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EXPLORING FACTORS INFLUENCING THE USE OF DIFFERENTIATED LEARNING STYLES IN ORDINARY LEVEL MATHEMATICS AT RIVERSDALE HIGH SCHOOL

BY

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DECLARATION

I, Makonese Trust hereby declared that, except for references to other people's work which have been duly acknowledged, this project is the result of my research and has neither in part nor in whole been presented in another education programme.

Signed: Trust Makonese Date: 12.05.23

(Student)

This research work was undertaken under the supervision of Dr. P. Chikuvadze

Signed:  Date: 12.05.23

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DEDICATION

I dedicate this dissertation to my family and special mention goes to my brother, Samuel Makonese, who has contributed immensely to who I have become today and for the unwavering support that has contributed to this achievement.

ABSTRACT

The purpose of this study was to explore the use of differentiated learning in Ordinary Level Mathematics learning activities. A qualitative approach was used in data analysis and discussion. For data generation document analysis and interviews were used. The sample for the study was made up of six teachers who were selected purposefully. Data were analysed according to the themes that were derived from the formulated research questions. The findings of this revealed that differentiated learning styles are important as they support each learner's learning process in Ordinary Level Mathematics, thus making it possible for them to reach their highest potential. This is in the sense that differentiated learning uses many strategies that deduce learners' different skills and interests. From the analysed and discussed data the researcher also noted that though the use of differentiated learning styles influences Ordinary Level Mathematics learning, some challenges are faced (i.e., it's time-consuming, putting pressure on teachers especially when it comes to syllabus covering). From the analyzed and discussed data, it can be concluded that the use of differentiated learning in Ordinary Level Mathematics is influenced by various factors, which can either have a positive or negative impact. The study recommends that the use of differentiated learning should be made mandatory so that learners can be engaged in learning more activities.

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CHAPTER ONE
PROBLEM AND ITS SETTING

1.1 INTRODUCTION

In this chapter, the problem will be put into context through the discussion of the following aspects: background to the study, statement of the problem, objectives of the study, significance of the study, assumptions of the study, delimitation of the study, limitations of the study, definition of terms, chapters layout, and chapter summary.

1.2 BACKGROUND TO THE STUDY

Mathematics is an essential discipline recognized worldwide and it needs to be augmented in education to equip students with the skills necessary for achieving higher education, career aspirations, and attaining personal fulfillment (Anderson, 2017). It is a key instrument in a diversity of fields such as medicine, engineering, natural science, social science, physical science, business, and commerce. Therefore, Mathematics is a crucial component of Zimbabwe's new curriculum framework, since it enables learners in basic education to enroll for careers in areas crucial for economic transformation (Armstrong, 2017). Hence, its inclusion in the curriculum to cater to diverse learners to equip them with relevant knowledge, skills, and attitudes such that they can be functional in different spheres of society enable (Ashman, 2016).

In addition, it is significant to acknowledge that most of the activities in our day-to-day activities are governed by laws of Mathematics (Bender, 2017). This calls for learners to have a good understanding of Mathematical processes and procedures, without which they might face significant challenges solving some real-life problems. Hence, learners' achievement in Mathematics teaching-learning activities can be considered a fundamental indicator of the performance of a school system in any country (Breaux, 2017). However, there is a need to acknowledge that most Mathematics classes are composed of learners with different learning styles (Benton, 2016).

The existence of learners with various learning needs in Mathematics calls for the use of different teaching and learning styles (Breaux & Glenn, 2017), However, in most instances teaching and learning activities are grounded in a 'one size fits all' approach, which has been proven to be ineffective (Brooks, 2017). Support studies by Brown (2017); Chapman (2016)

have alluded to the existence of mismatches between teaching styles and learners' learning styles resulting in ineffective teaching-learning. Against the above exposition, this research sought to gain insight into the influence of differentiated instruction on learners' achievement in Mathematics teaching-learning activities.

1.3 STATEMENT OF THE PROBLEM

The new curriculum framework advocates for the migration from the traditional teacher-centered to learner-centered approach in Ordinary Level Mathematics teaching-learning process (Cavanagh, & Cavanaugh, 2016). Thus, this calls for teachers to adopt innovative teaching-learning that takes into account learners' learning styles (Chappuis & Stiggins, 2017). Despite teachers being encouraged to use differentiated styles in teaching-learning activities, learners' performance in Ordinary Level Mathematics is still a cause for concern. It is in this context that this study sought to explore this gap guided by the following main question: What factors influence the use of differentiated learning in Ordinary Level Mathematics teaching-learning?

1.4 RESEARCH QUESTIONS

From the articulated main research question the following sub-research questions were derived:

1. What is the importance of using differentiated learning styles in Ordinary Level Mathematics teaching-learning?
2. How does the use of differentiated learning influence Ordinary Level Mathematics teaching-learning?
3. What challenges are encountered when using differentiated learning styles in Ordinary Level Mathematics teaching-learning?

1.5 SIGNIFICANCE OF THE STUDY

The study findings will be useful to the curriculum developers in the Ministry of Primary and Secondary Education's Curriculum Development Unit to institute changes in the curriculum that will help in improving the use of differentiated learning in Ordinary Level Mathematics

The findings of the study will influence the teachers' methodology in teaching-learning of mathematics. The study will be useful in determining the suitable strategies to employ to curb the problems that may be encountered in using differentiated learning styles in Ordinary Level Mathematics teaching-learning activities. These will bring about improved academic performance and hence increase the pass rate in Ordinary Level Mathematics. The findings of the study will enlighten teachers on the need to be resilient and also make them strong to the challenges that affect their progression in Ordinary Level Mathematics teaching-learning activities using differentiated learning.

It helps the university to produce mandated teachers who can see that all learners meet the standards of their district and state (Cook & Friend, 2016). Helps the university to produce teachers who can access the entering of students to the classrooms with different abilities, learning styles, and personalities.

1.6 DELIMITATION OF THE STUDY

Ministry of Primary and Secondary Education Mashonaland East Province has 6 education administration districts namely: Chivhu, Marondera, Murewa, Mutoko, Seke, and Mudzi. For this study, the focus was on Chivhu District with specific reference to Riversdale High School offering basic education to both female and male learners. The selected school has a staff complement of 20 teachers and seven hundred learners. The school offers basic education from form 1 - 6 guided by the demands of the new curriculum framework. At the selected school the study was centered on exploring factors influencing the use of differentiated learning in Ordinary Level Mathematics teaching-learning activities.

1.7 LIMITATIONS OF THE STUDY

The outbreak of COVID-19 limited the physical interactions between the researcher and the respondents. To minimize the effects of this limitation on the findings the researcher had to use technologies to interact with the selected participants as well as in collecting relevant information for the study.

1.8 DEFINITION OF TERMS

The following key terms are going to be defined contextually:

1.8.1 Differentiated learning style

Is considered as learners' differences in perceiving, processing, and communicating information (Haar et al., 2002). In simple terms, this can be seen as a unique way a learner prefers learning.

1.8.2 Ordinary Level Mathematics

According to Daro and Mosher, (2018), mathematics refers to a broad domain that has several topics which include algebra, geometry, arithmetic, calculus, and trigonometry. Debruin-Parecki (2016) regarded mathematics as an area that deals with numerical information in a variety of contexts. The contexts include communicating and interpreting mathematical ideas.

1.9 CHAPTERS LAYOUT

In chapter 1 the problem and its setting are put into context; chapter 2 identifies the gaps in the literature that this study intends to fill; chapter 3 outlines the data generation, analysis, and interpretation strategy; chapter 4 provides the platform for data presentation, analysis, and interpretation; and in chapter 5 study summary, conclusion, and recommendations are articulated.

1.10 CHAPTER SUMMARY

In this chapter, the problem under investigation was put into context through a discussion centered on the following: background to the study, statement of the problem, objectives of the study, significance of the study, assumptions of the study, delimitation of the study, limitations of the study, definition of terms, chapters layout, and chapter summary. The next chapter explores the gaps to be filled by this study.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

In the previous chapter, the problem and its setting were articulated. This chapter gives a review of the literature that provided insight into how differentiated learning style affects learner's achievement in Ordinary Level Mathematics.

2.2 DIFFERENTIATED LEARNING AS A CONCEPT IN MATHEMATICS

Since learners have different learning styles, some scholars suggest that mathematics teachers adopt the concept of differentiated teaching (Tomlinson, 2019). According to Stokes and Burt (2020), differentiated learning simply means teaching the same content to different students using a variety of teaching strategies. It involves modifying the content (what to teach), the process (how to teach it), and the product (how the learners demonstrate their learning) to suit the needs of the individual learners (Tomlinson, 2021). According to Allan and Tomlinson (2020), the teacher needs to create a learning environment that invites the attention of all learners. This can be achieved by being innovative and by using a variety of learner-centered teaching strategies that suit the learning styles of the learners.

2.3 IMPORTANCE OF DIFFERENTIATED LEARNING IN TEACHING-LEARNING

Differentiated learning can be used in various ways in Mathematics teaching-learning activities. In Mathematics teaching-learning activities, differentiated learning style support each learner's learning process through the intentional of differentiated learning style (Smagorinsky, 2020). Differentiated learning style also helps all students within a classroom to reach their highest potential and this is done by the way of engaging in an appropriate learning experience (Tomlinson & Moon, 2019) In addition, these experiences challenge and support them on their path to developing a deep understanding of the content.

Learners learn in several ways so that they benefit individually (Tomlinson, & Moon, 2019) it also helps the teacher in adjusting teaching methods to facilitate student learning preferences and also increase learners' participation in the classroom. Teachers can defer the content, process, and product so that students access it to learn in differentiated learning (Tomlinson, 2021). Aside from students and their preferred methods of learning, teachers need instruction and need to have tools available to them to complement differentiated learning in their

classroom, (Tomlinson, 2017). In the scope of mathematics learning, differentiated learning style has much importance in that it can create multiple learning environments at various levels (Tomlinson, 2018).

Moreover, differentiated instruction mandates that teachers create chances for students to access, analyze, and display learning through structured lessons (Tomlinson & Moon, 2018). As a result, when teachers adapt instruction depending on students' readiness, learning styles, and interests, they may develop a curriculum that is engaging, authentic, and rigorous (Wong, 2020). This approach further implies that by applying various tools and strategies in teaching mathematics, an educator can help every student maximize their learning experiences. According to Maggio and Wexler (2018), in mathematics, teachers should meet students' needs by matching their readiness to the level of content delivered. Tomlinson, (2021) stated that students who were taught using differentiated instruction in math performed better than those taught using a conventional instructional approach. Similarly, Tomlinson, (2021) discussed differentiated instruction, noting that it is significant in the context of mathematics since it contains multiple levels of sensitivity that enrich learning environments. To accommodate the needs of learners across many different levels of academic achievement, teachers across the country have implemented within-classroom strategies referred to as differentiated instruction. Differentiation is an attempt to address the variation of learners in the classroom through multiple approaches that modify instruction and curriculum to match the individual needs of students (Tomlinson, 2020). Learners vary in their abilities, interests, and prior knowledge.

Differentiation serves to address this variation by matching the content, instruction, and assessment to learners' needs and interests. Tomlinson (2019) emphasized that when teachers differentiate curriculum, they stop acting as dispensers of knowledge and serve as organizers of learning opportunities. Differentiation of instruction and curriculum suggests that students can be provided with materials and work of varied levels of difficulty, different levels of assistance, various types of grouping, as well as different environments in the classroom. In other words, differentiation is the opposite of a one size fits all curriculum (Ford & Grantham 2017).

2.3.1 Content

According to Ellis and Grimes (2017), learners have different abilities and interests and teachers can differentiate the content/curriculum delivered to their students. Some learners need content that matches their interests or is more or less challenging and appropriate for their reading level and not every student should receive the same content in any given lesson (Garrett & Verhoeven, 2017). Thus, learning happens best when a learning experience pushes the learner a bit beyond his or her independence level (Giangreco, & Doyle, 2017). When a learner continues to work on understanding and skills already mastered, little if any new learning takes place (Stokes & Burt, 2020). On the other hand, if tasks are far ahead of a learner's current point of mastery, frustration results and learning
learning does not occur (Hess, 2019).

2.3.2 Instructional strategies

Learners also arrive with different learning styles. Some learn best through group work and some by working alone, some learn best by doing projects, while others learn by discussion (Ismajli, 2018. Teachers can differentiate by using different instructional strategies that match the preferences of individuals or groups in their classrooms (Tomlinson, 2019). When teachers recognize diversity in their learners, in terms of how and what they identify with and how they learn, and when this recognition is reflected in how teachers teach (Rahmah, 2022). In addition, learners are free to discover new and creative ways to solve problems, achieve success, and become lifelong learners (Tomlinson & Imbeau, 2019).

2.3.3 The classroom

According to Tomlinson (2018), teachers can differentiate the learning environment itself, and how they manage it. Learners can have the opportunity to work in groups with other students like themselves or work in groups in which every learner has a chance to demonstrate their different styles (Tomlinson, 2022). In addition, the teacher can introduce new guest speakers or technology or bring your class into new environments like the computer laboratory, library, or field trip (Tomlinson, 2020). Differentiated instruction is not individualized instruction. Instead, it involves considering and selecting from a variety of instructional approaches and making frequent use of flexible, short-term groups to address a variety of learner needs and preferences (Tomlinson, 2017).

2.3.4 Products

Students express what they have learned in different ways some learners preferred the expression style to be written while others do better with technology, social action, or visuals (Demirkasimoglu, 2023). Teachers can differentiate products by giving students options, when practical, to choose their modes of expression to demonstrate what they have learned (Tomlinson, 2020).

2.3.5 The teacher

It is hard to imagine that teachers can differentiate every lesson every day so differentiation is about the decisions and choices that teachers make about how to differentiate the curriculum for a diverse group of learners (Blaz, 2013). Differentiation requires that teachers consider their learners' learning styles, interests, abilities, and expression styles and that they accept the freedom, flexibility, and creativity to implement this process in the classroom (Laurens, 2020).

According to Marlina (2019), the differentiation of process incorporates the use of various instructional strategies and materials to enhance and motivate various learners' learning styles. The differentiation of products enhances learners' communication skills by encouraging them to express themselves in a variety of ways (Parmar, 2020). To differentiate classroom management, teachers can change the physical environment and grouping patterns they use in class and vary the allocation of time and resources for both groups and individuals (Murphy, 2020). Teachers can differentiate themselves by modeling the roles of athletic or drama coaches, stage or production managers, promotional agents, and academic advisers (Shen, 2020). All these roles differ qualitatively from the role of teacher-as-instructor. Teachers can also 'inject' themselves into the material through a process called artistic modification (Renzulli, 1988).

2.4 USING DIFFERENTIATED LEARNING IN MATHEMATICS TEACHING-LEARNING

The diversity of skills, talents, and interests of learners that participate in Mathematics teaching-learning activities requires a remarkable range of teachers' skills, time, and resources. Hence, this section looks at how teachers can use differentiation in Mathematics teaching-learning activities.

2.4.1 Differentiation using a learning system

The main goal of the differentiated learning system is to provide students with experiences that help them enjoy the process of learning through their engagement (Liliawati 2022). Differentiated learning style expression styles with a vast array of educational activities and resources designed to enrich learners' learning process (Demirkasimoglu, 2023). According to (Rahmah 2022) differentiated learning system is an exciting new, interactive online program that matches learner interests, expression styles, and learning styles with a vast array of educational activities and resources, designed to enrich gifted and high-potential learners' learning process. Using Renzulli Learning, learners can explore, discover, learn, and create using the most current technology resources independently and in a safe environment (Field, 2009).

2.4.2 Differentiation by competency

According to Tomlinson (2016), differentiated learning style calls for the use of assessment data to modification of curriculum and instruction to respond to differences in learners' readiness, interest, and learning profile. In addition, the differentiated learning style emphasizes that learning is most effective when teachers can assess learners' current levels of functioning and learning preferences, and then use this information to help students progress to more advanced levels of functioning and more advanced learning (Shute & Rahimi, 2017). The differentiated Learning style enables teachers to use data-based decision-making to pre-assess student learning and use assessment, instruction, and data management to differentiate content (Tomlinson, 2023). Differentiated learning style combines flexible grouping of students with adjustments to the learning tasks; in other situations, the whole group instruction is the most appropriate delivery model, while in other instances, students work in small groups or individually to complete tasks that are targeted to their levels of readiness, interests, and learning preferences (Cavanagh, 2016).

2.4 CHAPTER SUMMARY

In this chapter the gaps to be filled by this study were identified through the interrogation of the following issues: importance of differentiated learning in Mathematics teaching-learning and using differentiated learning in Mathematics teaching-learning activities. in the next chapter strategies that are used in data generation, analysis and discussion will be articulated.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 INTRODUCTION

The previous chapter outlined the theoretical framework through, which the gaps to be filled were observed. This current chapter focuses on the research methodology used to conduct the study. The following issues will be discussed: research design, research approach, methods, sample and sampling procedure, data generation procedures, data presentation, and analysis procedures, research integrity, and chapter summary.

3.2 RESEARCH DESIGN

Research design is the systematic, theoretical analysis of the procedures applied to a field of study (Gail & Plano-Clark, 2020). According to Althubaiti (2016), research design involves procedures of describing, explaining, and predicting phenomena to solve a problem; it is the 'how?' According to Wong, (2020) research design in this study is considered as a general plan that describes how the research study will be conducted. In addition, it also explores a complete strategy for data collection and a plan or structure for investigation adopted to obtain answers to a research problem.

It is important to have a research design because it gives the researcher direction on how the data is going to be generated (Creswell, et al., 2007). It also helped the researcher to make appropriate decisions regarding what needs to be done during the research. It is against this background that this study selected the qualitative approach to guide the data generation, analysis, and discussion. A research approach can be considered to be a plan or procedures that are followed which span the steps from broad assumptions to detailed methods of data collection, analysis, and discussion (Brackstone, 2016). Hence, the qualitative approach was used in this study to gain an in-depth understanding of the issue under investigation. The qualitative approach focuses on discovering and understanding the experiences, perspectives, and thoughts of people and can be described as a naturalistic inquiry into knowledge (Kahlke, 2014).

3.3 SAMPLE AND SAMPLING PROCEDURE

A sample can be defined as a subset of the target population to which the researcher intends to generate data (Coyne, 1997). According to Ritchie, et al (2003), sampling is defined as seeking information about a population by observing a part of this population to illustrate the findings to the entire population. For this study, the target population comprised twenty teachers who were facilitating teaching-learning activities at the selected school. According to Suri (2011), the researcher adopted the purposive sampling procedure for the selection of the participants. In addition, Mthuli, et al (2022), noted that purposive sampling is a group of non-probability sampling techniques in which units are selected because they have characteristics that you need in your sample. Thus, six participants were selected based on their knowledge of the issue under investigation. Purposive sampling is often used when one's goal is to include participants who represent a broad range of perspectives, purposive sampling may also be used when a researcher wished to include only people who meet very narrow or specific criteria. In this scenario, the sampling procedure gave room for the researcher to be in control of the attributes that are needed such that the information needed will be very critical in closing the gap that has been created in the phenomenon being investigated.

3.4 METHODS

The following methods were used in generating data from the selected participants

3.4.1 Document analysis

Document analysis is a strict and systematic set of procedures for rigorous analysis, examination, and verification of the contents of written data. In addition, document analysis is considered a form of systematic procedure used to analyze evidence gained from documents and answer specific research questions. Thus, the researcher summarized the data sourced from the selected documentation. For this study, some of the documents interrogated included: policy circulars, syllabi, schemes of work, record books, minutes of departmental meetings, etc.

3.4.2 Personal interview

Personal interviews refer to a set of questions that are asked personally directly to the respondent (Cohen, 2016). According to Collins, et al (2008), the researcher used open-ended interviews. An interview guide was prepared with questions (items) to find out their understanding of differentiated learning in Mathematics teaching-learning. An open-ended interview was preferred because it allows the researcher to have an in-depth understanding of the phenomenon under study. The research questions were used to guide the researcher when preparing interview guides or interview questions that seek to find out the views of teachers on factors influencing the use of differentiated learning. Other related issues were also discussed. A total of six teachers from the Sciences and Mathematics Department were interviewed. As a way of dealing with confidentiality, no names were used when recording the data. The researcher did not disclose information from the participant and it was used for academic purposes only.

3.5 DATA GENERATION PROCEDURE

The researcher sought an introductory letter from the Bindura University of Science Education. The researcher applied for permission to conduct a study at the selected school. In response, the responsible authority gave the researcher the go-ahead to carry out the study following laid down policies and procedures. Thereafter, the researcher organized an introductory meeting with the school authorities. In this meeting, the researcher outlined the objectives of the study to the school authorities, and gray areas in the study were ironed out. In return, the researcher requested to meet the potential participants and explained to them their role in the study. In the end, the participants were requested to consent to their participation in the study. In that regard, the pre-document check was conducted with a mission to provide the researcher with what was on the ground and the possible expectations which would to essential data generation. It is also in this context that the researcher conducted some pre-study interviews with the selected teachers and the school-based supervisors to have some insights into the issue under investigation.

3.6 DATA ANALYSIS

In this study data analysis was seen as a process that systematical systematically interrogates the sourced experiences, views, and opinions about the issue under study (Bowen, 2009).

Thus, through this, the researcher was well-positioned to carry out an iterative and recursive type of data generation and analysis (Owen, 2014). In this study data sourced through the application of the selected methods was analyzed according to themes derived from the research questions in chapter 1. In this way, the researcher sort to identify and describe patterns and trends from the participants' perspective, with the aim of understanding and interpreting them. In addition, this called for the researcher to present data on each theme in the form of short quotations from the participants followed by an analysis of the contribution. It is against this background that data was generated and analyzed in line with the main thrust of the study.

3.7 RESEARCH INTEGRITY

In this study, the validity and reliability of research instruments will be considered. A pilot study was conducted at a neighbouring secondary school which is not sampled for the study. The piloted focus group discussion and interview guide were scrutinized to identify mistakes in the methods.

3.7.1 Trustworthiness of the study

Trustworthiness or rigor of a study refers to the degree of confidence in data, interpretation, and method used to ensure the quality of a study (Gorard, 2015). To improve trustworthiness, the researcher allowed the data to be assessed to check on its credibility, dependability, transferability, and confirmability (Hadi & José-Closs, 2016). This means that the researcher has to improve the consistency of the data. The researcher had to make sure that the present study replicates other studies done before in terms of methodology.

3.7.2 Ethical issues

Informed consent means research participants know all the information related to the research they wish to participate in (Artal & Rubenfeld, 2017). The benefits, harms, and other issues of research are disclosed to the participants so that they choose whether to participate or not. Participants were informed about the study and also receive a description of the intended use of the data that was collected. The time required for participation and the role of the researcher as non-interfering and non-judgmental will be explained. Each participant was asked to sign a consent form. No one was coerced to participate in the research study.

The researcher tried by all means to protect the confidentiality of the participants from other people in the study and from the general public. Participants were assured that the

information that they provided will be treated with strict confidence and be used for academic purposes only. Long (2007) observes that the need for privacy is a function of generally accepted social norms and an individual's expectations about information about oneself and should not be known to others. The participants had a right to decide when, where, to whom, and to what extent their attitudes beliefs, and behavior were to be used. The participant's right to privacy was not violated by the unauthorized use of one-way mirrors, microphones, and cameras, or any other methods that may interfere with privacy.

3.8 CHAPTER SUMMARY

This chapter outlined the research methodology that the present study will adopt. The chapter outlined the following: research design, sampling procedures, data generation procedures, methods, data analysis, and research integrity. The next chapter focuses on data analysis and discussion.

CHAPTER FOUR
DATA ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

This chapter presents an analysis and discussion of the findings from the study on exploring factors influencing the use of differentiated learning in Ordinary Level Mathematics at the school under investigation.

4.2 CHARACTERISTICS OF THE PARTICIPANTS

In this section demographic characteristics of selected teachers are analyzed and discussed.

Table 4.1 Characteristics of selected teachers (n=6)

Attribute(s)	(n)	(%)
Sex		
Male	3	50
Female	3	50
Professional Qualifications		
Certificate in Education	1	17
Diploma in Education	3	50
Degree in Education	2	33
Teaching experience (years)		
0 - 5	1	17
6 -10	2	33
11-20	1	17
Above 20	2	33

Table 4.1 shows the distribution of the six teachers according to gender, qualification, and teaching experience. Of the six teachers who participated in the study, three (50%) were males and the other (50%) were females. The table above also shows the distribution of teachers according to qualifications. Only one teacher (17%) had a Certificate in Education, three teachers (50%) have Diplomas in Education and another two teachers (33%) had Degrees in Education. All the qualifications were related to Mathematics. The table shows the different experiences of teachers in teaching mathematics. One teacher falls within the range of 0 - 5 years of teaching, two teachers fall within the range of 6 - 10 years, another teacher falls within 11 - 20 years of teaching and the 20 years and above range has only two teachers. These levels of experience made it possible to give the same contributions to the study because they interacted with both female and male learners every time.

4.3 IMPORTANCE OF USING THE DIFFERENTIATED LEARNING STYLES IN ORDINARY LEVEL MATHEMATICS TEACHING-LEARNING

In this section data generated from mathematics teachers is analyzed, and discussed with the view to provide answers to research questions raised in chapter one. In response to the theme from the question, one of the selected teachers revealed that:

Differentiated learning styles are important as they support each learner's learning process in Ordinary Level Mathematics, thus making it possible for them to reach their highest potential and climb up the educational ladder. This is done by way of differentiated learning in mathematics. In addition, differentiated styles support learners on their path to developing a deep understanding of mathematics content (Teacher A)

In addition, one of the selected mathematics teachers highlighted that:

Differentiated learning styles help the teacher in adjusting teaching methods to facilitate student learning preferences and also increase learners' participation in the classroom. The teacher can defer the content, process, and product so that students access it in learning (Teacher C)

From the responses above the researcher concluded that differentiated teaching and learning in teaching-learning mathematics support each learner's learning process through the intentional use of various differentiated learning (Tomlinson, 2017). Differentiated learning style also helps all students within a classroom to reach their highest potential and this is done by the way of engaging in an appropriate learning experience (Cook & Friend, 2015) In addition, these experiences challenge and support them on their path to developing a deep understanding of the content. it also helps the teacher in adjusting teaching methods to facilitate student learning preferences and also increase learners' participation in the classroom. Teachers can defer the content, process, and product so that students access it to learn in differentiated learning (Ellis, et al., 2017). Another selected mathematics teacher acknowledged that:

Differentiated learning can also help teachers by increasing learners' engagement and motivation in mathematics, as learners are more likely to feel successful and confident when they are learning in a way, they are suiting their learning style (Teacher F)

In line with the previous participant's contribution, another participant noted that:

Learners who were taught using differentiated instruction in math performed better than those taught using a conventional instructional approach, it is also significant in the context

of mathematics since it contains multiple levels of sensitivity that enrich learning environments (Teacher E)

The above responses led the researcher to conclude that differentiated learning styles have a lot of advantages in the teaching and learning of Ordinary Level Mathematics as they help learners to perform better and increase their participation. The observation also implies that if schools are to obtain and help learners to reach their full potential in Ordinary Level Mathematics, they should effectively employ the use of differentiated learning.

4.4 DIFFERENTIATED LEARNING AND ITS INFLUENCE ON ORDINARY LEVEL MATHEMATICS TEACHING-LEARNING

The researcher in this section centers on the analysis and discussion of the research question that looks at the influence of differentiated learning styles in Mathematics teaching-learning activities. In response to the theme from the question, one of the selected teachers revealed that:

Differentiated learning styles positively influence learners to have love, interest, and deeper knowledge of mathematics. This is in the sense that differentiated learning uses many strategies that extrapolate learners' different skills and interests through the use of strategies like centers, agendas, trajectory studies, learning agreements, and multiple teaching methods that can be applied within the class (Teacher F)

In addition, another participant acknowledged that:

Differentiated learning also influences the learning of Ordinary Level Mathematics by allowing students to work on tasks that are matched to their interests, abilities, and learning styles. When students are more engaged in their learning, they are more likely to be motivated to learn and to persist in their efforts (Teacher B)

In light of the above response, the researcher noticed that differentiated learning style has great influence as it can extrapolate different skills, and interests to learners through the use of different learning with many strategies such as station, centers, agendas, complex teaching, trajectory studies, entry points, learning agreements, and multiple teaching methods that can be applied within class periods (Fisher, et al., 2016). More so, multiple teaching strategies are used to provide students at all levels with a better understanding of the subject, to increase their success, and to make them responsible for their learning (Giangreco & Doyle, 2017). According to Tomlinson, (2018), as differentiated teaching reaches specific targets, it is also a strategy that offers various approaches based on the teacher's teaching skills, interests, and knowledge as well as the learners' learning styles. The strategy is generally used to address

different readiness levels (Smagorinsky, 2020). According to Tomlinson, (2019), with such a design, learners with low, medium, and high knowledge can learn the same subjects at suitable difficulty levels. In the same vein, one of the selected teachers revealed that:

The use of differentiated learning styles in Ordinary Level Mathematics teaching and learning influences learners to be critical thinkers and problem solvers in real-life situations. This is in the sense that differentiated styles base the teaching and learning on learners' pre-knowledge using examples of real-life situations (Teacher C)

In support, a teacher highlighted that:

Differentiated learning style improved classroom climate: It can also create a more positive classroom climate by promoting a sense of inclusivity and valuing the diversity of learners. When learners feel that their individual needs are being met, they are more likely to feel valued and respected as learners (Teacher A)

The researcher also noticed that differentiated learning style contributes to learners' cognitive learning by basing learning on learners' pre-knowledge with the use of flexible group methods (Hess, 2019). According to Stokes and Burt, (2020), a differentiated learning style is especially important for children who lack sufficient knowledge and skills in any subject significant to their academic advancement. In addition, to the literature, the studies that have examined the effect of the differentiated teaching approach on learners' mathematical success generally focus on numbers and geometry (Wexler, 2018). In addition, observations from the researcher indicated that differentiated teaching applications positively affect learners' mathematical success. Tomlinson, (2018) study conducted with Ordinary Level grades examined the effect of the differentiated teaching approach on learners' success with the subject of rational numbers. This experimental study conducted with multiple teaching methods concluded that differentiated teaching approaches positively affect learners' success.

4.5 CHALLENGES FACED WHEN USING DIFFERENTIATED LEARNING STYLES IN ORDINARY LEVEL MATHEMATICS TEACHING-LEARNING

This section focuses on the challenges encountered when using differentiated learning styles in Ordinary Level Mathematics teaching-learning. It also includes responses, analysis, and interpretation of the teachers' responses on the challenges they face when using differentiated learning styles in Mathematics teaching and learning. One of the selected teachers in response to the theme review noted that:

Differentiated learning styles put pressure on teachers and are time-consuming especially when it comes to syllabus covering. This is the reason why teachers choose traditional methods because it is faster and easier for learners to learn in this manner (Teacher A)

In addition, one of the selected teachers also indicated that:

Through the use of differentiated styles teachers end up losing control of the class discussion. Some teachers struggle with allowing the learners to be the center of attention in the classroom (Teacher C)

From the responses above the researcher observed that through the use of differentiated styles in teaching and learning mathematics teachers face challenges of pressure, failure to cover the syllabus and avoiding a differentiated class, and choosing a traditional classroom because the teacher believes that it is faster and easier for learners to learn in this manner. Differentiation is time-consuming as compared to traditional teaching which is often much easier for a teacher to make meaning for the learners because it usually saves time and prevents a situation where the teacher may lose control of the class discussion (Wong, 2020). Some teachers struggle with allowing the learners to be the center of attention in the classroom. Tomlinson, (2021) explained that the stage-and-audience arrangement that traditional classroom arrangements set up can be seductive to any teacher, it is easy to enjoy the performance. Another selected mathematics teacher revealed that:

As teachers, they lack experience and knowledge of how to use differentiated styles in Mathematics teaching-learning. Most teachers lack knowledge and the know-how of differentiated styles thus the reason why they revert to the use of traditional methods (Teacher D)

Another selected mathematics teacher acknowledged that:

Learners also resist new instructional methods and prefer a traditional classroom setting, it is not surprising that learners act the way we have trained them to act dependent on us, docile, unwilling to listen to peers, and fearful of sharing half-formed ideas. Learners have grown accustomed to being able to find the answer so quickly, that they do not like to struggle with a problem (Teacher B)

The researcher from the responses of the teachers observed challenges like learners' resistance to using differentiated learning and preferring a traditional classroom setting. Tomlinson, (2020) highlighted that it is not surprising that learners act the way we have trained them to act dependent on us, docile, unwilling to listen to peers, and fearful of sharing half-formed ideas. Learners have grown accustomed to being able to find the answer so quickly, that they do not like to struggle with a problem. In this regard, a participant noted that:

Differentiated learning can potentially exacerbate existing inequities in the classroom if not implemented carefully. Teachers need to ensure that all students have access to high-quality

instruction and resources and that differentiation is not used to track or segregate students based on perceived ability (Teacher A)

Although there is clear evidence to support differentiated learning style as a better pedagogy to maximize learner mastery of the standards, there are many classrooms in which no differentiation is taking place. The literature reveals that teachers may resist using differentiated instructional methods because, as Chapman (2016) stated, the traditional classroom feels right because that has been a familiar one for teachers and students. Chappuis & Stiggins (2017) also noted that unfortunately, choices are sometimes based on factors such as habits and comforts of practice instead of what will accomplish a particular desired outcome (Ellis, et al., 2017). More so, attributed pressures that teachers face when they stated, because of the focus on content related to a particular content discipline, textbooks, and curriculum frameworks influence what is taught, the result has been to teach the facts without using a meaningful learner-centered approach (Cavanagh & Cavanaugh, 2016).

4.6 CHAPTER SUMMARY

The chapter presented and discussed the findings using thematic analysis. The data was analyzed thematically using themes that are derived from the research questions. The themes include factors that influence the use of differentiated learning in Ordinary Level Mathematics and a broader theme that covers other factors that can influence differentiated learning style in Ordinary Level Mathematics at the targeted school. The next chapter will cover the summary, conclusion, and recommendations.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

In the previous chapter, data was presented, analyzed, and discussed. This chapter will focus on the summary, conclusion, and recommendations. Areas for further research will also be suggested. The chapter summary will also be given at the end of the chapter.

5.2 SUMMARY OF THE PROJECT

In chapter 1, the researcher looked at the problem and its context where the problem and its context where the focus was on the background of the study, the statement of the problem, the research questions, and research objectives, the significance of the study, the limitations of the study, and delimitation of the study as well as the definition of different terms. Chapter 2 is a literature review that outlined the research that was done by other scholars on the factors that influence the use of differentiated learning in Ordinary Level Mathematics. The research was reviewed to identify the research gap which will be filled by the current study. Chapter 3 covered the research design, research approach, sample and sampling procedure, methods, data generation procedure, data analysis, and research integrity. Chapter 4 outlined the following major findings:

- The findings of this study acknowledged the importance of using differentiated learning in Ordinary Level Mathematics teaching-learning
- The findings of this study revealed various approaches to using differentiated learning styles for example differentiation by competency, and differentiation by learning system, that influence Ordinary Level Mathematics teaching-learning
- From the findings, it was noted that various challenges were encountered when using differentiated learning styles in Ordinary Level Mathematics teaching-learning

5.3 CONCLUSION

From the findings, it was noted that the use of differentiated learning in Ordinary Level Mathematics was important for learners. In addition, the use of differentiated learning enables learners to be engaged in the following: individual and group work, problem-solving, project design, project-based learning, etc. However, when using differentiated learning in Ordinary Level Mathematics various challenges are faced in learning activities. It is in this context that this study concludes that the use of differentiated styles in Ordinary Level Mathematics teaching-learning is influenced by various factors that can have either a positive or negative impact on the learners.

5.4 RECOMMENDATIONS

In light of the findings, the researcher recommended that teachers, parents, and guardians should welcome and support the use of differentiated learning for the benefit and success of their learners. The use of differentiated learning should be made mandatory so that learners can be engaged in learning more activities.

5,5 AREAS FOR FURTHER STUDY

The researcher suggested that there is a need for further research in the following areas: challenges faced by learners when engaged in Mathematics learning activities through differentiated learning styles.

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APPENDICES

Appendix 1: Interview guide for selected teachers

Thank you for agreeing to be interviewed. I think you can make significant contribution about gaining insight into the issue under investigation. I am going to ask you some questions

which you are free to elaborate on in ways you consider fit. In case you do not feel like answering the questions you are at liberty to say so. I would like to let you know from the start that your personal and school details will not be included in the final report.

1. Briefly highlight the following: age, professional qualifications, and teaching experience
2. Which subjects do you teach and at what level?
3. What do you understand by differentiated learning?
4. In your own opinion, what is the relevance of using differentiated learning in Ordinary Level Mathematics teaching-learning?
5. In your Ordinary Level Mathematics teaching-learning, how are some of these differentiated learning styles used?
6. What challenges do you encounter in teaching and learning activities when you are using differentiated learning?
7. What strategies would you recommend as solutions to the challenges you raised and what areas do you think needs improvement?
8. Thank you for your contribution to this interview