibility for all learners					
I have enough knowledge on Inclusive Education					
I have enough knowledge on Special Education					

SECTION C: Teachers' Practice of Differentiated Instruction

Indicate the frequency of occurrences to your practice of differentiated instruction using the scale below:

1 = Never occurs, 2 = rarely occurs, 3 = Often occurs 4 = Always Occurs

STATEMENT	1	2	3	4
Materials/resources supports the standards and topics				
Materials/resources are age appropriate				
Materials/resources are available in adequate number for the class size				
Teacher differentiates the content of instruction to suit pupils' differences				
Teacher uses a variety of materials other than the standard textbooks during instruction delivery				
Teacher provides time for students to actively process information during lesson delivery				
Teacher applies assessment information to guide instruction				
Teacher differentiates using the general concepts				
Teacher differentiates process to suit pupils' differences				
Teacher uses both formative and summative evaluation				
Teacher provides opportunities for student products to be based upon the solving of real life and relevant problems				
Teacher uses variety of assessment tools before, during and after learning				
Assignments necessitates that students conduct research				
Teacher works with individual students or groups to determine the form of product				
Teacher allows for a wide range of product alternatives (oral, creative, visual etc)				
Composition of groups changes base on the activity of the lesson				
Learners are assessed based on their learning style				

SECTION D: Challenges to differentiated Instruction

Indicate your level of agreement about differentiated instruction using the scale below:

1= strongly disagree 2 = disagree 3 = undecided 4 = agree 5 = strongly disagree

STATEMENT	1	2	3	4	5
It is difficult to determine each learners learning style and the appropriate instruction tool to match with					
Teachers lack knowledge on how to address academic diversity in Differentiated Instruction					
Differentiated Instruction and assessment is one of the bureaucratic mandate leaped upon teachers					
Teachers can not differentiate if professional development resources are absent					
As a teacher, adjusting teaching practice as Differentiated instruction is disheartening and upsetting					
It is very difficult to access the readiness level of learners					
How to match the appropriate resource with teaching is a major challenge					
Teachers are limited to practice differentiated instruction due to limited space for group work.					
Time factor always poses a threat to differentiated instruction.					
Lack of administrative support hinders the practice of differentiated					
Large class size is one of the threats to Differentiated instruction and assessment					
Teachers fear that, there are no models to talk about differentiated instruction					
Teachers are apprehensive for the concept based teaching with the pressure of standardized test in Differentiated Instruction					

APPENDIX B

OBSERVATION GUIDE

Please Circle the Appropriate Number Next to Each Item Using the Below Evidence of Implementation

1 = never occur 2 = rarely occur 3 = Often occur 4 = Always occur

Practice of Content Differentiation

Statement	1	2	3	4
Materials/resources supports the standards and topics				
Materials/resources are age appropriate				
Materials/resources are available in adequate number for the class size				
Teacher uses a variety of materials other than the standard textbooks				
Teacher differentiates using major concepts				

Practice of Process Differentiation

Statement	1	2	3	4
Teacher works with total groups, individuals and small groups				
Teacher applies assessment information to guide instruction				
Teacher provides time for students to actively process information				
Teacher uses a variety of instructional strategies and activities to teach				
Teacher differentiates process to suit pupils differences				

Practice of Product Differentiation

Statement	1	2	3	4
Teacher uses variety of assessment tools before, during and after learning				
Teacher provides opportunities for student products to be based upon the solving of real and relevant problems				
Teacher allows for a wide range of product alternatives (oral, creative, etc)				
Teacher uses both formative and summative evaluation				
Assignments necessitates that students conduct research				
Teacher works with individual students or groups to determine the form of product				

APPENDIX C

INTERVIEW GUIDE

1. How often do you attend professional events, inside and outside this school?
2. Do any of the events provide instructional strategies discussing differentiated instruction?
3. What does differentiated instruction mean?
4. What activity do you take students through before instructing them in a new lesson?
5. What are some of the common strategies you use to differentiate a lesson?
6. How well do students learn in your classroom? How do you know?
7. Does time pose a threat to differentiated instruction? If yes, in what way?
8. Does large class size pose a threat in differentiated instruction? If yes, why?

APPENDIX D

LETTER OF INTRODUCTION

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

Date: April 23, 2019

The Municipal Director
Municipal Education Directorate
Mampong, A/R

Dear Sir /Madam,

LETTER OF INTRODUCTION

We forward to you, a letter from Mr. Bayou Felix Yelvieldong, a second year M.Phil student of the Department of Basic Education, University of Education, Winneba, with registration number 81700300003.

Bayou Felix Yelvieldong is to carry out a research on the Topic *"Teacher's Knowledge and Practices of Differeniatiated Instruction and Assessment in Basic Schools in Mampong Municipality "*.

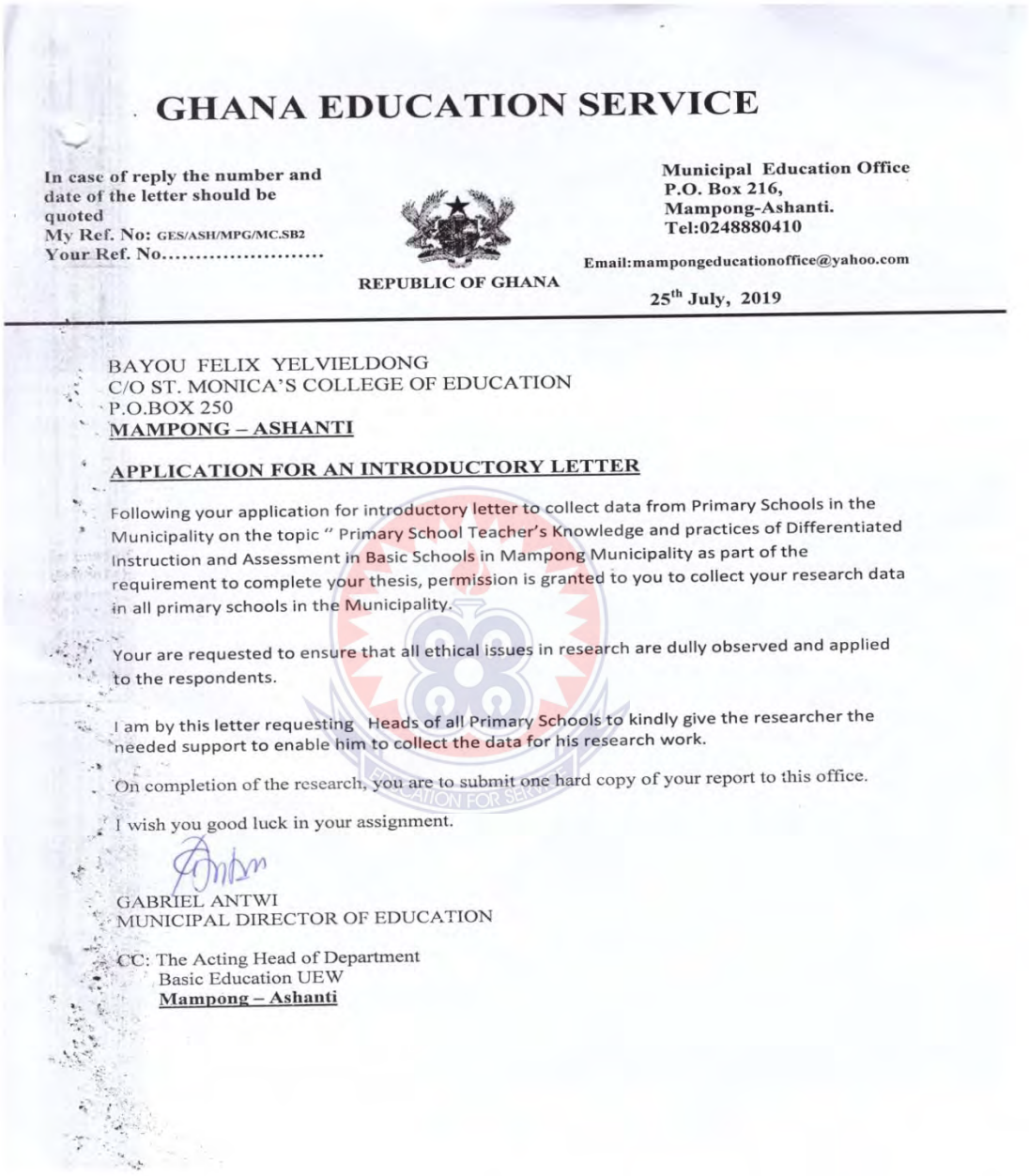
We would be grateful if permission is granted him to carry out his studies in the Municipality.

Thank you.

MRS. SAKINA ACQUAH (PHD)
(Ag. Head of Department)

APPENDIX E

APPLICATION FOR AN INTRODUCTORY LETTER FROM GHANA EDUCATION SERVICE



GHANA EDUCATION SERVICE

In case of reply the number and date of the letter should be quoted
My Ref. No: GES/ASH/MPG/MC.SB2
Your Ref. No.....

REPUBLIC OF GHANA

Municipal Education Office
P.O. Box 216,
Mampong-Ashanti.
Tel:0248880410

Email:mampongeducationoffice@yahoo.com

25th July, 2019

BAYOU FELIX YELVIELDONG
C/O ST. MONICA'S COLLEGE OF EDUCATION
P.O.BOX 250
MAMPONG – ASHANTI

APPLICATION FOR AN INTRODUCTORY LETTER

Following your application for introductory letter to collect data from Primary Schools in the Municipality on the topic " Primary School Teacher's Knowledge and practices of Differentiated Instruction and Assessment in Basic Schools in Mampong Municipality as part of the requirement to complete your thesis, permission is granted to you to collect your research data in all primary schools in the Municipality.

Your are requested to ensure that all ethical issues in research are dully observed and applied to the respondents.

I am by this letter requesting Heads of all Primary Schools to kindly give the researcher the needed support to enable him to collect the data for his research work.

On completion of the research, you are to submit one hard copy of your report to this office.

I wish you good luck in your assignment.

GABRIEL ANTWI
MUNICIPAL DIRECTOR OF EDUCATION

CC: The Acting Head of Department
Basic Education UEW
Mampong – Ashanti

APPENDIX F
RELIAQBILITY COEFFICIENTS OF THE VARIABLES

Reliability Statistics of Knowledge

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
0.994	0.995	45

Item Statistics

Item	Mean	Std. Deviation	N
Teaching/Learning activities should mainly/primarily be based or centered on individual pupil‘s needs during lesson delivery	2.3284	0.74366	135
I am familiar with entering into learning contracts with pupils	3.4627	0.73225	135
I am familiar with giving learners tiered activities/lesson	3.3881	0.56075	135
I am familiar with scaffolding learners in teaching	3.3433	0.67283	135
Students should be provided with the choice to work alone, in pairs or in small groups during teaching/learning	3.5000	0.65752	135
Some pupils can be given individual attention during teaching	4.2015	0.58528	135
A variety of teaching methods should be used during teaching	3.9851	0.58791	135
Learner groups in the classroom should be formed based on learners‘ abilities, interests, styles and learning preferences	4.0224	0.58124	135
Each learner in the classroom should be allowed to choose his/her own preferred way of learning	3.9925	0.63122	135
Questions asked during teaching should only measure pupils‘ understanding and progress on the content being taught	4.0821	0.60136	135
Pupils should be provided with the choice to work alone, in pairs or in small groups during classroom assessment	3.4104	0.59082	135
provide variety of assessment tasks for pupils to choose from	3.9179	0.61373	135

A variety of assessment tools/strategies should be employed before, during, and after teaching and learning	3.5224	0.60965	135
Every learner must work on the same assessment tasks	3.6791	0.60822	135
Gifted learners are also special pupils who need extra attention	3.7313	0.73744	135
Every classroom has pupils with learning disabilities/abilities	3.7090	0.69178	135
Every classroom has pupils with learning disabilities/abilities	3.6567	0.58944	135
Pupils in my classroom have the same learning characteristics	3.5746	0.68690	135
Lessons must be taught to all pupils generally in the same way	4.1045	0.65199	135
Lessons must be taught to satisfy each learner in the classroom	4.1642	0.67383	135
Every pupil‘s interest, cultures and expectations should be considered when teaching	3.4552	0.80986	135
Every individual learner has learning culture and expectations	3.3881	0.78434	135
Every pupil in the classroom has his/her own learning interest	3.9552	0.65884	135
Individual pupils‘ life situations impact their learning greatly	3.7537	0.86221	135
Classroom environment should be structured to support a variety of activities like flexible grouping or individual work	4.0149	0.68260	135
Materials should be varied to satisfy pupils‘ interest/abilities	4.0000	0.68276	135
Learning environment should favor every learner	4.4627	0.63313	135
Normal classroom environment should include special children or pupils with disability (physical, emotional, mental etc)	4.3358	0.54764	135
Every pupil‘s needs must be considered when planning lessons	4.2313	0.72459	135
Lesson objectives should consider individual leaner‘s needs	4.1716	0.64337	135
Lessons should be planned considering pupils‘ differences	4.1940	0.66579	135

The same lesson plan must satisfy all learners in the same class	4.0224	0.79912	135
I have enough knowledge on Differentiated Instruction	3.6119	0.90038	135
I know much about equity and accessibility for all learners	3.6791	0.79093	135
I have enough knowledge on Inclusive Education	3.7388	0.82196	135
I have enough knowledge on Special Education	3.9104	0.69868	135
Content can be varied for pupils in the same classroom	3.9552	0.71362	135
Specifically, contents can be reduced for pupils with learning difficulties and upgraded for gifted learners (in the same class)	4.0075	0.69905	135
All learners in the same classroom must learn the same content no matter their learning differences or learning needs	3.9627	0.65358	135
Content must satisfy the curriculum needs or examination requirements instead of individual pupil‘s needs	4.1567	0.72397	135
It is mandatory for teachers to clearly articulate what they want learners to know, understand and be able to do.	3.3955	0.87590	135

Reliability Statistics of practices

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.975	0.975	18

Item Statistics

Item	Mean	Std. Deviation	N
Materials/resources supports the standards and topics	2.3000	0.94868	9
Materials/resources are age appropriate	2.2000	0.78881	9
Materials/resources are available in adequate number for the class size	2.0000	0.66667	9
Teacher differentiates the content of instruction to suit pupils‘ differences	1.9000	0.73786	9
Teacher provides time for students to actively process information during lesson delivery	2.5000	0.52705	9
Teacher differentiates process to suit pupils‘ differences	2.4000	0.69921	9
Teacher uses a variety of materials other than the standard textbooks during instruction delivery	2.3000	0.67495	9
Teacher differentiates using the general concepts	2.3000	0.48305	9
Teacher applies assessment information to guide instruction	2.3000	0.67495	9
Teacher uses both formative and summative evaluation	2.5000	0.70711	9
Teacher provides opportunities for student products to be based upon the solving of real life and relevant problems	2.5000	0.52705	9
Teacher uses variety of assessment tools before, during and after learning	1.7000	0.67495	9
Assignments necessitates that students conduct research	1.8000	0.63246	9
Teacher works with individual students or groups to determine the form of product	1.6000	0.69921	9
Teacher allows for a wide range of product alternatives (oral, creative, visual etc)	1.4000	0.51640	9
Composition of groups changes base on the activity of the lesson	1.2000	0.42164	9
Learners are assessed based on their learning style	1.1000	0.31623	9

Reliability Statistics of challenges

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.969	0.970	13

Item Statistics

	Mean	Std. Deviation	N
It is difficult to determine each learners learning style and the appropriate instruction tool to match with	3.4444	0.69826	135
Teachers lack knowledge on how to address academic diversity in Differentiated Instruction	3.7407	0.75274	135
How to match the appropriate resource with teaching is a major challenge	3.9407	0.58288	135
Differentiated Instruction and assessment is one of the bureaucratic mandate leaped upon teachers	3.8222	0.57129	135
As a teacher, adjusting teaching practice as Differentiated instruction is disheartening and upsetting	3.7852	0.52384	135
Teachers fear that, there are no models to talk about differentiated instruction	4.1185	0.54707	135
Teachers can not differentiate if professional development resources are absent	3.8148	0.56231	135
Teachers are limited to practice differentiated instruction due to limited space for group work.	3.8815	0.51907	135
Time factor always poses a threat to differentiated instruction.	4.3037	0.50776	135
Lack of administrative support hinders the practice of differentiated	4.0444	0.42085	135
Large class size is one of the threats to Differentiated instruction and assessment	4.0519	0.53697	135
It is very difficult to access the readiness level of learners	2.9556	0.62135	135
Teachers are apprehensive for the concept based teaching with the pressure of standardized test in Differentiated Instruction	4.2889	0.45493	135