The use of streaming as a differentiated strategy in middle school mathematics classes: a case study of a private American-curriculum school in Dubai

استخدام عملية التقسيم كإستراتيجية مختلفة في تخطيط الرياضيات في المدارس المتوسطة
دراسة حالة فى احدى المدارس الامريكية الخاصة فى دبى:

by

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ABSTRACT

Streaming, or tracking, that is, grouping students according to ability is a hotly debated topic in mathematics education. This study aims to examine the advantages and disadvantages of using streaming in mathematics as a differentiated strategy, followed by the following objectives: a) to explore teachers' perceptions of using streaming; and b) to analyse the impact of streaming on students' performance.Twenty-eight mathematics teachers at a private American-curriculum school in Dubai participated in a survey; then eight teachers and two mathematics coordinators of the middle stage gave semi-structured interviews. Additionally, document reviews were used to investigate the implementation of streaming in middle school mathematics planning, as well as its impact on students' performance.A literature review provides context and the history of the subject which showed that some international studies supported the use of streaming as an effective differentiated strategy (Linchevski & Kutscher 1998; Smith and Sutherland 2003).Whereas, other studies did not show enthusiasm toward streaming practice (Loveless 1998;Ireson, Hallam & Hurley (2005).

Triangulation in this study (survey, interview and document review) gives an in-depth understanding of the advantages and disadvantages of the five years of mathematics streaming at this school. Some advantages observed were: it helped higher achievers' critical thinking due to more advanced teaching; it facilitated the integration of technology, which made learning more interesting; and it enhanced students' performance scores in MAP assessment. The obstacles which prevent its successful implementation include the unification of curriculum and assessment among groups; discipline problems due to students' feelings of frustration from being included in lower groups; and inadequate teacher training in streaming practices. This study contributes to the body of knowledge of streaming in mathematics for middle school students. These findings may guide other interested researches to examine this area from different aspects such as the fixed mind-set, students' attitudes and the role of parents.

الملخص

لقد أصبح تقسيم الطلاب حسب المستويات , أى تقسيمهم لمجموعات حسب القدرات داخل الفصول أحد المواضيع الهامة فى تدريس الرياضيات. وهدف هذه الدراسة هو فحص مزايا وعيوب استخدام تقسيم الطلاب حسب المستويات في مادة الرياضيات كإستراتيجية مختلفة متبعة بالأهداف التالية: أ) استكشاف تفهم المدرسين لاستخدام التقسيم كإستراتيجية مختلفة , ب) تحليل أثر التقسيم على أداء الطلاب في الرياضيات. لتحقيق مثل هذه الأهداف , شارك 28 مدرس رياضيات في مسح مكون من أسئلة غير مفتوحة ثم شارك منسقان رياضيات و8 مدرسين رياضيات من مدرسة للمرحلة المتوسطة في مقابلات شبه مخططة. وبالإضافة لذلك تم استخدام مراجعات مستندية لإتاحة تفهم أكثر عمقا لتنفيذ عملية التقسيم كإستراتيجية مختلفة في تخطيط الرياضيات في المدارس المتوسطة وأثرها على أداء الطلاب.

كانت الدراسة عبارة عن دراسة حالة تم استخدام التثليث (المسح والمقابلة والمراجعة المستندية) لضمان فهم أكثر عمقا لمزايا وعيوب التقسيم في الرياضيات في المرحلة المتوسطة في مدرسة منهج أمريكي خاصة في دبى. وتشير النتائج إلى أنه قد تم تنفيذ استراتيجية التقسيم في المدرسة لأكثر من 5 أعوام. ومن أحد المزايا الملحوظة لاستخدام التقسيم في المدرسة: مساعدة أصحاب الانجازات عالية المستوى على دعم تفكيرهم النقدي من خلال مدهم بأساليب تدريس أكثر تطورا , تسهيل تكامل التكنولوجيا عبر كل مستويات المجموعة مما جعل التعليم أكثر متعة والمساعدة في دعم أداء الطلاب من خلال تحسين نقاطهم المحرزة في تقييم امتحان الMAP.

ومع كلٍ , توجد بعض المعوقات التي تم مناقشتها والتي تمنع التنفيذ الناجح لإستراتيجية التقسيم وهى: توحيد المنهج والتقسيم عبر المجموعات المصنفة ومشاكل خاصة بالانضباط تحدث في مجموعات المستويات الدنيا بسبب شعور الطلاب بالإحباط من وجودهم في مجموعات دنيا والتسمية المهنية الغير ملائمة التي تقدم للمدرسين فيما يخص ممارسات التقسيم وأثرها على أداء الطلاب. وسوف تساهم هذه الدراسة في استيضاح جوانب القوة والضعف الخاصة بالتقسيم في الرياضيات لطلاب المدارس المتوسطة والتأثير على أداء الطلاب ووعى المدرسين الخاص بتنفيذ الاستراتيجية في فصولهم. وربما توجه هذه النتائج باحثين آخرين يهتمون بدراسة هذا الجانب.

Dedication

I consider this dissertation to be one of the significant challenges in my life. This accomplishment is warmly dedicated to:

My mother, who is part of my soul

My dear husband, for all his efforts

My lovely son, for his encouragement

My mentor, Dr. Solomon Arulraj David, for his support

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First of all, great thanks to God Almighty for blessing me and helping me to complete my dissertation.

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CHAPTER ONE: INTRODUCTION

1.1 Background and Motivation of the study

Mathematics is considered a vital subject that must be taught to students during their learning process which helps them to think critically and to be able to face many challenges in their lives. "Mathematics is the most international of all curriculum subjects, and mathematical understanding influences decision making in all areas of life - private, social, and civil" (Anthony & Walshaw 2010, p.6).Therefore, many countries have attempted to enhance the quality of their mathematics curricula through adopting new teaching methods that help in enhancing students' performance. Streaming (tracking; grouping according to ability across classes), especially in mathematics, has attracted interest in many schools in different countries, as an innovative way to enhance the quality of mathematics curricula, through applying differentiated strategies which help in achieving equality and justice for students of different abilities.

The UAE is a country that is greatly concerned to improve the quality of its education, especially in mathematics. In 2008, the ministry of education (MED) initiated its strategy of reforming the mathematics curriculum in the UAE (Al Ghfeli 2017). This strategy resulted in a change from the traditional mathematics curriculum to an advanced one which is based on developing differentiated strategies of learning with a focus on meeting the different abilities of students.

Ability grouping was considered a controversial issue for many years (Loveless 1998). Many research studies have attempted to examine the effect of ability grouping on students' performance, self-efficacy, and teachers' attitudes (Van Houtte & Stevens 2015; Tieso 2003; Boaler 2000; Slavin 1995). The connection of streaming with students' achievement in international assessments such as the Programme for International Student Assessment (PISA) led ability grouping to be a highly interesting topic in the educational field (Golds 2014).The impact of streaming (ability grouping) in schools has been viewed as a debatable issue for many years. Many studies have examined its effect on students' performance and behaviour, and teachers' attitudes or willingness.

Slavin (1990) reported after conducting meta-analysis of streaming in secondary schools in the United States that streaming has little impact on students' performance, due to the negative impact that has been shown in the lower groups which eliminated the achievement noted in higher groups. However, other studies have shown that streaming is an effective method where students have benefitted from working in small groups (Anthony & Walshaw 2010; Golds 2014).It has been stated that ability grouping is a suitable strategy for the mathematics subject (Burris, Heubert & Levin 2006). Previous findings have been supported by stating that streaming is being viewed as an applicable method in mathematics due to its nature of being linear or cumulative that requires students to be classified according to their abilities in order for them to benefit more (Linchevski and Kutscher 1998) .

1.2 Statement of the Problem

Streaming is a differentiated strategy used to improve students' performance and help them to attain their learning outcomes at a proper pace according to each student's level and ability (Yassin et al. 2015). The main aim of a streaming strategy is to deliver an appropriate content to match each student's ability and understanding (Slavin 1990).The Dubai Schools Inspection Bureau (DSIB) emphasise on the importance of using differentiated strategies in the classroom to meet the needs of every learner by using real world applications: student-centred activities which encourage learners to think critically and to be more creative (DSIB 2017).

Although streaming has been implemented in many schools in the UAE, few research studies have been done concerning the advantages and disadvantages of using a streaming strategy in the middle stage and on teachers' perspectives toward implementing it in their classes. This study will shed a light on the lack of research concerning the use of streaming as a differentiated strategy in middle school mathematics classrooms. In addition, this study will attempt to examine mathematics teachers' perceptions toward implementing streaming in their school. Additionally, it will explore the advantages and disadvantages of using streaming in mathematics at the middle school stage (including grade 7and grade 8) in an American-curriculum private school in Dubai.

1.3 Purpose of the Study

The purpose of this study is to examine the advantages and disadvantages of using streaming in mathematics at the middle school stage in an American-curriculum private school in Dubai. In addition, this study aims to explore mathematics teachers' perceptions toward implementing a streaming strategy in their school.

1.4 Definitions of the Terms

There are many terminologies which are used for the topic of "**streaming".** These terminologies vary according to the country in which it is used (Golds 2014). Due to differences in research' designs and the use of some terms interchangeably, it has been important in this study to use the terms tracking, streaming and homogenous group to refer to ability grouping, while using the term heterogeneous groups refers to mixed ability grouping.

The terms "**ability grouping"** or "**grouping by ability"** are used in Britain where students are grouped according to their abilities, performance and attainment (Wiliam & Bartholomew 2004)."**Setting"** is a term referring to grouping students according to their abilities in certain subjects (Wiliam & Bartholomew 2004). It is known as "**streaming**" in the United Kingdom, New Zealand, Europe, and in Asian schools, whereas in the United States it is known as "**tracking**" and "**ability grouping**" (Wilkinson, Penney & Allin 2015).

1.5 Research Questions

The main research question was" What are the advantages and disadvantages of using streaming as a differentiated strategy in the middle school mathematics classroom in an American-curriculum private school in Dubai?

In addition, the research aimed to:

a) Explore teachers' perceptions of using streaming as a differentiated strategy in an American-curriculum private school in Dubai.
b) Analyse the impact of streaming on students' performance in mathematics in an American-curriculum private school in Dubai.

1.6 Rationale of the Study

I chose this topic for my research as I am mathematics teacher who has used a streaming strategy in my school for more than five years. I like teaching mathematics and all the time I am searching for interesting, innovative and motivated teaching methods to encourage my students and allow them to be engaged during the lesson. Students are usually not interested or engaged in mathematics lessons due to the learning through routine strategies which depend on memorisation only (Boaler & Staples 2008).

A significant change has taken place in the field of mathematics, in that the way of teaching mathematics has been adjusted from the traditional method, which depends on textbooks, algorithms and memorising rules with very limited use of materials or activities, to modern methods that focus more on critical thinking, searching and interpreting data. This research led me to ask myself about learning in streaming and whether it is an effective differentiated strategy in mathematics. There have been few research studies conducted in the UAE in this area but there are many international research studies that have been carried out concerning streaming in mathematics.

Some research has proved the effectiveness of ability grouping on students' performance and has shown positive attitudes from teachers toward practising it in their classes (Wilkinson & Fung 2002; Hallam & Ireson 2003; Linchevski & Kutscher 1998; Lorenz 1982). However, other research has not supported the idea of implementing streaming in general and has illustrated its disadvantages on students' performance and behaviour (the literature review in Chapter 2 will discuss this in detail).

1.7 Structure of Dissertation

The aim of this research was to examine the advantages and disadvantages of using streaming as a differentiated strategy in the middle school mathematics classroom in an American-curriculum private school in Dubai, and to explore how mathematics teachers perceive the use of this differentiated strategy in their classes, as well as to determine its impact on students' performance in mathematics. This chapter presents the background and motivation of the study, statement of the problem, purpose of the study, definitions of the terms, research questions, and rationale of the study.

Chapter 2 discusses the literature review of this topic including the conceptual analysis of streaming practices in mathematics through representing factors and differentiated methods used in teaching mathematics effectively, the theoretical framework which shows different types of grouping, and a history of streaming. It concludes with a review of the literature that relates to the advantages, disadvantages, and teachers' beliefs, and ends with a special consideration of mathematics' achievement and streaming implementation in the UAE.

Chapter 3 includes a comprehensive discussion about the design of the research, the main research questions and sub questions, participants' information, structure of streamed classes' groups, instruments used to collect data, validity and reliability, ethical considerations and the role of the researcher. Chapter 4 shows the data obtained from the study, its analysis and a discussion of the results. Finally, chapter 5 includes the summary of the study, key findings and conclusions, implications of the study, assumptions and limitations are discussed, recommendations and scope for future study, and finally it ends with concluding notes.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

2.1 Introduction

The literature review discusses the importance of learning mathematics and the successful ways of teaching it, differentiated instructions in mathematics, and differentiated practices. I specifically study streaming as one of the differentiated strategies in mathematics as my topic is concerned about this concept; I explore its advantages and disadvantages. Also, I will consider teachers' beliefs about practising ability grouping strategies in their classes. In addition; I briefly discuss mathematics achievements and streaming implementation strategy in the UAE. There is a substantial body of international research related to my research topic has been included in this chapter, as there have been very few studies on this topic in the UAE setting.

2.2 Conceptual Framework

2.2.1 Effective Literacy in Mathematics

Mathematics is an essential subject that teaches students how to make their own decisions in all aspects of life. This is because learning mathematics requires building understanding through investigation, problem solving, discussions and real-life experience (Haylock 2005).

Kilpatrick (2003) reported that successful learning of mathematics can be acquired through accomplishing five strands (see figure 1):

a) *Conceptual understanding* - awareness of basics, operations and connections in mathematics.

b) *Procedural fluency* - acquisition of appropriate skills to be able to perform mathematical procedures precisely.

c) *Strategic competence* - enhancement of capability for solving reasoning problems.

d) *Adaptive reasoning* - ability of thinking in a reasonable way.

e) *Productive disposition* - link mathematics to practical experience and real-life situation.

However, it has been noted that some students still find mathematics a difficult subject. This leads them not to engage and interact effectively in mathematics classes. Thus, utilising effective mathematical teaching methods can encourage these students and help them to be engaged. Anthony and Walshaw (2010, p.5) recommended some key elements that help in leading to successful mathematics teaching, such as: "an ethic of care, arranging for learning, building on students' thinking, worthwhile mathematical tasks, making connections, assessment for learning, mathematical communication, mathematical language, tools and representations, and teacher knowledge".

I think one of the most important elements above is "arranging for learning" which concerns the strategies teachers should use to prepare their students for working independently and with their colleagues. It has been stated that "Working with partners and in small groups can help students to see themselves as mathematical learners" (Anthony & Walshaw 2010). This strategy helps students to gain more self-confidence and to be encouraged to interact effectively in their groups.

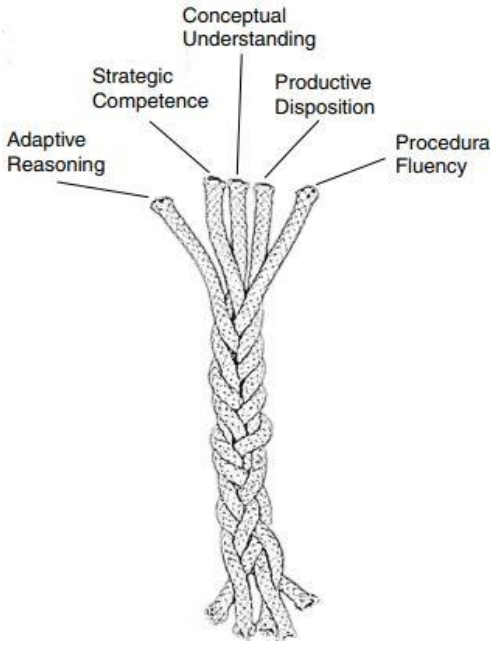


Figure1.Intertwined Strands of Proficiency

Source: (Kilpatrick 2003, p.5)

2.2.2 Differentiated Instructions in Mathematics

Classrooms in the 21st century include students with different cultures and linguistics backgrounds. Each student is distinctive. Students are different in their characters, intelligence, cognitive and physical abilities (Gregory& Chapman 2013).

Learners are different in their interests, experiences, and academic levels. Thus, effective teachers utilise different teaching strategies to meet these diversities. The term "differentiated instruction" has emerged in the field of education to serve these differences (Levy 2008).

Gregory and Chapman (2013) mentioned a good example about differences among students, that same–sized school uniform cannot fit all student 'sizes. Therefore it needs to be different (See figure 2). Differentiated instruction is defined as "a principle-guided method to approach teaching and learning, and it is implemented in the context of a classroom system that contains four interdependent elements: learning environment, curriculum, assessment, and instruction" (Tomlinson & Imbeau 2011).Also, differentiated instruction has been described as a set of procedures used to assist teachers to meet the different abilities of students and enhance their performances (Levy 2008).Effective differentiated strategies should use different plans and various learning materials, and provide alternatives to suit different levels of students (Gregory & Chapman 2012).

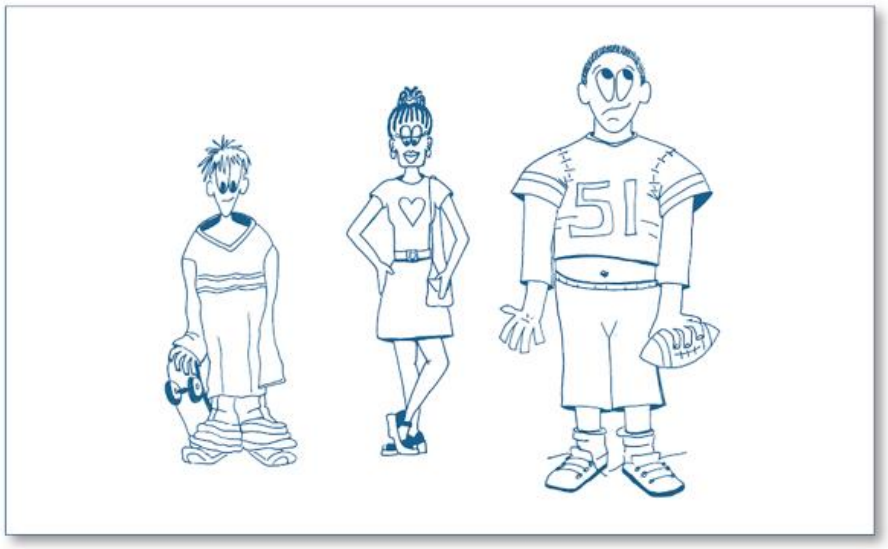


Figure 2.As with clothing, so with lessons: One Size Does Not Fit All

(Source: Gregory & Chapman 2012, p.2)

2.2.3 Differentiated instruction based on content, process and product

The key elements of differentiated instruction is based on utilising content, process, and product according to the students' strengths, needs and learning styles (Levy 2008).

2.2.3.1 Content

The content is what teachers teach, including knowledge, skills and understanding (Tomlinson & Imbeau 2011). Teachers can deliver the same concept to all learners through providing different types of activities varying in difficulty to suit learners' levels (Levy 2008). Gregory and Chapman (2012) suggested some key elements that should be accomplished to lead differentiated contents to be more suitable:

a) Content should be designed appropriately

b) Attractive to learners

c) Helps in engaging students

d) Has a specific aim

e) Its goals and objectives should match the district's common core state standards.

2.2.3.2 Process

According to Levy (2008), process refers to the strategies used in the classroom and the way knowledge is transferred to learners. Teachers should encourage learners to work collaboratively through group work, to participate and interact with each other. This helps them to gain more confidence especially lower-level learners as they will be able to participate and express their thoughts freely within the group.

It has been noted that successful teachers enjoyed using a mixture of different instructional strategies and utilised them effectively to meet students' differences in willingness, enthusiasm, and level of understanding besides, encouraging them to be engaged in the learning process (Berliner 1986; Stronge 2003).

Gregory & Chapman (2012, p.5) recommended some essential skills that should be taught to students to enable them to deal with 21st century challenges:

- "Thinking critically and making judgements
- Solving complex, multidisciplinary, open-ended problems
- Creativity and entrepreneurial thinking
- Communicating and collaborating
- Making innovative use of knowledge, information, and opportunities
- Taking charge of financial, health, and civic responsibilities".

2.2.3.3 Product

This refers to the ways students show what they have learned. This can be done by assessing students through pre-assessment, formative assessment, and summative assessments (Levy 2008). Tomlinson (2014) stated that successful teachers use innovative ways to let their students express what they have learned during lesson, such as using technological applications (PowerPoint, Padlets, interactive games) and students can have the choice to work individually or within groups. Patterson, Connolly and Ritter (2009) reported that the use of differentiated instruction has contributed to increasing students' performance in the Measures of Academic Progress program (MAP). In addition, it has positive impact on changing students' attitudes toward learning mathematics. Jacque Ensign (2012) stated that classifying students into small groups according to their level of understandings is considered an effective differentiated strategy.

2.3 Theoretical Framework

2.3.1 Differentiated Grouping Practices

Different types of grouping practices are used in differentiation to facilitate the teaching process and to meet the needs of different abilities of students, such as streaming, setting, within-class grouping, and mixed ability grouping (Sukhnandan & Lee 1998). Table 1 shows different types of grouping practices and their definitions.

Homogenous grouping refers to any kind of ability grouping (streaming, setting, within classes), while heterogeneous grouping refer to mixed-abilities groups (Sukhnandan & Lee 1998).

The next section of this literature review focuses on streaming, as it is an appropriate practice for my research topic.

UK Term (*USA equivalent*)	Definition
Streaming (*tracking*)	The method of assigning pupils to classes on the basis of an overall assessment of their general ability. Pupils remain in their streamed class for the majority of subjects. (GB. DES. HMI, 1979)
Setting (*regrouping*)	The (re)grouping of pupils according to their ability in a particular subject. Setting can be imposed on a whole year group or on a particular band at a time. (GB. DES. HMI, 1979)
Banding (*no equivalent*)	The year group is divided into two, three or four bands differentiated by ability. Each band contains a number of classes, which may vary according to ability or size. (GB. DES. HMI, 1979)
Within-class grouping (*no equivalent*)	This approach involves dividing a class into small groups and instructing each group separately. (Sørenson and Hallinan, 1986)
Mixed ability teaching (*heterogeneous grouping*)	Teaching groups include pupils of widely ranging abilities. The spread of ability in such a group depends upon the ability range for which the school provides. (GB. DES. HMI, 1979)

Table1. Key terms and definitions (source: Sukhnandan & Lee 1998, p.11)

2.3.2 History of Streaming (ability grouping)

Educational systems in many countries across the world are concerned mainly with raising achievement standards. This achievement can be tested through evaluating students' scores in national tests and examinations (Stobart 2008). It has been suggested that students' performance can be improved through grouping them by abilities (Hallam & Parsons 2012).

Slavin (1990, p.5) defined ability grouping as "any school or classroom organisation plan which is intended to reduce the heterogeneity of [the] instructional group". Ability grouping usually includes higher- and lower-level groups of the same subject.

Streaming is defined as a strategy of grouping students into separate classes according to their abilities in academic subjects such as English, mathematics, science, and social studies. Streaming was considered the most famous strategy for ability grouping after the Second World War (Sukhnandan & Lee 1998).This strategy aims to help students to achieve learning outcomes, based on their levels and pace of learning (Oakes 2005; Yassin et al. 2015). The practice of streaming is applied mainly in mathematics and science classes in many countries across the world (Wilkinson, Penney & Allin 2015).

In the 1950s, nearly all schools in the United Kingdom (UK) implemented a streaming strategy as a process of segregating students by their abilities (Boaler, William & Brown 2000). Streaming was used widely in the 1960s and 1970s (Ireson & Hallam 2001).However, a study by Jackson (2011) highlighted some deficiencies of streaming such as inequality among students; and less experienced and unqualified teachers have been assigned for teaching lower-level groups. During the 1970s and 1980s a mixed-abilities strategy had flourished as the government was concerned with educational equity which was not perceived in a streaming strategy (Boaler, William & Brown 2000).

However, in the 1990s the Westminster government emphasised the importance of implementing ability grouping again in their schools as a way of raising standards and achieving higher academic progress (Hallam & Parsons 2012). Accordingly, governments have adopted differentiated curricula and assessment settings (Hallam & Parsons 2012).Also, at the beginning of the 20th century, the US economy moved from agriculture to the industrial sector. This shifting led to a demand to establish more high schools to raise a generation able to serve the labour market. Policy makers emphasised on the importance of designing a differentiated curriculum that could meet students' different interests and attract them to complete their education (Loveless 1998).

Grouping students can be done by different criteria according to the decision of each school. Some schools classify their students into groups according to internal or national exam scores, while other schools allocate students into groups based on behavioural and motivational considerations (Davies, Hallam & Ireson 2003).

2.4 Review of the literature

This part of the study will discuss the literature related to the advantages, disadvantage and perceptions of teachers toward using streaming as a differentiated strategy. In addition, the review will show how mathematics reforms have been done in the UAE, as well as how streaming has been implemented in its schools.

2.4.1 Advantages of Streaming (ability grouping)

Grouping students by ability is perceived as a way of increasing academic standards (Huang 2009).Wilkinson and Fung (2002) stated that instructions in streaming showed a slight advantage than instructions in mixed-abilities classes. It has been stated that streaming is considered one of the best methods to enhance the performance of all students (Linchevski & Kutscher 1998).

Mathematics has been seen as "a linear progression of skills and number knowledge objectives to be mastered" (Golds 2014). Thus, it has been recognised that streaming is an adequate approach for teaching mathematics, due to its hierarchal structure (Linchevski & Kutscher 1998).Lorenz (1982) viewed the difference in students' abilities as a major reason which affected their achievements in mathematics. Therefore, grouping students according to their abilities could lead to deal with these diversities and enhance performance in mathematics.

Moreover, it has been recommended that the evidence of "fairness" in a streaming system came from the concept of achieving equality among all levels of students according to their abilities, which would be difficult to attain within the same class, whereas putting students into separate classes would facilitate their learning process and meet their abilities easily (Oakes 2005). In support of this, it has been perceived that teachers of mixed-ability classes find difficulties in serving different abilities of students in the same classroom (Hallam & Ireson 2003). Accordingly, Smith and Sutherland (2003) asserted that ability grouping provides more facilities to teachers regarding work organisation and as a method of motivating higher-level students. However, in mixed-abilities groups; teachers face difficulties in arranging their work and meeting the diverse needs of students located in the same classroom.

In sharp support of previous findings, Slavin (1990) defended the idea of ability grouping by explaining the various duties of teachers to different levels, as in higher-level groups teachers provide more opportunities for higher achievers by letting them practise more difficult problems, while those in lower-level groups, lower achievers, got more support from their teachers to enable them to understand the concepts smoothly. Moreover, teaching mathematics in mixed-abilities classes has not been seen as an appropriate strategy, while other subjects can be taught through mixed-abilities practices, such as humanities (Reid et al. 1981). In concurrence, many researchers have encouraged the idea of ability grouping strongly (Adams-Byers, Whitsell & Moon 2004; Chessor 2004; Fuchs et al. 1998).

In support of this, the OECD (2010) reported that the purpose of grouping students by ability is "to better meet students' needs by creating a more homogeneous learning environment and making it easier for teachers to teach". It has been asserted that differentiation in teaching approaches lead to more equitable outcomes (Boaler1997; Cohen& Lotan 1997; Linchevski&Kutscher 1998)**.** Loveless (1998) stated that grouping students into levels with an adjusted curriculum suiting each level is more practical in English and mathematics. In addition, ability grouping can have a positive impact on lower-level students in cases where they are not underestimated or depressed (Muijs &Dunne 2010).Grouping students by their abilities is perceived as an effective method for meeting the diverse needs of all students (Adams-Byers, Whitsell & Moon 2004).

It has been noted that ability grouping is very beneficial to be applied in physical education classes because students with less physical ability may get bullied by their colleagues with higher physical ability, which in turn can lead them to feel frustrated and embarrassed (Goodwin 1997).Many international studies perceived that working in small groups is beneficial for students' learning (Van de Walle et al. 2006; Jorgensen & Dole 2011). Moreover, it has shown that the performance of students in streamed classes is better than their performance in mixed-abilities classes (Kulik and Kulik 1992; Khazaeenezhad, Barati & Jafarzade 2012).

2.4.2 Disadvantages of Streaming

Ability grouping is considered a conflicted topic in English educational policies and studies. Many UK studies have pointed out some negative impacts of ability grouping on students' motivations and on the quality of teaching given to lower-level groups by less qualified or less experienced teachers (Araujo 2007; Forgasz 2010; Hornby, Witte & Mitchell 2011; Ward 2005). It has been reported that studies have not proved any notable advantages of ability grouping. Some disadvantages have been stated concerning lower-group students (Francis et al. 2016).It has been stated that ability groups or streaming has expanded the gaps in attainment among students, in which higher-level students performed better in cross-grouping while the achievement of lower-level students in cross-grouping is lower (Duckworth et al. 2009).

On the same perspective, it has been indicated that the high achievement in streaming (ability grouping) shown in many studies was due to the results of high achievers who benefitted more from streaming than lower achievers (Hornby, Witte & Mitchell 2011).Moreover, Hornby, Witte and Mitchell (2011) concluded that many benefits were being added to students in higher groups due to high expectations set by their teachers, while some problems have been raised in lower groups such as increasing behavioural problems and a reduction of student's motivation. In support of previous studies, Li (1998) indicated that ability grouping has become an arguable issue in the education field. Hanushek & Wossmann (2006) reported that mathematics results in streamed classes (See Table 2) showed low achievements in international tests (PISA and TIMMS).

Table2. Tracking and Mean performance

	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Secondary-school test:	PISA 03	PISA 00/02	TIMSS 95	TIMSS 95	TIMSS 03	TIMSS 03	TIMSS 99	TIMSS 99
Primary-school test:	PIRLS	PIRLS	TIMSS 95	TIMSS 95	TIMSS 03	TIMSS 03	TIMSS 95	TIMSS 95
Subject:	Reading	Reading	Math	Science	Math	Science	Math	Science
Early tracking	-1.053***	-0.951***	-0.062	0.597**	-0.021	-0.013	-0.410*	0.234
	(0.343)	*(0.287)*	*(0.135)*	*(0.222)*	*(0.157)*	*(0.161)*	*(0.219)*	*(0.370)*
Mean performance in primary school	0.676***	0.643***	0.965***	0.738***	0.928***	0.929***	1.045***	0.828***
	(0.139)	*(0.130)*	*(0.063)*	*(0.097)*	*(0.085)*	*(0.075)*	*(0.088)*	*(0.124)*
Constant	0.526**	0.475**	0.019	-0.184*	0.006	0.004	0.137	-0.078
	(0.230)	*(0.203)*	*(0.087)*	*(0.103)*	*(0.101)*	*(0.095)*	*(0.079)*	*(0.102)*
Number of countries	18	20	26	26	25	25	18	18
R^2	0.582	0.635	0.900	0.779	0.858	0.863	0.921	0.751

Dependent variable: Mean performance in secondary school. – Huber-White heteroscedasticity-consistent standard errors in parentheses. – Significance levels: *** 1 percent. – ** 5 percent. – * 10 percent.

(Source: Hanushek & Wossmann 2006, p.8).

In spite of the previously mentioned advantages of ability grouping (streaming), Slavin(1990) declared some drawbacks resulting from practising streaming, such as the lower amount of, and less qualified, instruction delivered to lower-level groups and lower expectations determined for these lower groups. These findings supported previous findings which stated that students in lower-level groups are more liable to depression, misbehaviour, social problems and more absent schooldays (Crespo & Michelena 1981; Wiatrowski et al. 1982; Marascuilo & McSweeney 1972).Slavin (1991) suggested that cooperative learning, which is used in mixed-abilities groups, is more feasible than mastery learning, used in ability-grouped classes.

Accordingly, the Publishing & Organisation for Economic Cooperation and Development (2012) recommended that ability grouping should not be implemented before secondary school due to its inequitable practices among students and that it did not show an increased achievement in their performance. One of the main indictments of streaming was the establishment of unequal opportunities among students, especially those who were in lower track (Loveless 1998). In support of this, Meijnen and Guldemond (2002) reported that ability grouping may lead students in lower-level groups to compare themselves with their colleagues in higher-level groups which resulted in feelings of dissatisfaction and depression toward their learning. Moreover, Smith & Sutherland (2006) mentioned that students in higher-level groups suffer from high pressure and great expectations set for this level which puts a great burden on them. Ireson & Hallam (2005) supported this finding by stating that

teachers give more homework and assignments to students in higher-level groups than those in lower-level groups.

On the same perspective, it has been reported that in spite of benefits gained by some students (higher achievers) due to the implementation of streaming, a majority of students (moderate and lower levels) have been denied academic and social improvement (Macqueen 2013).Moreover, Ireson, Hallam & Hurley (2005) stated that no considerable impact was noted from using streaming practice in subjects like English, mathematics and science. The two different perspectives shown above about the advantages and disadvantages of utilising ability grouping drive the importance of conducting more research concerning this topic. This will provide deeper understanding and clearer explanation.

2.4.3 Teachers' Beliefs toward Streaming (ability grouping)

Teachers' opinions toward ability grouping are affected by many factors, such as the kind of grouping that is being taught, type of subject, and teachers' experiences and qualifications (Hallam & Ireson 2003). In concurrence with this, Kim (2012) considered other factors that influenced teachers' attitudes toward ability grouping, such as the availability of required materials, curriculum plan, and effective professional training for teachers.

Many studies showed positive attitudes of teachers toward implementation of an ability grouping policy in their schools. However, some differences in teachers' opinions have been noted that depend on teachers' awareness and the type of subject being taught (Hallam & Ireson 2003).It has been noted that teachers who teach high-level groups become more eager and excited in teaching their higher achievers (Cook & Rosenbaum 1977). In support of this, a study by Hargreaves and Hargreaves (2013) indicated that the reason for teachers' preference toward teaching high-level groups was to avoid the behavioural problems existing in lower-level students due to the negative attitudes these students hold toward their schools.

Smith and Sutherland (2003) listed some strengths and weaknesses of ability grouping according to teachers' perceptions. The perceived strengths for ability grouping were as follows:

a) It fosters cooperation among teachers.

b) Makes teachers' preparation easier.

c) The homogenous nature in ability grouping helps more whole-class teaching to occur.

d) Helps teachers to be more focused and the work to be more determined.

The perceived weaknesses were as follows:

a) Difficulty in motivating students in lower-level groups
b) Difficulty in moving between groups due to differences in curriculum contents and levels of teaching
c) It has been seen that ability grouping is often fixed and inelastic.

A study by Worthy (2010) found that teachers perceived teaching styles used in lower-level groups as being simple and routine ones which depend on repetition. Kim (2012) indicated that some teachers may become less motivated when teaching lower-level groups. In support of this, it has been indicated that teachers prefer to teach higher-level groups more than lower-level ones (Ball 1981; Finely 1984).Hallinan (1994) pointed out that developing the differentiated strategies and practices that are used in ability grouping could help to reduce its disadvantages which have been mentioned above, in spite of its implementation in schools. This study was supported by another study by Allan (1991) who suggested that cooperation between teachers and parents could play a role in minimising the behavioural problems that can emerge from practising ability grouping.

A study carried out by Harries (2010) stated that middle school teachers in America guide instructions in tracked (streamed) groups and meet the diverse needs of students through different ways, such as: modifying the curriculum; using differentiated instruction methods; spending more time in academic support; and trying to reduce behavioural problems to give all students equal learning opportunities.

2.4.4 Mathematics Achievement and Streaming in the UAE

The UAE is one of the countries that are concerned with the development of its curricula to meet the needs and challenges of the 21st century. “The UAE Vision 2021 National Agenda emphasises the development of a first-rate education system. This will require a complete transformation of the current education system and teaching methods.” (The Cabinet 2018).

The Program of International Student Assessment (PISA) plays a great role in enhancing the performance of school systems in many countries across the world. PISA scores allow educational policy makers to determine the performance of students compared to the international standards, which in turn help them to improve the level of students with low achievements (Breakspear 2012). In 2009, the UAE engaged in the Program of International Student Assessment (PISA) that is carried out in 72 countries every three years. PISA is the most extensive international assessment used to evaluate students' achievement and determine differences in their performance (KHDA 2013).

KHDA (2013) noted that there was progression in mathematics achievement in PISA Assessment 2012 among 15-years-old students in the UAE, where average mathematics score has been raised from 453 in 2009 to 464 in 2012. (See figure 3.).However, Westley (2017) reported that the UAE's performance in the PISA test is still below the average standard. It has been viewed that the system of education in the UAE needed to be improved in order to face the economic and technological evolutions that have occurred in recent years (Gaad, Arif & Scott 2006). In 2011 for the first time, the UAE took part in an additional international assessment known as TIMMS. This assessment is used to assess grade 4 and grade 8 learners in both mathematics and science. TIMMS results aid decision makers in comparing students at UAE local schools with students studying internationally. This led to the development of the national curricula and educational system within the UAE (Al Ghfeli, M. 2017).

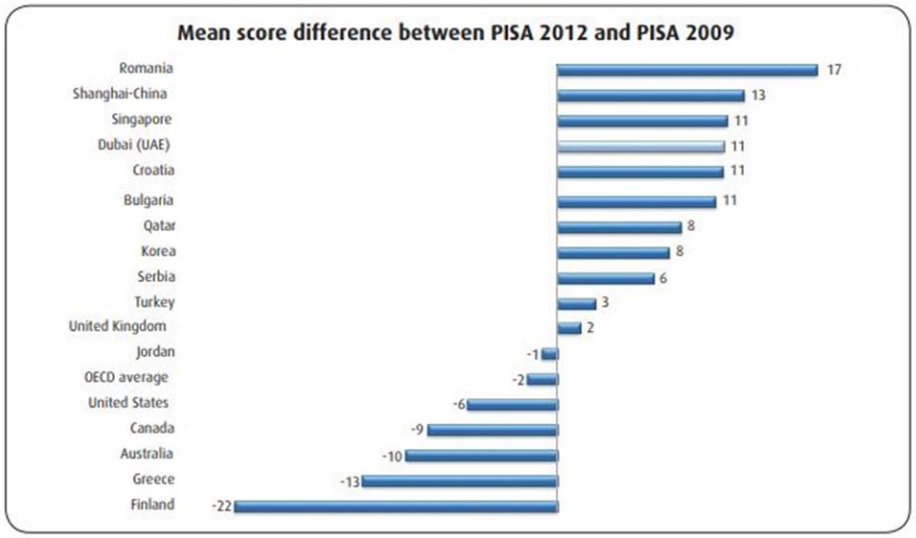


Figure3. Global trends in Mathematics Performance

(Source: KHDA 2013, p.23)

According to what has been mentioned above, the UAE policy makers sought to enhance the performance of its educational system through implementing new strategies that help to meet the different needs of students. The UAE has implemented streaming (ability grouping) recently in their schools to improve their students' performance and development (Howling 2017). In addition, a study conducted in the UAE by Mustafa (2002) showed that mixed-abilities classes have a negative effect on students' performance and inspiration. However, classifying students into groups according to their abilities helped in enhancing their progression (Howling 2017).

2.5 Summary

It has been noted from the literature review in this chapter that streaming has been perceived as an appropriate practice to be used in teaching mathematics to convert its traditional teaching methods to more interesting and modern ones. In addition, it was shown that streaming is a debatable issue which has studies that support it and prove its positive impact on teachers' attitudes and students' performance, while other studies appear to criticize its implementation and its impact on students' attitudes. Moreover, it was observed that no studies have been done in the UAE regarding the advantages and disadvantages of using streaming in mathematics. Thus, the purpose of this research is to present this gap.

CHAPTER THREE: METHODOLOGY OF THE STUDY

3.1 Introduction

This chapter presents the research methods that I used to explore the research question:

What are the advantage and disadvantage of using streaming as a differentiated strategy in a middle school mathematics classroom?

This chapter also includes: a discussion of the method used for this study and a description of the tools utilised for data collection; a brief explanation of participants' information; identification of groups' structure in the examined school; time planned for the study; accessibility and validity of the research; and assumptions and limitations of the study.

3.2 Research design

A case study is used in this research as a method of describing an educational phenomenon. Burns (2000) stated that a case study is an effective method that can be used to investigate many aspects within an educational field. Moreover, case study is viewed as a relevant approach for single researchers to discuss particular issues in depth (Bell 2014). This study was carried out in an American-curriculum private school in Dubai. A mixture of qualitative and quantitative methods was used in the study. The tools used for collecting data were surveys, interviews and document reviews. It has been mentioned that using different sources for gathering data in the case study gives it more power and relevance as it reflects numerous aspects and attitudes (Yin 2018). The use of various data collection tools in the research helps in gathering a wide range of perspectives and points of view that served the study (Yin 2009).

Although there are some arguments concerning the nature of a case study, such as the lack of generalisation, Flyvbjerg (2006) suggested that conducting a descriptive, phenomenological case study could lead to more demonstration, which helps in providing richness and value to the research context. In addition, it has been suggested that an educational researcher should provide valuable data with clear explanations about the sources of collecting this data, its analysis, interpretations and verification, to assure its relevance (Rose & Shevlin 2014).

Yin (2018) stated that building a detailed picture through examining a wide scale of perspectives with in the school is an effective method in educational research. The nature of

this study is a single-case study with descriptive design that aimed to provide a full description of the study's context (Yin 2009). Case study enabled to use different sources of data (Denscombe 2010) as in this study, three sources were used which are surveys, interviews, and document reviews. The use of mixed methods of quantitative and qualitative methods in a research provides deeper understanding and more detailed information (Robson & McCartan 2016; Wellington 2015).) .

3.3 Research question and sub-questions

Research question

- What are the advantages and disadvantages of using cross-grouping as a differentiated strategy in the middle school mathematics classroom?

The research sub-questions are:

- What are middle school mathematics teachers' perceptions about using streaming as a differentiated teaching strategy in mathematics classes?
- What is the impact of streaming in mathematics on students' performance?

3.4 Participants

The participants in the interviews were two Mathematics Coordinators (MC) and eight middle school mathematics teachers (MT) in an American-curriculum private school in Dubai. Mathematics coordinators were referred to as **MC01 and MC02** and the teachers were given codes from **MT01 to MT08** to assure their anonymity. All of the teachers who participated in the interviews had a degree in education and the majority have completed a Master in Education. An email was sent to all participants containing a brief description about the research, and a written consent form was included as an attachment.

3.5 Study population

Population has been described as a representative of all individuals or paperwork used in planning the study (Ngulube 2016).In this study, the population represented all mathematics teachers that practice streaming in their classrooms. From this population, only middle school mathematics teachers and mathematics coordinators were purposely selected.

3.6 Sample Size

A sample has been defined as a small part of the population who participated in the study (Denscombe 2007).In this study, 23 mathematics teachers have participated in the survey, whereas two mathematics coordinators and 8 middle school teachers participated in the interviews. The researcher chose the participants on purpose because it was noted that these participants would provide the study with relevant and required data.

3.7 Accessibility

The researcher got permission to access the studied school easily and obtain information, as well as the smooth communications that happened among participants. This was due to the position of the researcher as being an employee in the mentioned school.

3.8 Structure of Groups in Streamed Classes

The students in the studied school are categorised into four different groups according to their mathematical abilities and their results from diagnostic testing.

These groups are classified as follows:

a) **Ruby** - this group caters for students who are above the average level. These students can think critically and creativity in an independent manner.

b) **Emerald** - this group of students is also above the average level, but at times need to be led to think critically and creatively.

c) **Diamond** - this group caters for the students who are on the average level. These students understand the subject knowledge but struggle to go to deeper levels of thinking.

d) **Onyx** - this group of students are below average level. They find it difficult to obtain basic subject knowledge and require full teacher support.

Thus, academic streaming allows all students to learn effectively according to their own individual needs.

3.9 Research Instruments

This study used both quantitative and qualitative approaches.

- A descriptive quantitative method was performed through conducting a survey to discover the underlying dynamics of teachers' perceptions on using streaming as a differentiated strategy in the middle school mathematics classroom.
- Interviews were used in the qualitative method to explore the perceptions of middle school mathematics teachers and mathematics coordinators toward practising streaming as a differentiated strategy in the middle school mathematics classroom.
- Document analysis was used in the qualitative method to provide in-depth understanding about implementing streaming as a differentiated strategy in middle school mathematics planning, as well as its impact on students' performance.

3.9.1 Surveys

The survey was chosen in this study as the quantitative method of data collection to underlying dynamics of teachers' perception on using streaming as a differentiated strategy in the middle school mathematics classroom. Creswell (2012) stated that surveys have been used extensively in education research for many years. Cross-sectional and longitudinal is considered two main styles of research surveys designs. Cross-sectional design is used in this study as being more suitable design in education research (Creswell 2012). This style has been used to obtain information related to participants 'attitudes, beliefs, and opinions at particular time, whereas a longitudinal design needs to spend long time to gather information and examine participants' perspectives (Creswell 2012).

The aim of the survey is to collect data from large number of individuals who represent the views of the population to be examined (Bell 2018).This helps researcher to make appropriate comparisons and analysis using large segment of individuals (Robson 2016).All participants in the survey are being asked the same questions and they can answer through either self-completion questionnaire (as the case in this study) or through an interview .In education research, self-completion questionnaire is preferred to be used (Bell 2018).

The survey in this study was classified into two sections. The first section consisted of questions concerning demographic data about participants such as; age, gender, educational degree, and teaching experience years, whereas the second section was scale- rated

statements of five point Likert scale (Likert 1932) used to examine mathematics teachers' perspectives to ward using streaming in their classes. It should be mentioned that survey was not the only method used in this study for collecting data; interviews and document review were also used for data collection in order to provide more support and strength to the final findings.

3.9.2 Interviews

Interviews are viewed as one of the most effective tools for collecting data(Yin 2018).Interviews are used to gain participants' perspectives, and to understand their thoughts through facial reaction (Creswell 2008). Sidu (2006 p. 149) described interviews as "the mode of data collection involving verbal information from a case study participant". It has been stated that conducting interviews might help the researcher to apprehend the feelings, opinions and emotions of the participants more than any other collecting tool (Sidu 2006).

In this case study, the researcher selected interviews to be one of the tools for collecting data. Interviews were conducted with the mathematics coordinators, as well as the middle school mathematics teachers. The researcher conducted the interviews with participants who had an experience with cross-grouping (streaming) in mathematics. Each interview was recorded with permission from the participant. All interviews were transcribed to be read easily, and all data was then coded for analysis. The teachers interviewed were teaching grade 7and 8 classes, and they all had experience ranging from three to 14 years in Dubai schools.

Each teacher was interviewed once for 15-20 minutes using semi-structured questions. These questions are included in Appendix B. The interviews were conducted at a time that suited the participants. The participants chose their classrooms for the interviews to be carried out. Rich data has been provided from the interviews transcripts. Firstly, they have been read well and adjusted to ensure the accuracy of language and spelling. Then, I read them many times to draw out some general themes.

3.9.3 Document Review

Documents are viewed as a useful tool in qualitative research as they give essential data to the researcher. Documentation plays a large role in verifying and improving evidence collected from other sources (Yin 2018). Additionally, data collected from documents are

analysed easier than data obtained from interviews and observation which need to be transcribed first (Creswell 2012). However, sometimes it is difficult to be able to obtain these documents which is considered one of its limitations (Creswell 2014).I used document review to understand deeply how streaming is implemented among groups and its impact on students' performance.

3.10 Validity and Reliability

Validity is considered a controversial topic in education and social research as it has many definitions, not only one (Winter 2000). One of the definitions of validity was described by Hammersley (1987) as "An agreement between two efforts to measure the same thing with different methods". "Validity is an important key to effective research" (Cohen, Manion & Morrison 2011**).** It has been concluded that validity tends to be related to the word 'precision' which depends on the accuracy of the methods used in the research and the effectiveness of these methods to examine the goals of the study (Hammersley 1987).

The validity of interviews can be achieved through keeping the same interview questions throughout, and revising the transcripts which represent the interviews' results (Golds 2014). In addition, using participants' statements and quotes of their speech is another consideration to assure the validity of the interviews (Yin 2009).Validity has three types which are construct validity, internal validity, and external validity (Burns 2000).In this research, construct validity was represented by the use of multiple sources of evidence by utilising appropriate research methods.

The researcher has used three sources of data: surveys, interviews, and documents reviews. In addition, the use of triangulation (surveys, interviews, and documents reviews) through linking the findings of three sources of data collection ensure the internal validity in this study .However, external validity did not have significant role in this research as the purpose of this study is to examine only one case where the findings are not being generalised.

The reliability of the research represents the degree of stability and consistency of the research methods outcomes. Silver (2006) stated that reliability of the research can be achieved through using clear methods and procedures. In this research, all data collected has been utilised safely and honestly to serve the purpose of the study and keep participants' confidently.

3.11 Ethical Considerations

The ethical issues of the research are sets of measures that manage and control the research's plan (Bell 2014). It has been asserted that confidently of the participant is the most important aspect during conducting the research (Ayiro 2012).

There are some ethical methods have been done before conducting the research:

a. All participants have signed a consent form which indicated that they agreed to participate in the research, and they have been informed that they have a right to leave any time.
b. All participants have been provided by clear and full explanation of the purpose of the study, its benefits and any possible problems that may occur due to conducting the research.
c. All participants' identities have been kept confidential.

3.12 Role of the Researcher

Although the researcher has been a mathematics teacher from more than 12 years, the segregation of being a teacher from the role of researcher was an essential action that was been taken before conducting the research. The researcher decided not to be biased toward any personal experience or special viewpoint from the beginning of the research as this would have a negative impact on the research process. To accomplish this neutrality, the researcher used three instruments (surveys, interviews, and document reviews) to collect data instead of one, to verify and ensure the validity of data collected through different resources. Also, the researcher interviewed experienced teachers to obtain deep understanding and clear thoughts to analyse the results of the quantitative method by the qualitative one. Keeping the confidentiality of participating teachers allowed them to express their feelings freely and openly.

3.13 Summary

This chapter has reviewed main elements of methods used in this case study. The purpose of choosing participants and the way of selecting them have been mentioned. The approaches used for collecting data and analysing it have been discussed. Next chapter will present results and analysis of this study, as well as discussions about its findings.

CHAPTER FOUR: RESULTS, ANALYSIS AND DISCUSSIONS

4.1 Introduction

The scheme of this chapter was to link key findings to the existing literature on utilising streaming as a differentiated strategy in mathematics. The aim of this study was to provide in-depth interpretation about the advantages and disadvantages of using a streaming strategy in middle school mathematics classes and to explore mathematics teachers' perceptions toward using a streaming strategy in their classes. It was intended that this research would help to provide considerable understanding of the implementation of streaming as a differentiated strategy in middle school mathematics classes. This chapter discussed data gathered from three research methods: surveys, interviews and document reviews. The quantitative data in this study was represented by responses that have been analysed from conducting the survey with all mathematics teachers in the school who practised a streaming strategy (grade 5 to grade 12).The qualitative data was collected from two sources:

a) Interviews with 2 mathematics coordinators and 8 middle school mathematics teachers.

b) Official documents analysis which included differentiated mathematical lesson plans and results of MAP tests.

4.2 Quantitative results from the survey

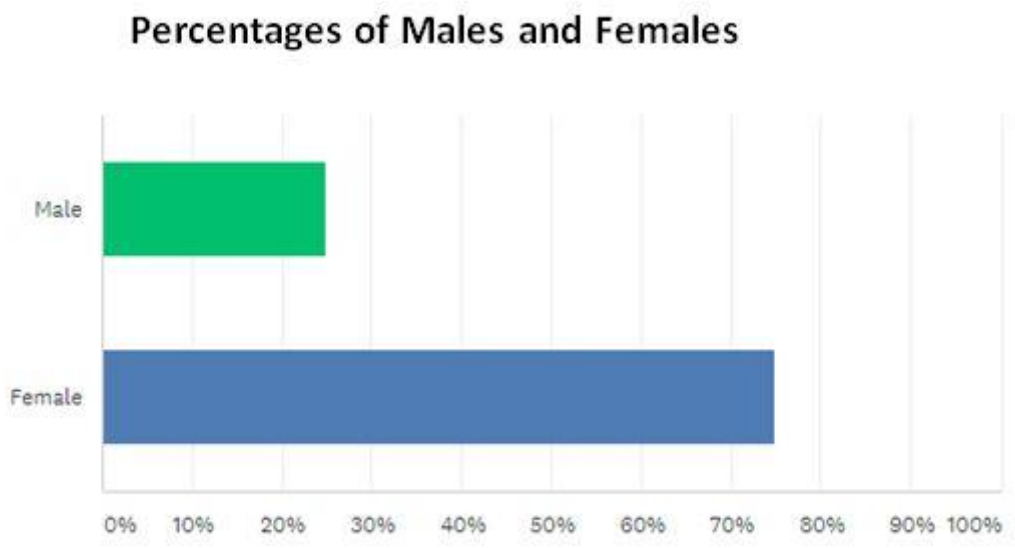
The researcher sent an email to all mathematics teachers in the school who use streaming as a differentiated strategy (grade 5 to grade 12). Out of 32 teachers, 28 responded to the survey questions. A consent form was attached with the email sent.

The survey conduction was used to discover the underlying dynamics of teachers' perceptions on using streaming as a differentiated strategy in a middle school mathematics classroom (see Appendix A for the survey). The findings shown below are the beliefs of the 28 participant teachers who answered the survey questions. Although this represented the opinion of 88% of study population, it did not represent the opinion of the whole school.

4.2.1 Section A. Demographics data

In my study, the participants' demographics were classified into age, gender, educational degree, and numbers of teaching years. I preferred not to include nationalities in the demographics section. However, 75% of participants were Lebanese and the rest were from different countries such as Egypt, Syria, Palestine, India and Jordan.

Figure 4: Gender of the participants



It can be clearly observed from the above graph that the percentage of females who participated in the survey was 75% while the participant males comprised only 25%. This is because there are a higher number of female mathematics teachers than male in this school. Out of 52 mathematics teachers in the school, 38 are female while 14 are male.

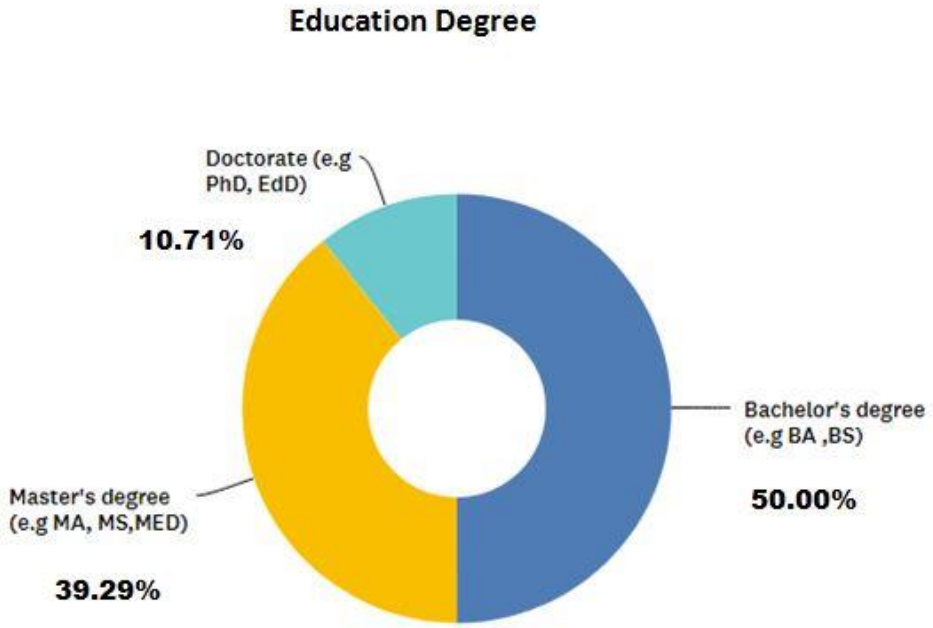
Table3: Age of the participants

Age of the participants

Age (years)	Number of participants	Percentage (%)
25-34	8	28.75
35-44	14	50
45-54	6	21.43

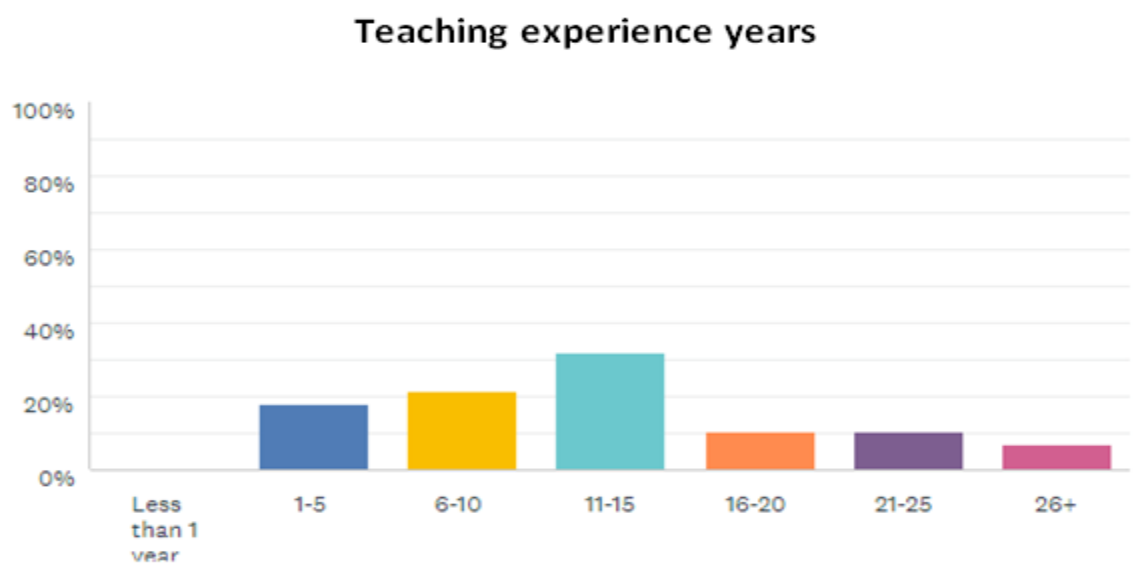
It can be observed from the above table that half of participants were between the ages of 35 and 44 years old. This indicated that these participants had sufficient years of experience, which will be shown in the next figure.

Figure5: Educational qualifications degree



The findings in figure5 showed that half of participants (n=14) had bachelor's degrees in education, while the other half had Master's (n=11) and doctorate degrees (n=3) in Education. It was important to mention the educational qualification degrees of my participants, as it was a positive indicator to have this percentage of higher degrees that helped in adding value to the study's results.

Figure6: Years of teaching experience



The findings in figure 6 indicated that out of 28 participants, half of them had between 6 and 15 years' of experience teaching mathematics. These years of experience were sufficient in this study to reflect effective and relevant opinions toward the implementation of streaming practices in mathematics classes.

4.2.2 Section Teachers' perspectives toward practising streaming (ability grouping) strategy in mathematics

My participants were requested to respond to the survey statements (Q6 to 10) by rating their agreement or disagreement about using streaming as a differentiated strategy in mathematics classes.

The scale rate levelling was as follows:

"Strongly agree", "Agree", "Neither agree nor disagree", "Disagree", and "Strongly disagree".

1. Believe that Streaming in Mathematics is an Effective Differentiated Strategy

Figure 7 showed findings that most participants responded positively to the belief that streaming in mathematics is an effective differentiated strategy. It was recorded that 17.86% (n=5) chose "Strongly agree" and 39.29% (n=11) chose "Agree". In spite of this majority that responded positively to this statement, some participants responded negatively toward viewing streaming as an effective differentiated strategy. It was shown that 14.29% (n=4) chose "disagree" and 10.71% chose "strongly disagree". 17.86% of participants (n=5) voted neutrally, "Neither agree nor disagree".

These differences in responses will be more deeply understood through analysing the data of interviews that were conducted with some of these participants to explore the perceptions of middle school mathematics teachers and the mathematics coordinators toward practising streaming as a differentiated strategy within the middle school mathematics classroom.

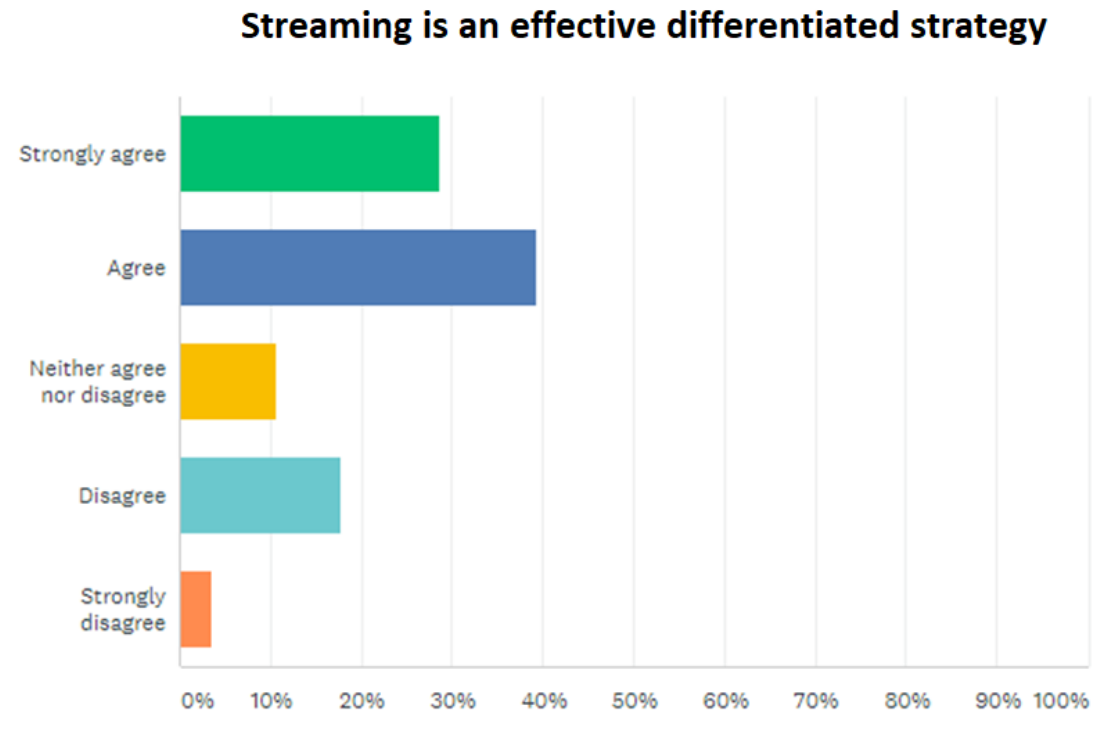


Figure 7: Believe that streaming in mathematics is an effective differentiated strategy

2. Believe that streaming in mathematics engages students

As shown in figure 8, it was clear that the majority of participants perceived that streaming engages students. It was shown that 71.43% (n=20) chose "strongly agree" and "agree" while 17.86% (n=5) chose "disagree" and "strongly disagree". In addition, 10.71% (n=3) preferred to choose "Neither agree nor disagree".

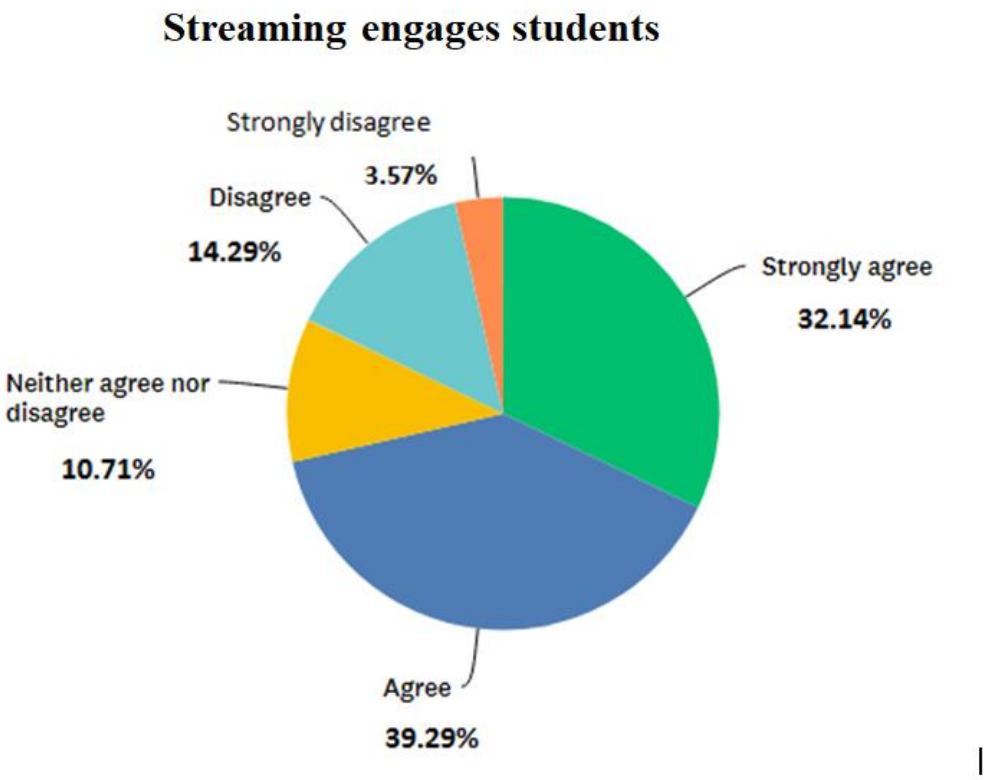


Figure 8: Believe that streaming in mathematics engages students

It was noted from figures 7 and 8 that most participants supported the use of streaming as differentiated strategy in mathematics classes. These findings are consistent with the findings of Tieso (2005) who asserted that grouping students according to their levels helps in increasing their motivation and encouraging them to enjoying the subject of mathematics.

3. Believe that students learn more in mixed-abilities classes than in streamed classes

According to table 4 and figure 9 below .It was shown clearly that participants have been divided between agreement and disagreement for this believe that mixed-abilities classroom can learn students more than streamed classes.

Although the percentages of "disagree 'and "strong disagree"(39.28%) were more than the percentages of "strongly agree" and "agree" (35.64%), the difference was not great, which indicated that there were two different perspectives toward choosing mixed-abilities classes or streaming classes to achieve better learning for students.

Participant responses	Number of participants	Percentage (%)
Strongly agree	2	7.14
Agree	8	28.5
Neither agree nor disagree	7	25.00
Disagree	10	35.71
Strongly disagree	1	3.57

Table 4: Believe that students learn more in mixed-abilities classes than in streamed classes

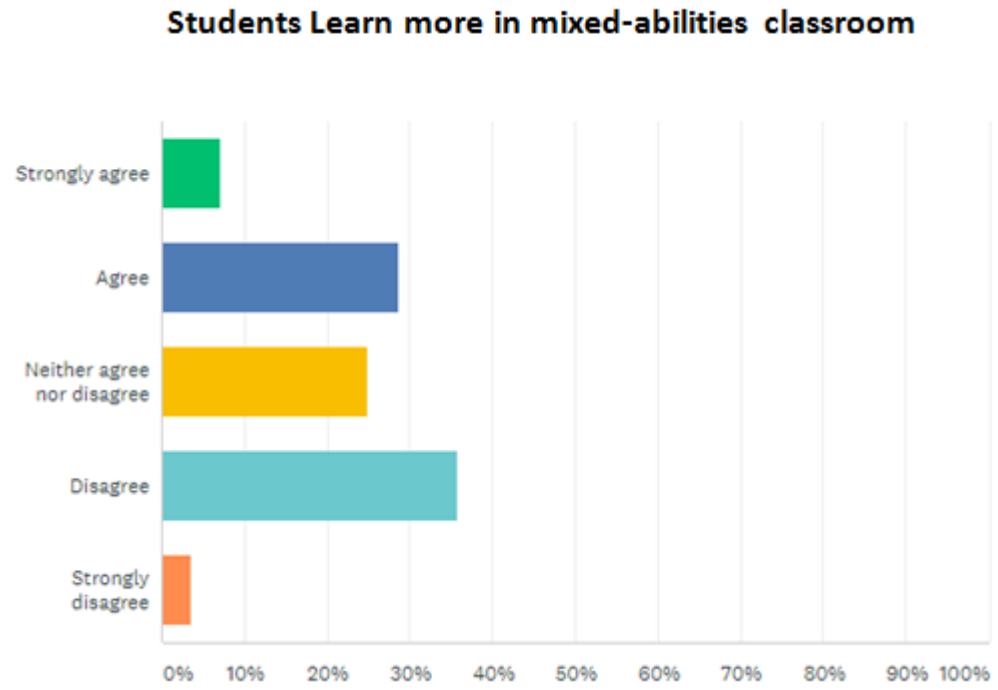


Figure9: Students learn more in mixed-abilities classes

4. Believe that streaming improves student's learning

It was shown from table 5 and figure 10 below that most participants perceived that streaming helped in improving student's learning, while a small percentage (21.42%) did not perceive that streaming improved students' learning.

Streaming improves students' learning

Participants' responses	Number of participants	Percentage (%)
Strongly agree	4	14.29
Agree	15	53.57
Neither agree nor disagree	3	10.71
Disagree	5	17.86
Strongly disagree	1	3.57

Table 5: Streaming improves students' learning

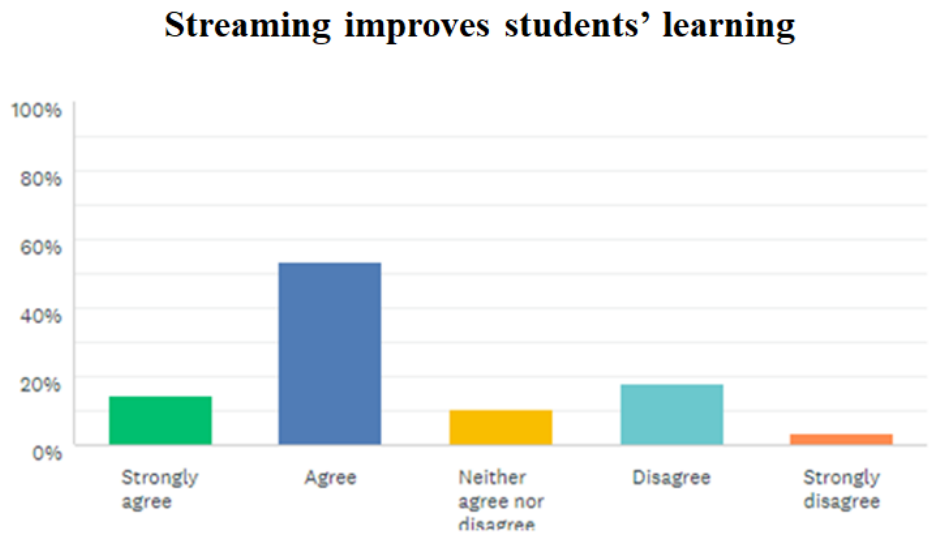


Figure10: Streaming improves students' learning

The findings from (figure 9, table 4) and (figure 10, table 5) mirrored various findings, in that some of them supported learning through mixed abilities and others supported learning through streaming classes. Ireson and Hallam (2001) stated that teachers preferred to teach in mixed-abilities classes than in streamed ones. In addition, Forgasz (2010) believed that applying streaming in middle school is not applicable. Accordingly, using mixed-abilities classes was seen to be more effective in case of differentiation. On the other hand, it has been perceived that streaming has played a great role in enhancing the performance of students and their self-efficacy (Kulik & Kulik 1992; Mustafa 2002; Khazaeenezhad, Barati & Jafarzade 2012).

4.3 Qualitative results from interviews

The findings from the interviews will be discussed in this section. The aim of the research question was to explore perceptions of mathematics coordinators and mathematics teachers on using streaming as a differentiated strategy in mathematics. Teachers' comments on the advantages and disadvantages of streaming were taken into consideration in terms of analysing the findings. In addition, verbatim quotations were included in the interviews findings to provide an in-depth understanding of participants' views and feelings, as well as used as evidence for researcher's interpretations (Corden & Sainsbury 2006).The interviews were semi-structured (Creswell 2012) and were conducted individually with participants; these interviews were transcribed and analysed.

4.3.1 Findings from the mathematics coordinators' interviews

The first findings were from the interviews which were conducted with the two mathematics coordinators (MC01, MC02) who are females with a Master's Degree of Education. Both of them were working as mathematics teachers and had taught in cross-grouping classes for years in the school before taking the coordination position. It was beneficial to listen to their perspectives from two different aspects as a teacher and as coordinator. Below are ten interview questions that were put to the mathematics coordinators, as well as their responses to them.

First question: Who decided **the implementation of streaming** in the school? How long has it been applied?

MC01 stated that the decision came from the head of department and had been applied since five years ago. MC02 explained that the benefit behind this decision was raising the level of students' attainment and achieving faster progress in their performance.MC01 added that enhancing students' attainment can be done through streaming by designing certain activities and exercises that suit students' levels, which in turn helps teachers to achieve the desired outcomes that suit their students' levels.

Second question: How are **students' performances** tested through streaming?

MC02 said, "Actually, we focus on testing the progression through formative assessments, drop quizzes and discussions in the classroom". She continued that the evaluation process of student's progression is done by comparing the previous assessment with the current one to see the progress. Additionally, MC01 pointed out the importance of MAP tests in evaluating the students' performance. Both of the MCs stated that this test is done three times during the academic year to track the progress of the student, and it shows great improvement in students' performance in all groups. Accordingly, MC01 said "I think that the improvement shown in the MAP test scores, especially for lower groups, is considered an indication of the successful implementation of cross-grouping within the mathematics department".

Third question: What are the procedures set for **evaluating the level of student** in each group?

MC01 expressed this by stating that "the evaluation depends on many factors, such as assessment results and teachers' feedback" In addition, she indicated that there are some exceptions that occur in the students' evaluation due to physiological reasons related to the nature of some students, for example those who can't be exposed to challenges or become overwhelmed, even though their marks are high and they can fit into the higher group.

Fourth question: Do you believe that this type of differentiation is **beneficial to students** regarding the **equity and attitude**?

MC02 responded, "Definitely it is suitable for students. Although we teach the same curriculum, we take into consideration the student's pace of learning according to his/her level of attainment and progress". Both of the MCs assured me that all students are taught the same curriculum but with different learning outcomes that suit their different abilities. MC01 gave an example of teaching "equations with variables on both sides"; she said that all students know how to isolate the variable and solve the equation, but in Onyx and Diamond" groups they may work on whole numbers only. Emerald group may work with rational numbers and decimals and Ruby group may be given word problems to explore the concept of the lesson. For students' attitudes, MC02 said that streaming has a great impact on the student's attitude, as when the lesson is being taught according to the student's pace of learning they feel more comfortable.

Fifth question: What are the **advantages of teaching** according to this strategy (streaming)?

Both MCs declared that streaming has many advantages to the teachers; one of the advantages is that streaming helps teachers to focus on the quality of activities that suit each group's level, unlike the mixed ability classroom which includes a wide range of varieties among students' levels that make it difficult for the teacher to meet all their needs. In addition, MC02 indicated that streaming has played a great role in satisfying the various needs and abilities of students, which helped in raising their levels of achievement.

Sixth question: What are the **disadvantages of this practice** (streaming)?

MC02 stated that one of the challenges in this system is the great effort and preparations required from teachers in teaching lower groups to achieve the desired learning outcomes, while MC01 regarded discipline issues as one of the important challenges teachers face in streaming. This issue is more prominent in lower groups than in higher groups, which in turn affects students' performance and concentration.

Seventh Question: How is **summative assessment** being conducted in streaming?

MC01 and MC02 both replied that the summative assessment is unified in all groups from grade 5 to 9; while from grade 10 to 12 it is differentiated. Also, they pointed out that special needs students in all grades have differentiated assessment that meets their needs and abilities.

Eighth Question: Do you think is it fair for students to have **unified assessment**?

MC01 said that "yes, it is fair because assessment is designed in a balanced way where 75% of the questions are matching the curriculum expectations and meet all students' abilities, while only 25% are left to target the expectations of higher groups.MC02 indicated that unified assessment is more practical in streaming because differentiated assessment will not give accurate results and the whole marks system will be compromised.

Ninth question: What are the procedures taken to **train teachers** regarding this practice (streaming)?

MC01 and MC02 both said that the mathematics department arranges professional development sessions for new teachers to train them how to work in cross-grouping classes, besides weekly meetings, which are held to follow up with teachers and listen to their comments to try to improve their performance.

Tenth question: Have you had any **feedback or comments from parents** about this practice?

MC01 stated that they always get feedback from parents through parent meetings or letters. Some is positive and others are negative comments. MC02 said that streaming is a new structure in math classes which is not easily accepted by all parents, as they prefer their children to be in mixed-abilities classrooms instead of being separated according to their levels.MC01 and MC02 both emphasised on the importance of clarifying the rationale behind this practice and its objectives to the parents as they play a great role in their children's learning process.

4.3.2 Findings from the mathematics teachers' interviews

The next findings are from the eight individual face-to-face interviews with the middle school mathematics teachers. The interviewed teachers were working with students aged between 11 and 13 years old. Although the school has students with different backgrounds, the majority students are Emirati. The teachers who participated in the interviews had experience in mixed-abilities classrooms which was a positive point that helped in comparing the current practice (streaming) with the previous one (mixed-abilities).

The interviews with the eight teachers who participated resulted to the following themes that are presented below in thematic analysis (Table1).

1. Planning in streaming
2. Impact of streaming on students' attitudes
3. The role of technology used in streaming
4. Streaming and the curriculum
5. Assessment

Thematic analysis of findings

Braun and Clarke (2006) stated that thematic analysis is considered an effective method in testing different participants' points of view. In addition, it has been mentioned that "Highlighting the process of how to conduct a trustworthy thematic analysis may be a positive contribution to qualitative research as a methodology and help to the advance the elusive research method: thematic analysis" (Nowell et al. 2017, p.11).Table 6 below shows a thematic analysis of the semi-structure interviews used in this study.

Table6. Emergent themes based on analysis of semi-structured interview responses

Themes	**Interview responses**
Theme 1: **Planning in streaming**	MT01 - No difference between planning in streamed and mixed-abilities classrooms MT02 – Differentiated strategies should be given to lower groups. MT03 - No change in planning happened when teaching streaming than mixed-abilities classrooms MT04 - Planning in streaming needs more time and effort MT05 - Simple instructions are planned to lower-group students that might lead to negative impact on their performance MT06 - Planning in streaming depends mainly on homogenous groups not heterogeneous groups MT07 - Planning in streaming includes differentiated planning strategies that suit all levels MT08 - Planning in streaming requires different activities to meet all students' needs
Theme 2: **Impact of streaming on students' attitudes**	MT01 - Streaming is more beneficial to higher groups than lower groups MT02 - Streaming motivates students in higher groups more than those in lower groups MT03 - Streaming challenges students in higher groups and increases their motivation

	MT04 - Streaming causes frustration to students in lower groups MT05 - Streaming limits the expectations of lower-groups students MT06 - Students in lower groups avoid solving higher critical thinking problems MT07 - Streaming leads lower-group students to rely more on their teachers MT08 - Teachers in streaming should act as facilitators.
Theme 3: **The role of technology used in streaming**	MT01 - Technological application saves more time and is an effective tool in mathematics streaming practice MT02 - Technology is an essential tool in streaming but not used as differentiated strategy MT03 - Technology plays an important role in streaming MT04 - Technology plays a significant role in streaming MT05 - Technology is an essential tool in streaming but not used as differentiated strategy MT06 - Technology helps in building a strong relationship between students and their teachers MT07 - The use of technology in streaming is more effective for students with special education needs MT08 - Technology plays an important role in enhancing students' performance

Theme 4: **Streaming and the curriculum**	MT01 - Some lessons are required to be covered in a short period due to the unified curriculum MT02 - Differentiation should exist in the curriculum MT03 - I care about students more than caring about finishing the curriculum MT04 - Curriculum and assessment are the same across all groups MT05 - There should be differentiation in the content of the curriculum Mt06 - Curriculum should be designed to meet the needs of every level separately MT07 - Quality of the curriculum is more important than its quantity MT08 - No differentiation exists in the curriculum or assessment of streaming.

Theme 1: Planning in streaming

This theme talked about the workload needed to meet planning requirements. Many participants stated that although groups are separated according to students' levels, they still have differences in the same group which required different plans, activities and strategies in the same group to meet all students' needs. These findings differ from the international findings which regarded streamed classes as having students with the same abilities in each group (Wiliam & Bartholomew 2004).

In addition, findings showed that most of participants believed that planning for streaming was similar to the planning for mixed-abilities classes, as they were putting in the same effort in differentiated planning. From another perceptive, my findings were not consistent with

those of Wiliam and Bartholomew (2004) who indicated that teachers in streaming used little or no differentiated plans. However, same teachers used various differentiated plans, strategies and activities when they taught mixed-abilities classes.

Furthermore, another point was discussed in this theme with my participants, which is the great difference between the types of teaching strategies planned to be given to lower groups, and those planned for higher groups. In lower groups only direct instructions and simple problems are given, while in higher groups more inquiry-based learning is provided with high critical thinking questions. Out of eight participants, three of them showed dissatisfaction toward these differences among groups. MT05 said that "using direct instructions and simple problems in lower groups will have a negative impact on the students and restrict their learning capacity".MT07 stated that, "It is not fair to limit students' abilities as they are being classified as lower groups by giving them direct applications, while in higher groups they practice higher thinking questions". It was noted that some participants were not satisfied on giving students in lower-groups simpler contents than those in higher-groups.

MT06 believed that working with a heterogeneous group as in a mixed-abilities classroom is more effective than that with a homogenous group which is mainly used in streaming classes. However, other findings were inconsistent with these findings as they indicated that putting students in a homogenous group helps teachers to minimise varieties among students' levels and to be able to meet students' needs more effectively than in a heterogeneous group (Wilkinson & Fung 2002).

The other five participants stated that planning in streaming is more focused than planning in mixed-abilities classes. They mentioned that planning in mixed- abilities classes needs more effort and detailed plans to meet a wide diversity of abilities.MT03 believed that higher groups benefit a lot from streaming practices, especially in the quality of activities designed for these higher levels. These types of activities help in enhancing higher achievers' critical thinking skills and increase the challenges among them which allow them to feel more motivated and interested.

MT02 emphasised on the importance of giving students in lower-level groups different teaching strategies than higher-level groups; they should be more guided and simpler. This is similar to the findings which indicated that students in higher groups should be given more independent work and higher critical problems, while students in lower groups should be

given more instructions, guided strategies, and concentrate more on basic skills (Ireson & Hallam 2001).

It was shown from the findings that some of the participant teachers preferred not to deprive students in lower groups from practising higher critical thinking such as problem solving. I think that real-life problems are very important to be taught to all levels of students in spite of their classification. The problem-solving skills help students to improve their mathematical performance. However, I believe that in spite of cancelling these types of problems to lower groups, they can be given with different levels of difficulty that suit each group's ability. In support of this, Askew (2016, p.18) stated that, "This involves thinking about how we encourage a classroom community that is a co-operative collective rather than a collection of individuals".

2**. Impact of streaming on students' attitudes.**

Most of the participants confirmed that streaming is beneficial and more practical in higher groups than in lower groups. In higher groups students like challenging themselves and achieving better marks which help in increasing their motivation and willingness in their learning process. However, the participants mentioned that in higher groups, more challenging questions should be given to the students to raise their expectations and show them that there is still more knowledge to be acquired.

MT03 said, "Many students in higher groups show self-confidence as higher than it should be; which sometimes could have a negative impact on their performance. They always need their teachers to remind them that they still have a lot to learn". This comment shows that students in higher group still need their teacher's support and guidance as those in lower group. For lower groups, most of the participants mentioned that the main negative aspect facing students in lower groups is their belief that they are not able to do more as they are lower-level students. This, in turn, affects students' performance and their abilities to exert more effort to enhance their achievement and therefore to be able to shift to higher groups.

MT06 said, "Students in the lower group give up on thinking of more critical problems and if I try to push them for higher thinking questions, they might refuse because they believe that they can't do it because they are in the lowest group". This last comment shows that students

in lower groups may get depressed and frustrated which needs a great support from their teachers and school administrators to solve this issue.

In addition, some participants raised an important point that may cause a great problem on student's attitudes and their psychology from their point of view, which is the time when a student shifts from a higher group to a lower one due to a deterioration in his/her marks. MT04 said, "One of the worst situations I face is when one of the students shifts from a higher group to a lower one due the failure of attaining the required grade in this group. Unfortunately, these students suffer from depression and frustration due to this change". MT04 continued by declaring that this shifting sometimes oppresses the students because there are other reasons than marks or students' abilities that may affect their grades, such as personal reasons (parents' divorce, mother's illness, economical issues).These two comments might draw attentions to consider other factors than marks during movement from one group to another.

Another point of view was mentioned by MT03and MT07who assured that lower-level groups depend mainly on the teacher in streamed classes, while if they would have been in a mixed-abilities classroom they could learn from higher-level colleagues rather than relying mainly on their teacher. This would have a positive impact on their performance and encourage them to participate and interact in the class. MT07 said that "students of lower-level groups depend mainly on their teacher", so it has been suggested that if they were in a mixed-abilities classroom, they would share knowledge with their colleagues and interact in their discussions which will help them to be more confident and independent. This finding is consistent with findings of Boaler (2009) who suggested that teaching mathematics in a heterogeneous (mixed-abilities) group let students feel more excitement and enjoyment and showed more progress.

MT08 added that "teacher should be a facilitator who provides a supportive classroom environment and teaches students how to help each other and share experiences with their colleagues". It has been noted from the responses that most of participants viewed that streaming is more useful in higher-level groups than in lower-level groups, as they saw that this practice was not in the interest of students in lower groups. These findings are consistent with what has been mentioned, that teachers like teaching in mixed-abilities classes more than in streamed classes, where more expectations are made for higher groups, while lower groups are restricted by lower expectations (Ireson & Hallam 2001). This study is

inconsistent with findings of Mustafa (2002) which stated that primary and secondary teachers' attitudes toward mixed-abilities groups were negative and unsatisfactory.

A study by Oakes (2005) supported these findings in which students of higher groups got more learning opportunities than students of lower groups, Moreover, students in lower groups tended to have lower ambitions than those of higher groups. However, the study of Kulik and Kulik (1992) pointed out on the advantages of streaming to lower groups students which helped in increasing their self-confidence when they worked with their similar level colleagues. In addition, many findings stated that most teachers have a positive perspective toward practising streaming in their classes (Linchevski & Kutscher 1998; Oakes 2005; Zevenbergen 2005). Accordingly, these findings interpreted the findings of the survey (in this study) when participants were asked about whether students learn more in mixed-abilities classes than in streamed ones. It has been shown that the percentage of participant (35.64%, n=10) who preferred to teach in mixed-abilities classes was close to the percentage of participants (39.28%, n=11) who preferred to teach in streamed classes.

I believe that, although streaming is more beneficial in higher groups and increases students' motivational sprits, it can also be helpful for lower groups if it is utilised in an efficient way. This can be done by giving students in lower-level groups the same opportunities that are given to students in higher-level groups, such as independence, responsibility, and critical thinking strategies. Students in lower groups can be treated as students in higher groups but in a way that suits their abilities. For example, if higher groups are given tasks to be searched for on the internet by themselves, lower-level group students can be given the same tasks but to be done in the class with the help of their teachers instead of doing it alone. Also, for real-life problems, students in lower groups can solve them with clue words that are highlighted to help them identify the mathematical operations that will be used in these problems, or by dividing the problem into several steps to encourage their thinking.

3. The role of technology used in streaming

This theme concentrates on the integration of technology and its importance in streaming practice. All participants stated that technology plays a great role in students' learning process and especially in the differentiated groups. Moreover, participants stated that technological activities used with higher groups differ from those given to lower groups. MT03 said, "Technology plays an enormous role in differentiation and it takes a big part in

my class. For example, in higher groups I allow them to search to get a specific formula or getting a rule, and for lower groups I use technology as an assistive aid for more practice to be able to understand the concept of the lesson". It was noted that technology was utilized effectively among different groups of streamed classes in this school.

Most participants mentioned that the use of technology has enhanced the cognitive skills of students especially in mathematics as there are many applications that suit different abilities and meet the needs of all students. MT06 said "My students created a WhatsApp group for open discussions and asking questions for topics they don't understand, I found it very effective and saved more time; besides, it helps in building a good relationship with my students". Two participants (MT02, MT05) out of the eight confirmed that the use of technology is essential in their classes. However, they don't use it as a differentiated strategy. MT05 said, "I use the same application for all the class but I let every student solve as much as he/she can do".MT02 indicated that using the same application in mathematics lessons helps students to interact together and help each other; this leads to create a cooperative learning environment in the classroom, where students can helps their colleagues.

MT01 and MT07 both indicated that using technology in their streamed classes helps in saving more time and improve students' performance, especially students with special needs. It has been noted clearly from the findings that technology plays a great role in mathematics streamed classes for all levels and it is used by most of the mathematics teachers but in different ways: some of the teachers use it for a differentiation strategy, while others use its applications for the whole class to encourage students to cooperate together.

These findings are consistent with the findings of Shaughnessy and Sunderman (2013) who asserted that using technology in mathematics lessons enhances students' self-efficacy and increase their motivation toward solving critical thinking problems. In addition, it has been believed that integrating technology in schools improves the performance of students with special needs (Blackhurst 2005).From another perspective, Aagaard (2016) believed that technology has a great impact on getting information but at the same time it can lead to the distraction of students' attention. It can be concluded that, technology is a very useful tool in the learning process but it should be used in an effective way with the supervision of the teacher. For lower groups, one of the participants (MT04) stated that using technology in lower groups is beneficial; however, sometimes these groups need more work papers to understand the concept better, such as support worksheets.

4. Streaming and the curriculum

The fourth theme that came out focused on the curriculum structure in mathematics streaming classes. As Ruthven (1987) pointed out, mathematics is perceived as having hierarchical structure. It has been seen that students should be taught the contents that suit their levels (Zevenbergen 2002). In addition, it has been stated that regarding the curriculum; streaming helps teachers to work in an easier and more organised way (Ireson & Hallam 2001). Accordingly, streaming allows teachers to select the suitable learning objectives and arrange the curriculum according to students' levels of understanding and performance (Zevenbergen 2002).

However, many participants stated that having the same curriculum and same assessment is not practical for lower-level groups. MT04 said that although there is differentiation in groups, the curriculum and assessment are still the same for all groups. This places a great burden on teachers especially those who teach lower-level groups because they are forced to finish all the required materials for the curriculum. This is somewhat similar to international findings which state that grouping students into levels and giving them the same curriculum is not practical and does not have any positive effect on students' achievement, while if the curriculum is adjusted to suit each ability level, it will have a great impact on students' performance (Loveless 1998).

MT02 said that there must be differentiation on the curriculum to be aligned with streaming targets which aim to meet the needs of students according to their abilities.MT01 stated that she was forced to teach some lessons in a very short period of time because these lessons would be tested, in spite of her students' understanding capabilities, especially in lower-level groups who need more time and effort to understand the concepts of these lessons.

MT07 emphasised on the importance of focusing on the quality of curriculum, not on its quantity, and not to consider the curriculum as just a number of lessons that should be taught. MT03 said, "Really, I don't care about curriculum; I care more about my students. For example, my students in higher groups are fast learners who don't need too much effort to get the idea of the lesson, while in lower groups I have to revise some requisite information which takes much time to be learnt". MTO3's comment was a positive indication of teachers' interest in giving students enough time to understand their lessons, in spite of only trying to finish the curriculum.

However, most of the participants indicated that the unified curriculum did not hinder them from practising various teaching strategies that suit each group. For example, in high-level groups teachers use more advanced language and learning methods, whereas in low-level groups; simpler vocabulary, more repetition and visual aids are used.

5. Assessment

The participants stated that students in streamed classes are assessed through different types of assessments such as diagnostic tests, quizzes, summative assessments and international assessment, where the MAP test is one of the important tests used for evaluating students' performance. Some of the participants (n=3) showed dissatisfaction toward unifying the summative assessment in all groups. Participant MT03 said, "Although unified assessment includes only 10% of higher thinking problems, lower-group students feel frustrated when they are not able to solve these problems". Participant MT08 supported the same idea: "It is not fair to bring the same assessment to all group levels where they are separated due to their differences in academic achievement".

However, five out of eight participants supported the idea of the unified assessment. Participant MT02 believed that it is fair because if students in lower-level groups get a special exam which suits their level, this will limit their capabilities of doing better and they become satisfied with this level only. In support of this, participant MT01 stated that unified assessments would encourage students to do their best in order to pass and get better marks which leads to an increase of the challenging among all groups and enhances their performance. Participant MT05 assured that preparing students to solve all type of questions will help them when they enter university as there is only one exam for all students, so they need to get used to following the same style of exams. It was noted above from participants' responses that some of them were satisfied with assessments' unification while others were not satisfied and asked for differentiation.

However, in the MAP test most of the participants agreed that their students' marks have been improved even in lower groups as this test is not related to the curriculum, while it tests the knowledge and prerequisite information students have acquired. These findings are aligned with the findings of the document analysis that will be discussed in next section, as

the results showed an improvement in students' scores in all groups. For example, a mathematics teacher can use different activities with various degrees of difficulty in teaching one-step equations. That one activity can include problems with integers only, another activity can include problems with decimals, and a higher-level one can include word problems with decimals and fractions.

4.4 Qualitative results from document analysis

The aim of the document review was to understand in depth the strategy of streaming in mathematics through comparing these results with other data sources (interviews, surveys) to determine if the goals and objectives of this strategy are being accomplished.

In the document review, I used one mathematical lesson plan of grade 7 to examine the differentiation plan that is applied among groups and the way it is being implemented. The lesson plan structure will be explained below in detail. The researcher obtained the results of MAP tests for two consecutive years (2016-2017) of grade 8 which includes four different mathematics groups' levels (Ruby, Emerald, Diamond and Onyx) to investigate the students' performance in streamed classes which will be displayed in this section.

4.4.1 Mathematical Lesson plan of grade 7

The lesson plan is done through a computer program known as Atlas Rubicon .This program was implemented in the school in 2016 (see figure 11).

It is used to develop the school curricula in all subjects through many functions:

a) Improve the quality of lesson plans.

b) Align the curriculum with common core standards.

c) Ensure the mapping of the curriculum.

d) Highlight the chosen power standards to improve students' learning outcomes.

Figure11.Atlas Rubicon program

Appendix 5 shows a curriculum design for a mathematics lesson of grade 7. It is classified into stages:

Stage 1: Represents the desired outcomes

Stage 2: Represents the assessment evidence

Stage 3: Represents the learning plan with differentiated instructions.

It is shown that elements of the curriculum are combined and considered as a whole body which reflect an effective curriculum (Ornstein, A., & Hunkins, F. 2009).

As shown in figure 12 below, I focused on the part of differentiation instruction in a lesson plan for grade7 and analysed it to understand in depth how a streaming strategy is implemented.

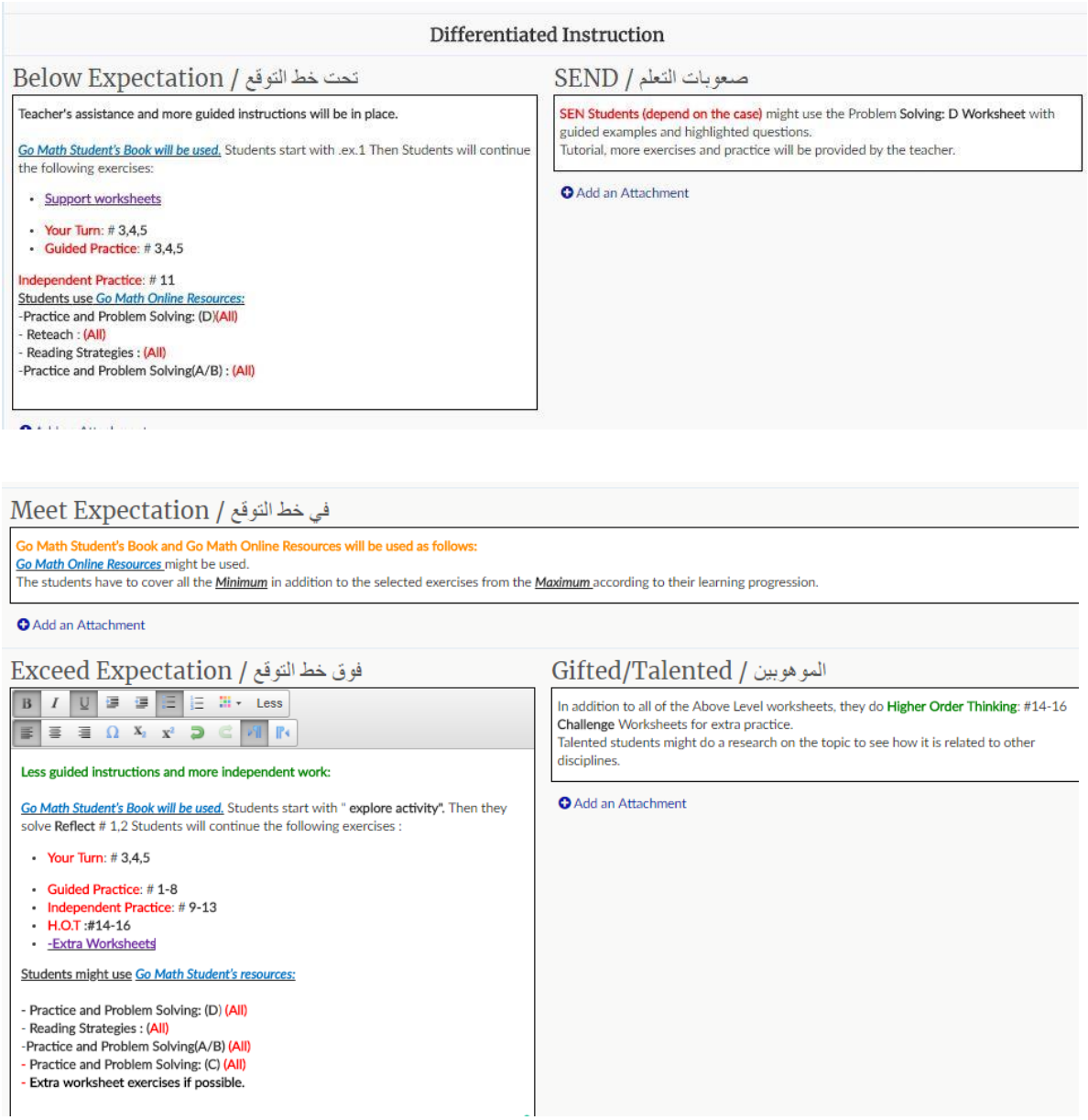


Figure12.Differentiation instructions of lesson plan in grade 7

It has been shown above that different types of questions are given according to the level of each group. More guided instructions and teacher's assistance are given to lower groups (Diamond and Onyx), while less guided instructions and more independent work are provided to higher groups (Ruby and Emerald).For special educational needs students (SEN), different worksheets are assigned to meet their special abilities.

In the part of "Exceed expectations", higher groups (Ruby) practise more critical questions with extra worksheets. However, in the part of "Below expectations", lower groups (Onyx) are given support worksheets with extra practices. In the "Meet expectations" part, middle

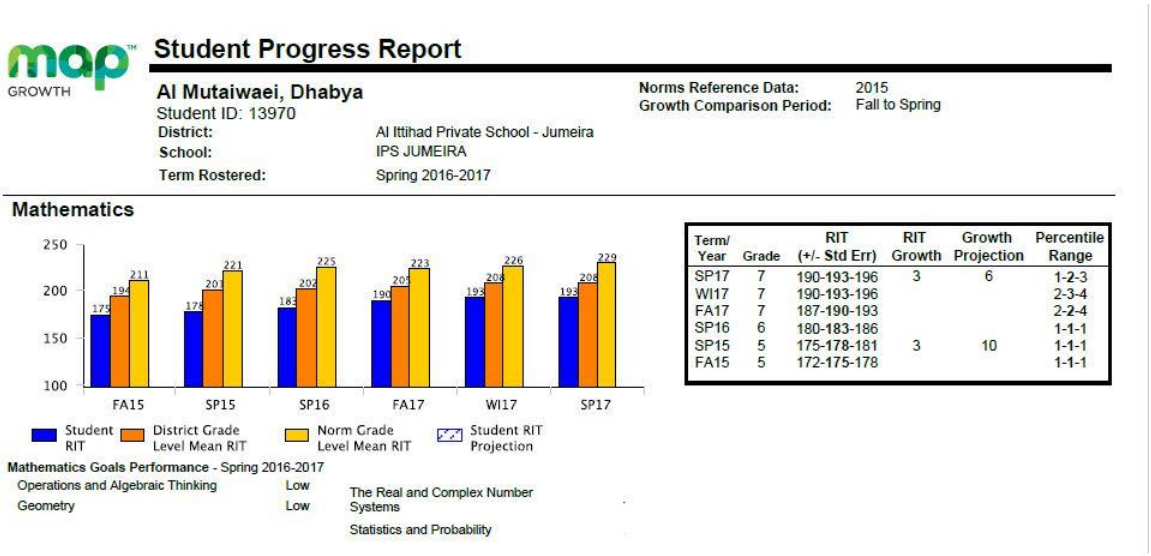
groups (Emerald and Diamond) have to cover all exercises given to lower groups, besides some selected exercises given to higher groups if it is possible. These findings supported the previous findings of Tomlinson (2014) who asserted that a unified approach was not applicable to all students. Therefore, teachers should create a variety of approaches to design a successful lesson plan. These different approaches would help students to accomplish the main learning goals and objectives effectively.

4.4.2 Mathematics Results of Measure of Academic Progress Test (MAP) for grade 8 (2016-2017)

The MAP test is a computerised assessment issued by the North West Evaluation Association (NWEA) (Merino & Beckman 2010). The MAP test provides teachers with an efficient and precise evaluation of their students' attainment within a subject. The results of MAP tests are recorded in RIT scores (short for Rasch Unit). RIT scales norms is an accurate measurement scale that measures a student's level of performance in a specific subject (Sheet 2015). I preferred to use this type of assessment in my study because it depends on comparing a student's achievement levels at different times. This will give a better indication about the progression that takes place in a student's performance over time.

To examine students' performance in mathematics through the streaming practice, I chose report samples of MAP test results for mathematics goals performance of one term rostered (Spring 2016-2017) that showed the performances of students in two consecutive years. These are samples for grade 8 students who have different learning abilities, as well as different genders. The results can give a clear picture of students' improvement over a period of time, individually and on an international level. The bar chart below shows the MAP progress reports of grade 8 students from different groups. Each bar represents students' RIT score, district mean RIT and norm grade mean RIT score respectively. The results show a clear picture of students' improvement irrespective of groups and gender.

Onyx Group



Student Progress Report

Al Mutaiwaei, Dhabya
Student ID: 13970
District: Al Ittihad Private School - Jumeira
School: IPS JUMEIRA
Term Rostered: Spring 2016-2017

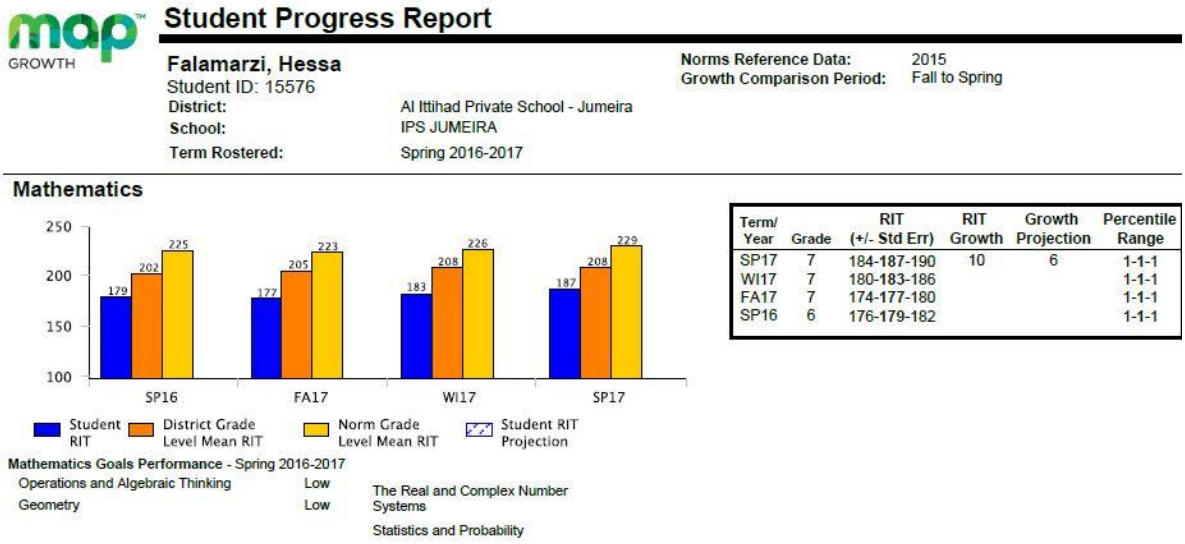
Norms Reference Data: 2015
Growth Comparison Period: Fall to Spring

Mathematics

Term/ Year	Grade	RIT (+/- Std Err)	RIT Growth	Growth Projection	Percentile Range
SP17	7	190-193-196	3	6	1-2-3
WI17	7	190-193-196			2-3-4
FA17	7	187-190-193			2-2-4
SP16	6	180-183-186			1-1-1
SP15	5	175-178-181	3	10	1-1-1
FA15	5	172-175-178			1-1-1

Mathematics Goals Performance - Spring 2016-2017

Operations and Algebraic Thinking	Low	The Real and Complex Number Systems
Geometry	Low	Statistics and Probability



Student Progress Report

Falamarzi, Hessa
Student ID: 15576
District: Al Ittihad Private School - Jumeira
School: IPS JUMEIRA
Term Rostered: Spring 2016-2017

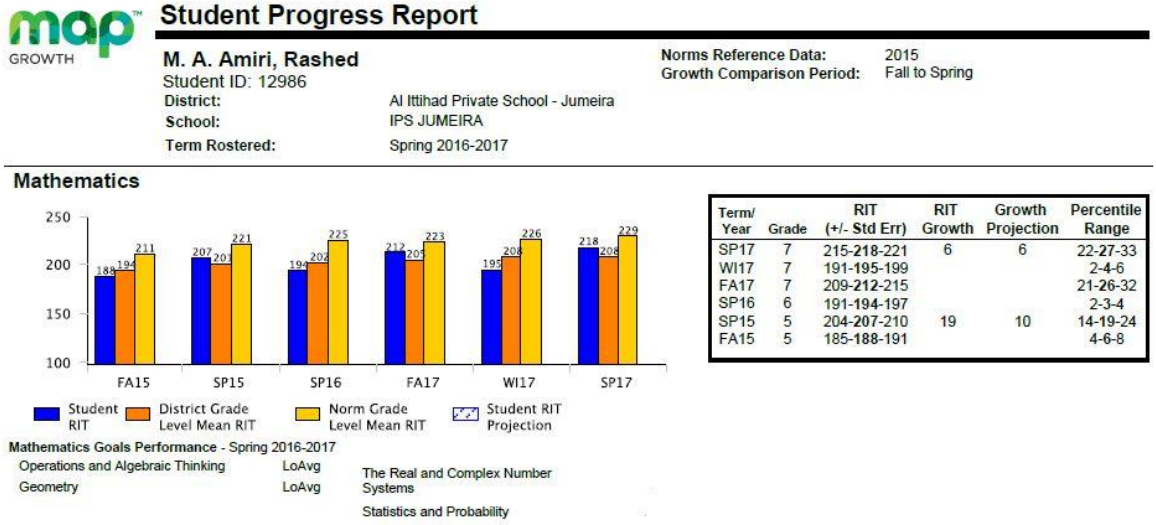
Norms Reference Data: 2015
Growth Comparison Period: Fall to Spring

Mathematics

Term/ Year	Grade	RIT (+/- Std Err)	RIT Growth	Growth Projection	Percentile Range
SP17	7	184-187-190	10	6	1-1-1
WI17	7	180-183-186			1-1-1
FA17	7	174-177-180			1-1-1
SP16	6	176-179-182			1-1-1

Mathematics Goals Performance - Spring 2016-2017

Operations and Algebraic Thinking	Low	The Real and Complex Number Systems
Geometry	Low	Statistics and Probability



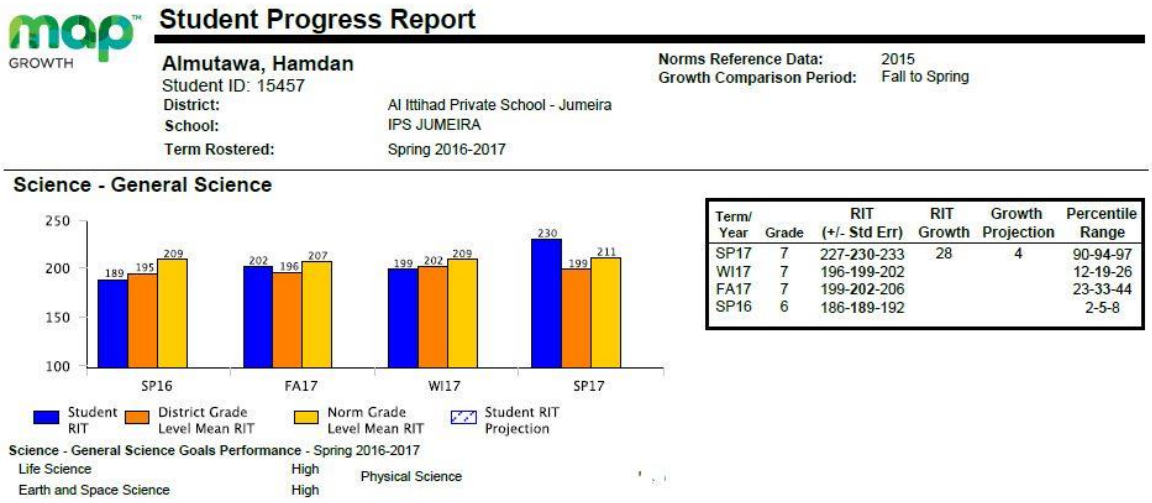


Figure13.samples of student progress reports for MAP test, spring 2016-2017.

(Onyx group)

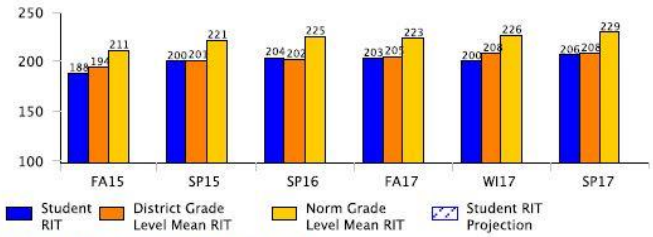
Diamond Group

Student Progress Report

Al Rais, Meera
Student ID: 13075
District: Al Ittihad Private School - Jumeira
School: IPS JUMEIRA
Term Rostered: Spring 2016-2017

Norms Reference Data: 2015
Growth Comparison Period: Fall to Spring

Mathematics



Term/ Year	Grade	RIT (+/- Std Err)	RIT Growth	Growth Projection	Percentile Range
SP17	7	203-206-209	3	6	7-10-13
WI17	7	197-200-203			4-6-9
FA17	7	200-203-206			9-12-16
SP16	6	201-204-207			7-10-14
SP15	5	197-200-203	12	10	7-9-13
FA15	5	185-188-191			4-6-8

Mathematics Goals Performance - Spring 2016-2017

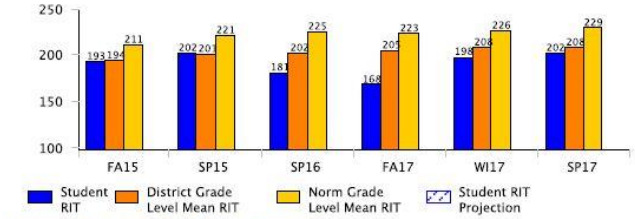
Operations and Algebraic Thinking	Low	The Real and Complex Number Systems	
Geometry	Low	Statistics and Probability	

Student Progress Report

Al Jumairi, Maitha .
Student ID: 12915
District: Al Ittihad Private School - Jumeira
School: IPS JUMEIRA
Term Rostered: Spring 2016-2017

Norms Reference Data: 2015
Growth Comparison Period: Fall to Spring

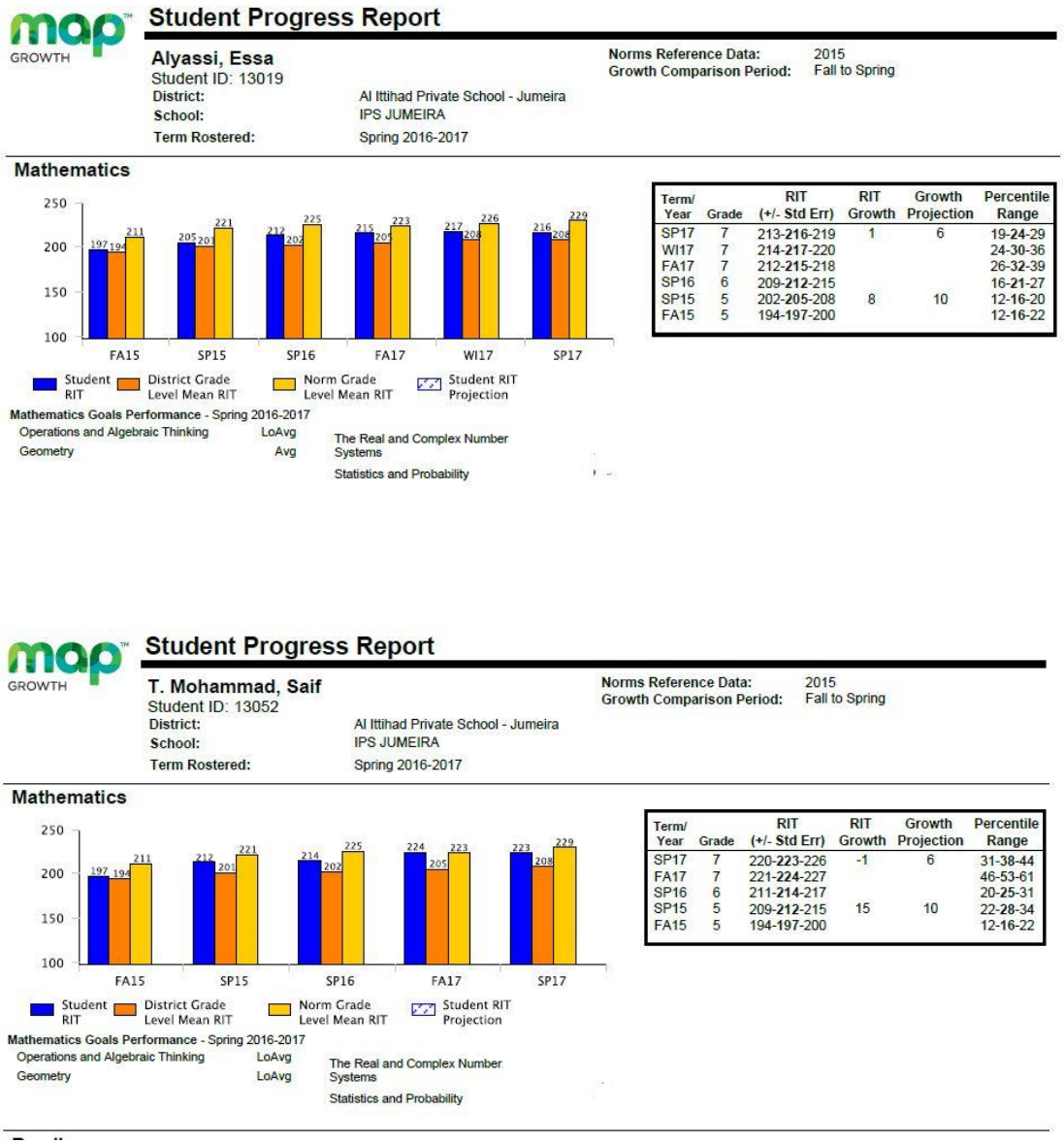
Mathematics



Term/ Year	Grade	RIT (+/- Std Err)	RIT Growth	Growth Projection	Percentile Range
SP17	7	199-202-205	34	6	5-7-9
WI17	7	195-198-201			3-5-7
FA17	7	165-168-171			1-1-1
SP16	6	178-181-185			1-1-1
SP15	5	199-202-205	9	10	8-12-15
FA15	5	190-193-196			7-10-14

Mathematics Goals Performance - Spring 2016-2017

Operations and Algebraic Thinking	Low	The Real and Complex Number Systems	
Geometry	Low	Statistics and Probability	



Student Progress Report

Alyassi, Essa
Student ID: 13019
District: Al Ittihad Private School - Jumeira
School: IPS JUMEIRA
Term Rostered: Spring 2016-2017

Norms Reference Data: 2015
Growth Comparison Period: Fall to Spring

Mathematics

Term/ Year	Grade	RIT (+/- Std Err)	RIT Growth	Growth Projection	Percentile Range
SP17	7	213-216-219	1	6	19-24-29
WI17	7	214-217-220			24-30-36
FA17	7	212-215-218			26-32-39
SP16	6	209-212-215			16-21-27
SP15	5	202-205-208	8	10	12-16-20
FA15	5	194-197-200			12-16-22

Mathematics Goals Performance - Spring 2016-2017

Operations and Algebraic Thinking	LoAvg
Geometry	Avg
The Real and Complex Number Systems	
Statistics and Probability	

Student Progress Report

T. Mohammad, Saif
Student ID: 13052
District: Al Ittihad Private School - Jumeira
School: IPS JUMEIRA
Term Rostered: Spring 2016-2017

Norms Reference Data: 2015
Growth Comparison Period: Fall to Spring

Mathematics

Term/ Year	Grade	RIT (+/- Std Err)	RIT Growth	Growth Projection	Percentile Range
SP17	7	220-223-226	-1	6	31-38-44
FA17	7	221-224-227			46-53-61
SP16	6	211-214-217			20-25-31
SP15	5	209-212-215	15	10	22-28-34
FA15	5	194-197-200			12-16-22

Mathematics Goals Performance - Spring 2016-2017

Operations and Algebraic Thinking	LoAvg
Geometry	LoAvg
The Real and Complex Number Systems	
Statistics and Probability	

Figure14.samples of student progress reports for MAP test, spring 2016-2017.

(Diamond group)

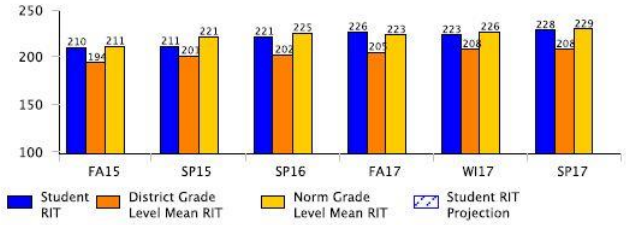
Emerald Group

Student Progress Report

Abbasi, Lina
Student ID: 12997
District: Al Ittihad Private School - Jumeira
School: IPS JUMEIRA
Term Rostered: Spring 2016-2017

Norms Reference Data: 2015
Growth Comparison Period: Fall to Spring

Mathematics



Term/ Year	Grade	RIT (+/- Std Err)	RIT Growth	Growth Projection	Percentile Range
SP17	7	225-**228**-231	2	6	42-49-55
WI17	7	220-**223**-226			36-43-50
FA17	7	223-**226**-229			51-58-65
SP16	6	218-**221**-224			33-40-47
SP15	5	208-**211**-214	1	10	21-26-32
FA15	5	207-**210**-213			39-46-54

Mathematics Goals Performance - Spring 2016-2017

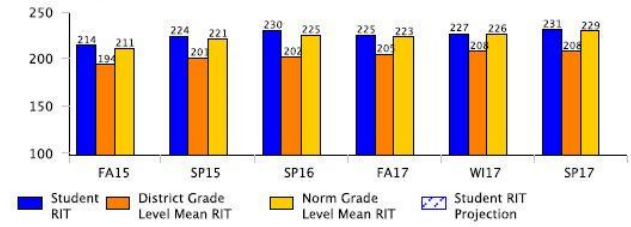
Operations and Algebraic Thinking	Avg	The Real and Complex Number Systems
Geometry	Avg	Statistics and Probability

Student Progress Report

Al Zaabi, Mariam
Student ID: 13231
District: Al Ittihad Private School - Jumeira
School: IPS JUMEIRA
Term Rostered: Spring 2016-2017

Norms Reference Data: 2015
Growth Comparison Period: Fall to Spring

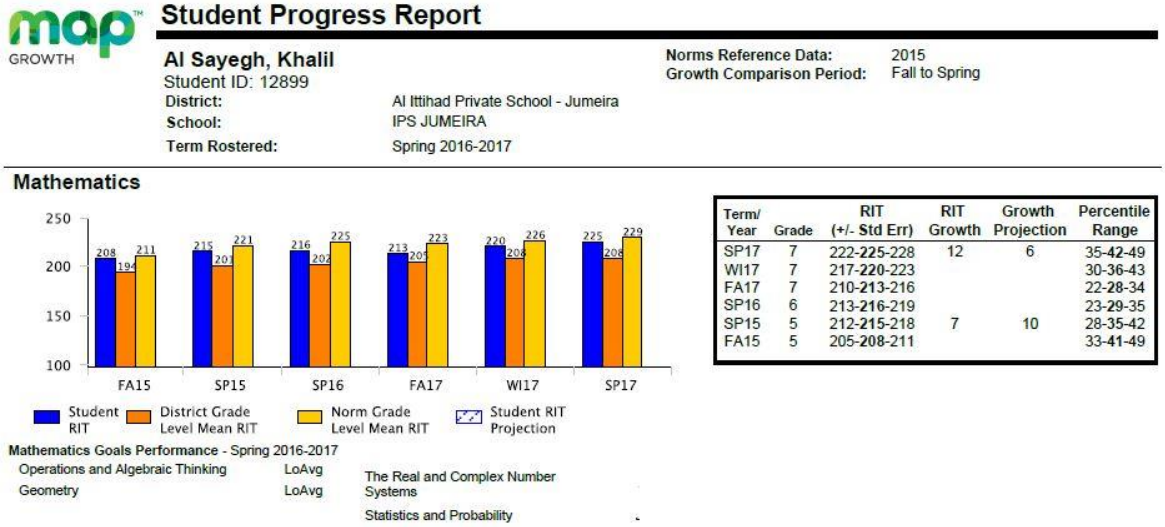
Mathematics



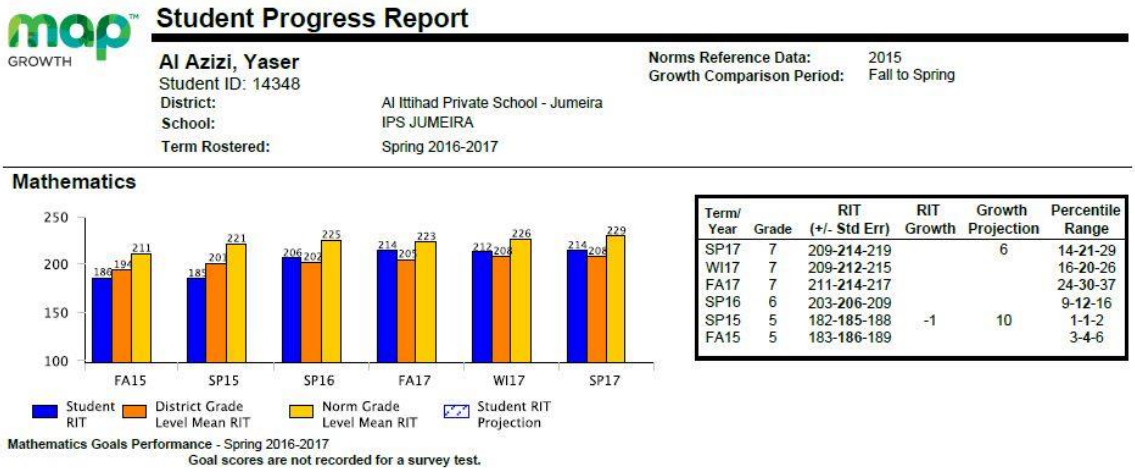
Term/ Year	Grade	RIT (+/- Std Err)	RIT Growth	Growth Projection	Percentile Range
SP17	7	228-**231**-234	6	6	49-55-62
WI17	7	224-**227**-230			45-52-59
FA17	7	222-**225**-228			49-56-62
SP16	6	227-**230**-233			54-61-68
SP15	5	221-**224**-227	10	10	49-56-63
FA15	5	211-**214**-217			49-57-65

Mathematics Goals Performance - Spring 2016-2017

Operations and Algebraic Thinking	Avg	The Real and Complex Number Systems
Geometry	HiAvg	Statistics and Probability



Term/ Year	Grade	RIT (+/- Std Err)	RIT Growth	Growth Projection	Percentile Range
SP17	7	222-225-228	12	6	35-42-49
WI17	7	217-220-223			30-36-43
FA17	7	210-213-216			22-28-34
SP16	6	213-216-219			23-29-35
SP15	5	212-215-218	7	10	28-35-42
FA15	5	205-208-211			33-41-49



Term/ Year	Grade	RIT (+/- Std Err)	RIT Growth	Growth Projection	Percentile Range
SP17	7	209-214-219		6	14-21-29
WI17	7	209-212-215			16-20-26
FA17	7	211-214-217			24-30-37
SP16	6	203-206-209			9-12-16
SP15	5	182-185-188	-1	10	1-1-2
FA15	5	183-186-189			3-4-6

Figure15.samples of student progress reports for MAP test, spring 2016-2017.

(Emerald group)

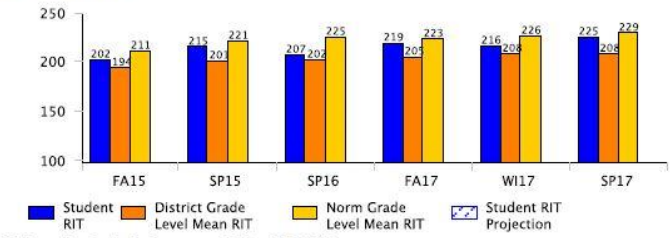
Ruby Group

Student Progress Report

Al Rehman, Dayana .
Student ID: 12994
District: Al Ittihad Private School - Jumeira
School: IPS JUMEIRA
Term Rostered: Spring 2016-2017

Norms Reference Data: 2015
Growth Comparison Period: Fall to Spring

Mathematics



Term/ Year	Grade	RIT (+/- Std Err)	RIT Growth	Growth Projection	Percentile Range
SP17	7	222-225-228	6	6	36-42-48
WI17	7	213-216-219			22-28-34
FA17	7	216-219-222			35-41-48
SP16	6	204-207-210			10-14-18
SP15	5	212-215-218	13	10	28-35-42
FA15	5	199-202-205			20-26-33

Mathematics Goals Performance - Spring 2016-2017

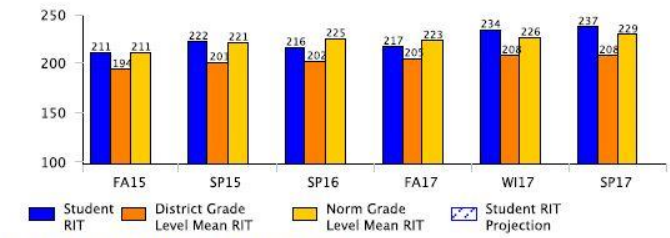
Operations and Algebraic Thinking	Avg	The Real and Complex Number Systems
Geometry	Avg	Statistics and Probability

Student Progress Report

Khalid, Mahra
Student ID: 12908
District: Al Ittihad Private School - Jumeira
School: IPS JUMEIRA
Term Rostered: Spring 2016-2017

Norms Reference Data: 2015
Growth Comparison Period: Fall to Spring

Mathematics



Term/ Year	Grade	RIT (+/- Std Err)	RIT Growth	Growth Projection	Percentile Range
SP17	7	234-237-240	20	6	62-68-74
WI17	7	231-234-237			61-68-74
FA17	7	214-217-220			30-37-43
SP16	6	213-216-219			23-29-35
SP15	5	219-222-225	11	10	44-52-59
FA15	5	208-211-214			41-49-57

Mathematics Goals Performance - Spring 2016-2017

Operations and Algebraic Thinking	Avg	The Real and Complex Number Systems
Geometry	HiAvg	Statistics and Probability

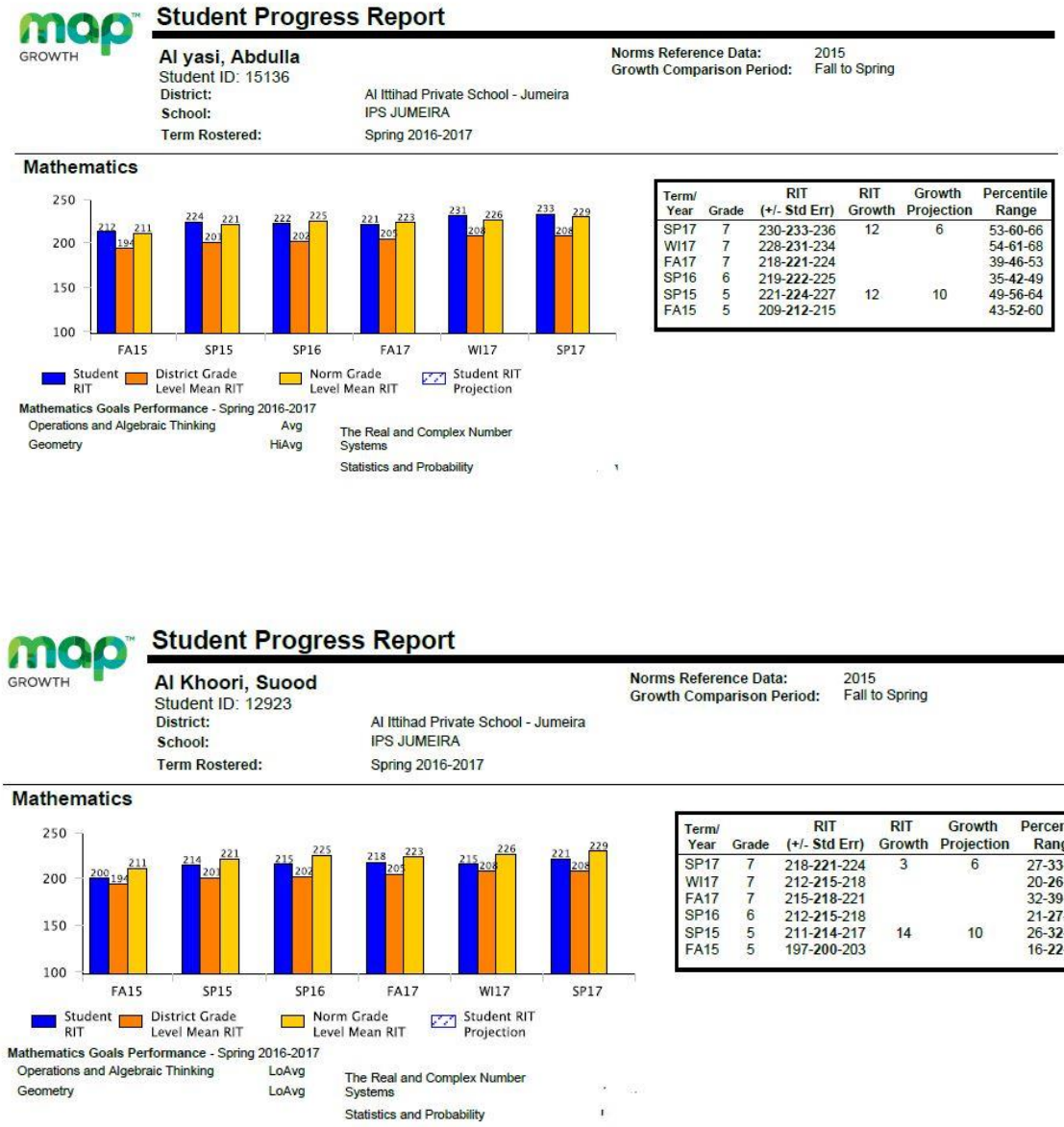


Figure16.samples of student progress reports for MAP test, spring 2016-2017.

(Ruby group)

It was shown from the above graphs that there was an improvement in students' results from spring 2016 to Spring 2017. The progression was observed in all levels, even in lower groups (Diamond and Onyx).For example, the student with the ID 13970 has increased in RIT scores from 183 to 193. Also, in the Diamond group a student with the ID 12915 has shown an improvement in RIT scores from 181 to 202.These findings are similar to the interview findings with the two mathematics coordinators and middle school mathematics teachers,

who stated that the achievements levels of students in streamed classes had improved in MAP scores. This indicates that streaming has a positive impact on students' performance.

4.5 Summary of Findings

The study has discussed two main points: the advantages and disadvantages of streaming practices in mathematics.

The advantages that have been mentioned in this study:

a. The teachers in the studied school were very eager to enhance the students' performance at all levels.
b. It was noted that streaming is practised very well in high-level groups where the technique of highly challenging and critical thinking questions was adopted.
c. The use of technology in all streamed mathematics classes has played a great role in improving the students' progress.
d. The use of differentiated instructions in mathematics which varied among different groups' levels was perceived as an effective method to motivate students and increase their engagement in the class.
e. There was an improvement noted in students' performance in mathematics evaluation assessments such as MAP tests, which showed higher scores in all streamed groups.

The disadvantages that have been mentioned in this study:

a. The behavioural and academic problems that teachers faced when teaching lower-level groups. These problems occurred due to students' feelings of frustration from being included in these lower groups.
b. Giving students in all groups the same content of the curriculum that should be covered to enter a unified assessment was a major problem that has been discussed widely in this study.
c. The lack of professional development for practising streaming and dealing with all levels of students more effectively.

4.6 Triangulation of the Findings

Triangulation has been defined as “Rationale for using multiple sources of evidence” (Yin 2018, p.126).The researcher in this study used triangulation to provide various sources of data which helps in providing more validity to the data collected in this research (Denscombe 2007).Some results from the survey were similar to findings from the interviews as well as being verified by the results of documents analysis findings, such as the agreement by most participants that streaming helped in enhancing the performance of students. This was clearly shown in the results of the MAP test. Also; some perspectives were similar in the survey and interviews, like the preference of some teachers to teach in mixed-abilities classes.

Some findings were different. The majority of teachers preferred to differentiate the curriculum covered by streamed groups in mathematics as well as the summative assessment, whereas administration’s point of view (represented by the two mathematics coordinators) and few teachers agreed on applying the same curriculum and assessment among all groups. It was not easy for the researcher to reach final findings as the findings showed in this study were mixture of different perspectives. These differences encourage for conducting further research to provide more and clear explanation for this topic.

CHAPTER FIVE: CONCLUSION

5.1 Summary of the Study

In this research, I examined the advantages and disadvantages of using streaming (tracking) as an effective differentiated strategy in middle school mathematics classes. Additionally, I explored teachers' perceptions on using a streaming practice in mathematics classes. Information was collected through many sources (surveys, interviews, and document analysis).The survey included questions with a rating scale. This permitted the researcher to gather data about how mathematics teachers perceived the practising of streaming in mathematics as a differentiated strategy and its role in engaging students and improving their performance in their learning process. Interview was an important tool in this study as it helped the researcher to obtain a better understanding of teachers' perceptions about the advantages and disadvantages of using streaming in mathematics classes.

The document analysis was very useful in giving an in-depth understanding of the implementation of streaming in planning mathematics lessons and its impact on students' performance. The data collected was used to serve the objective of the research which is to examine the advantages and disadvantages of streaming through teachers' beliefs and the analysis of reviews to determine whether this data supports the current literature concerning the use of streaming in mathematics.

Although, there have been few research studies conducted in the UAE that relate to the use of streaming, especially in mathematics as an effective differentiated strategy. It has been noted that some international research supports the use of streaming as a differentiated strategy in mathematics (Kulik & Kulik 1992; Loveless 1998; Wilkinson, Penny & Allin 2015). However, other research had stated that streaming was not an applicable strategy, as it was seen that it is not fair for lower-level groups (Slavin 1990; Boaler 2009; Van Houtte & Stevens 2015).This chapter summarizes the conclusion of the research and provides recommendations related to the utilisation of streaming in mathematics classes.

5.2 Key Findings and Conclusions

It can be seen clearly from the findings that streaming was used as an effective differentiated strategy in middle school mathematics classes. It has been shown from the survey results that most of the teachers believe that streaming was used efficiently and helped to engage students and improve their learning. These findings were aligned with the results of document analysis and teachers' interviews that acknowledged an improvement in students' scores in MAP assessment due to learning in streamed classes.

However, it has appeared from the survey results that some teachers still preferred to teach in mixed-abilities classes rather than in streamed classes. The reason for this preference has been understood deeply in the interviews that were carried out with some of these participants. It was shown that some teachers believed that mixed-abilities classes encouraged students in lower-level groups and allowed them to be engaged and interact with their higher-level colleagues. In turn, this mixing would motivate lower-level students and improve their performance.

Also, it has been found from interviews that teachers perceived streaming to be more beneficial to higher-level groups. In addition, all participants in the interviews stated that technology used in streamed classes was effective for all groups in different ways, according to the abilities of each group. Also, it was shown from the interviews that teachers were very keen about motivating their students, especially those in lower-level groups, and they emphasised on modifying their learning methods to include more advanced and critical thinking strategies that will help in increasing students' self-efficacy. However, there were some obstacles that faced mathematics teachers in practising streaming strategy, such as:

a. The unification of curriculum and assessment

Some participants indicated that teaching the same curriculum and giving the same assessment for all groups was not a successful system as it was not fair to lower groups. However, the two mathematics coordinators and a few participants supported the unified assessment as they believed that it helped to raise the performance of students in lower-level groups because the effort they would exert to pass the assessment would help them to raise their performance. Additionally, it has been emphasised on the importance of applying a

differentiated curriculum among groups to meet the needs of different abilities of students. These findings are consistent with the findings from Tieso (2005).

b. The negative impact of streaming on lower-level groups

Many participants stated that lower achievers suffered from being included in lower-level groups as it affected their self-efficacy, willingness of participation and the occurrence of discipline issues due to their feelings of frustration for being in these lower groups. This in turn led them to gain lower marks and stay in lower groups. These findings are similar to the findings of Slavin (1995), Boaler, William & Brown (2000), and Hallam & Parsons (2012).On the other hand, it was noted that management (two mathematics coordinators) strongly supported the implementation of a streaming strategy.The main reason for this support - as stated in the interviews with the two mathematics coordinators – was that streaming contributed to improve the quality of activities provided to students as these activities were designed to meet the differing needs of students and improve their performance, as was shown in the MAP test scores.

However, the MCs did not deny that this strategy (streaming) had some disadvantages, such as the frustration felt by teachers who teach lower groups due to the great efforts they exerted, besides the discipline problems they may face in dealing with students in lower-level groups. Another point that was discussed was the complaints from the parents of some lower achievers and the difficulty of persuading them of the reasons and benefits of putting their children into these lower groups. In spite of the resistance shown by some participants toward practising streaming in mathematics classes, all participants showed enthusiasm toward raising the level of students and giving them the same opportunities through providing different teaching strategies that suit each level.

5.3 Implications of the Study

My purpose with this study was to examine the advantages and disadvantages of using a streaming (tracking) strategy and to explore teachers' perceptions toward implementing this strategy in middle school mathematics classes in one of the private American-curriculum schools in Dubai. In spite of some international studies which showed that streaming did not have any impact on students' performance, streaming or ability grouping in general has spread extensively in many countries, especially in Britain.

In the UAE, streaming for mathematics in middle school has still not been fostered or spread broadly. However, according to the UAE curriculum, schools have the freedom to choose the learning-appropriate approaches that help to meet their learners' needs. Therefore, some schools in the UAE have chosen to apply streaming as a differentiated strategy, especially in mathematics. All of the teachers who participated in the study showed great concern toward improving their students' performance and meet their different needs in an equitable system. This can be achieved through practising streaming in an effective and more professional way.

However, one of the drawbacks that have been discussed in this study was the unification of the curriculum among all groups. It has been recommended from some teachers that the curriculum should be differentiated to meet the different abilities of students in these classified groups. This recommendation was aligned with the findings of Tieso (2005), which indicated that a differentiation in the curriculum provided teachers with more flexibility in time and activities to meet their students' needs in each level instead of concentrating on covering the curriculum without full understanding.

5.4 Assumptions

The aim of this research study was to provide a clear image of the advantages and disadvantages of using "cross- grouping" as a differentiated strategy in mathematics middle school classrooms and teachers' perceptions toward this strategy. Accordingly, the first assumption was that participants would reply honestly to the questions in the interview, which would help in expressing their perceptions freely and accurately. The second assumption was that all participants were aware of using streaming in their classrooms, which would help in giving appropriate examples of strategies used in differentiated instructions. The third assumption was that participants have an adequate experience in practising streaming in mathematics for middle school, which would help in providing clear and honest reflections about using these approaches in their classrooms.

5.5 Recommendations

It has been seen from the findings of this study that some teachers recommended to return back to mixed-abilities classes in teaching mathematics. The core for this recommendation was to encourage lower achievers to be merged with higher achievers to increase their motivation and interest in learning mathematics. Boaler and Stapler (2008) stated that

working in mixed-abilities groups led students to be more motivated and increased their performance.

In support of the above recommendations regarding mixed-abilities classes, MC01 suggested in the interview a new strategy that is planned to be applied next year. This suggestion was for mixing two groups (one higher group and one lower group) together once a week with their teachers to allow students to share knowledge and exchange their experiences, and in indirect ways, students in lower-level groups will benefit from students in higher-level groups. It has been noted from the findings of this study that there were misconceptions from some teachers about the concept of streaming and its application. This indicates that there is a need for further professional development regarding the practices of streaming and its impact on students' performance. All of the teachers who were interviewed had many years of experience in teaching. I think the picture may have been different if more recent graduates had been interviewed; they might have more flexible and modern perceptions toward a streaming strategy.

My recommendations would be to provide more professional workshops for teachers who practice streaming to be aware about its functions and its role in helping students and increasing their performance. Although the two MCs and other teachers supported the idea of the unified assessment, I suggest designing a special assessment for the highest group (Ruby) that includes high critical thinking which matches their levels, and other assessment which is moderate in its types of questions to meet the levels of other groups. This suggestion will help in minimising the level of frustration that occurred in lower-level groups due to getting lower marks.

5.6 Limitations of the Study

This research study includes some limitations. The sample size was one of the limitations as the number of teachers who contributed to the survey and participated in the interviews limited the study from being generalised. The selection of participants is another limitation as it is focused only on the teachers' opinions and did not consider other stakeholders such as principals, students and parents. Also, the study concentrated only on one stage, which is the middle stage (grade 7 and 8). Additionally, the study was restricted to examining the perception of mathematics middle school teachers in one American-curriculum private school. Moreover, it is concentrated only on mathematics and did not consider other subjects

in using streaming practices. Additionally, no data has been collected from classroom observations to examine actual streaming practices inside classes.

5.7 Future of the Study

As perceived above in the limitations, it would be helpful to observe streaming practices by teachers in classrooms. This would be useful in comparing what teachers perceive toward using this practice and what happens in the daily reality. Although this research attempted to shed light on implementing mathematics streaming practices and teachers 'perceptions toward this practice, future studies may contribute to provide deeper understanding and more clarifications regarding this topic through conducting larger studies where more teachers, parents, administrators ,and students could participate from different schools and districts in the UAE.

5.8 Concluding Notes

Enhancing education is one of the most crucial issues in many countries that are concerned to develop their societies and raise a generation who are able to face the challenges of the labour market. Education in the UAE has been improved recently. According to the UAE's national agenda, one of its goals is to improve students' performance in mathematics through participating in international tests such as PISA and TIMMS and to achieve high scores (The Cabinet 2018). This led to the implementation of modern differentiated strategies, such as streaming - which is the main topic in this study - in many of its schools.

This study showed that streaming was implemented effectively in the middle school mathematics classes and it was perceived by many of participants as being an effective method to enhance the performance of students and encourage them to be engaged in mathematics classes. However, it has been noted that some teachers face difficulties in practicing streaming, especially those who teach lower-level groups, such as some issues with student self-efficacy, discipline problems, and frustration (Witte and Mitchell 2011).

It has been noted that streaming (ability grouping) is still a confusing topic that divides the research between supporters, who proved that streaming plays a major role in enhancing students' performance and increase self-efficacy (Lorenz 1982; Smith and Sutherland 2003; Gold 2014), and opponents who stated that streaming (ability grouping) does not have a great

impact on students' progress and reduces students' self-confidence (Meijnen and Guldemond 2002; Hallam & Hurley 2005).This conflict draws attention towards the role of streaming in schools that should be considered by education policy makers in order to utilise it effectively.

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Appendix 1

The Teachers' Survey

The use of streaming as a differentiated strategy in middle school mathematics classes: a case study of a private American-curriculum school in Dubai.

This survey has two sections

Section A: Demographics

Please answer these questions

1. What is your age?

Under 18 ☐

18-24 years old ☐

25-34 years old ☐

35-44 years old ☐

45-54 years old ☐

55-64 years old ☐

2. Select your Gender

Male ☐

Female ☐

3. What is the highest degree you have completed?

High school degree ☐

Bachelor's degree (e.g BA, BS) ☐

Masters' degree (e.g MA, MS, MED) ☐

Doctorate (e.g Phd,EdD) ☐

4. Your teaching experience in years

Less than 1 year ☐

1-5 ☐

6-10 ☐

11-15 ☐

16-20 ☐

21-25 ☐

26+ ☐

Section B: Teachers' perspectives toward practising streaming (ability grouping) strategy in mathematics

Please rate the extent to which you agree or disagree

(Strongly agree – Agree- Neither agree nor disagree – Disagree-Strongly disagree)

5. I believe that "streaming" is an effective differentiated strategy

Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

6. I believe that "streaming" engages students in their learning

Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

7. I believe that students learn more in whole classroom than in streamed classes

Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

8. In my personal practice, I have seen that "streaming" practice improves student learning

Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

Appendix 2

Semi – structure interview questions for mathematics coordinators

1. Who decided the implementation of streaming (tracking) in the school? How long has it been applied?

2. How are students' performances tested through streaming?

What are the procedures set for evaluating the level of student in each group?

3. Do you believe that this type of differentiation is beneficial to students regarding the equity and attitude?

4. What are the advantages of teaching according to this strategy (cross-grouping)?

5. What are the disadvantages of this practice (streaming)?

6. How is summative assessment being conducted in cross-grouping?

7. Do you think is it fair for students to have unified assessment?

8. What are the procedures taken to train teachers regarding this practice (streaming)?

9. Have you had any feedback or comments from parents about this practice?

Appendix 3

Semi – structure interview questions for the mathematics teachers

Notes to interviewee:

Thank you for your participation. I believe your input will be valuable to this research and in helping grow all of our professional practice.

Confidentiality of responses is guaranteed

Approximate length of interview: 30 minutes.

Interview Questions

1. How many years have you been teaching?

2. How long have you taught in this school?

3. How many years have you been using streaming practice in your classroom?

4. How do you feel about using differentiated Math group as differentiated strategy in your classroom?

5. Do you find streaming is an effective method in teaching? Why?

6. What personal experiences, if any, have you had that influence your use of differentiated Math group method?

7. What professional experiences have you had with differentiated Math group strategy that you would like to share about?

8. In what ways, if any have your experiences with streaming practice influenced your classroom practice?

9. Do you feel you do an inadequate, adequate, or more than adequate amount of differentiated instruction in your classroom?

10. Have you ever had a college course in differentiated strategies?

11. Have you ever had any kind of professional development instruction in

Streaming?

12. If you had the option would you want to learn more about differentiated Math group method?

13. Do you feel that differentiated Math group (streaming) strategy is practical? - Necessary? Fair? Why?

14. What role does technology play in your ability to differentiate?

16. What is scaffolding do you use with the differentiated Math group methods?

17. What are the barriers of differentiated Math group method?

Appendix 4

Consent Form

For use when interviews are involved

Project title: **The use of streaming as a differentiated strategy in middle school mathematics classes: a case study of a private American-curriculum school in Dubai.**

Project Supervisor: **Dr. Solomon Arulraj David**

Researcher: **Amel Mohamed Abdelsalam**

- I have had an opportunity to ask questions and to have them answered
- I understood that notes will be taken during the interviews and that they will also be audio –taped and transcribed.
- I understand that I may withdraw myself or any information that I have provided for this research at any time prior to completion of data collection, without being disadvantaged in any way.
- If I withdraw, I understand that all relevant information including tapes and transcripts will be destroyed
- I agree to take part in this research
- I wish to receive a copy of the report from the research

- Yes No

Appendix 5

Curriculum design for a mathematics lesson plan of grade 7

Unit Planner: D 1 :L(1.1) :Adding Integers with the Same Sign
J : Math 7
Sunday, June 17, 2018, 7:40PM

Jumeira Middle School > 2017-2018 > Grade 7 > Mathematics > J : Math 7 > Week 3

Last Updated: Wednesday, November 1, 2017 by Iman Ayas

Abdul Hadi, Lames; AL Qubati, Amani; Ayas, Iman; El Sayary, Areej; Ghanem, Nour El Sabah; Mathews, Rija; shabaan, Amel; Zeidan, Hassan

Stage 1: Desired Outcomes / النتائج المرجوة

Standards / المعايير

CA: CCSS: Mathematics
CA: Grade 7
Mathematical Practice
The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.
3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

7. Look for and make use of structure.

The Number System
7.NS Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.
1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
1a. Describe situations in which opposite quantities combine to make 0.

1d. Apply properties of operations as strategies to add and subtract rational numbers.

3. Solve real-world and mathematical problems involving the four operations with rational numbers.

Appendix 5 (continue)

Enduring Understanding / المفاهيم الدائمة	Essential Question / الأسئلة الجوهرية
You can represent real-world quantities with integers, and then solve the problems by finding the sums or differences of the integers. **Example:** Scientists and Ecologists use Negative integers to represent elevations :a mountain's elevation may be listed as +20,000 feet, while a valley's bottom might be listed at -5,000 feet. **Example:** The business world also makes use of adding integers;Brokers, for example, may trade in whole shares of stock, or place an order for a rounded dollar amount.Their continual buying and selling of shares is yet another way to put in use both adding positive and negative integers.	**Chapter Essential Question:** How can you use addition and subtraction of integers to solve real-word problems? **Lesson Essential Question:** How do you add integers with the same sign?

Content / المحتوى	SCF Performance Indicators/ إطار الكفاءات الطلابية	Skills or Objectives / المهارات و الأهداف
Add integers with the same sign.	**Competency E.** **Grade 7** **Learning and thinking skills** **Problem Solving** • make use of their knowledge and skills to find a solution or solutions to a posed problem; identify problems within a given situation • solve different types of problems which may range from simple to complex, and present solutions in the context of the problem • Identify alternative approaches to problem solutions **Personal and Social Skills** **Self- Confidence** • seek guidance when they do not understand something **Entrepreneurship** • use financial or business knowledge and understanding	Bloom's Taxonomy **Objectives/Learning Outcomes:** 1.1.1 Use the number line to find the sum of integers with the same sign; 1.1.2 Use the rule to find the sum of integers with the same sign; 1.1.3 Solve real-life problems involving adding integers with the same sign;

Stage 2: Assessment Evidence / التقويم

Assessment Criteria / معايير التقييم
Formative تقييم مستمر: Other: Teacher Observation تقييم المعلم
Formative تقييم مستمر: Oral: Discussion مناقشة
Oral discussion and exit cards or socrative questions

Resources / الوسائل	Activities / النشاط
• Teacher's Edition of Go Math Middle School book; • Go Math Website: https://my.hrw.com/	**Kinesthetic Experience:** Tape or draw a 6 to -6 number line on the classroom floor, with numbers about one step apart. Place students, one at a time, facing the number line. Guide them to pace out an addition, moving left to add two negative integers and right to add two positive ones. For example, to add -2 + (-3), a student should stand at -2 and move 3 steps to the left to stand on -5. Invite students to challenge one another to step out various additions.

Real-life application / Cross-curricular links
التطبيقات في الحياة والروابط عبر المناهج الدراسية

Cross-Curricular Example:
Accounting: Salman withdrew $200 from his bank account on Sunday. He withdrew $400 on Tuesday. How much money did Salman withdraw in a week?
Real-Life Application:
The temperature was 2° F below zero. The temperature drops by 5° F. What is the temperature now?

Differentiated Instruction

Below Expectation / تحت خط التوقع	SEND / صعوبات التعلم
Students will have one to one support and modified instructions using visual aids and kinesthetic approach The Minimum of this lesson is: **Go Math Student's Book will be used as follows:** a) Students start with **Explore Activity** 1 and 2. Then they solve **Reflect** # 1, 2, & 3. b) Students continue the following exercises: - **Your Turn:** # 7 – 14 - **Guided Practice:** # 1- 14, & # 17 - **Independent Practice:** # 18 & 20 **Students might use Go Math Online Resources as follows:** - **Practice and Problem Solving (D)**: All exercises - **Reteach**: All exercises - **Reading Strategies:** Only exercises 1 and 4 - **Practice and Problem Solving(A/B):** Exercises 1 to 15 except 14	R.H -Gr7 onyx -Differentiated work with accommodation by paper color green **Go Math Student's Book and Go Math Online Resources will be used as follows:** a) SEN Students might (depends on the case) use the Problem Solving (D) Worksheet with guided examples and highlighted questions; b) Tutorial and more practice will be provided by the teacher.

Meet Expectation / في خط التوقع
Peer support and guided instructions will be in place
Go Math Student's Book and Go Math Online Resources will be used as follows:
The students cover all the Below-Expectation plan in addition to the selected exercises in the Exceed Expectation according to their learning progression.

Appendix 5(continue)

<table>
<tr>
<td>Exceed Expectation / فوق خط التوقع
Students will be working more independently with less guided instructions and more with the higher level of inquiry approach.
The Maximum of this lesson is:
Go Math Student's Book will be used as follows:
a) Students start with Explore Activity 1 and 2. Then they solve Reflect # 1 - 6.
b) Students continue the following exercises:
- Your Turn: # 7 – 14
- Guided Practice: # 1- 17
- Independent Practice: # 18 - 23
- Higher order thinking (H.O.T): All exercises
Students might use Go Math Student's resources as follows:
- Practice and Problem Solving (D): All exercises
- Reteach: All exercises
- Reading Strategies: All exercises
- Practice and Problem Solving(A/B): All exercises
- Practice and Problem Solving (C): All exercises
- Extra worksheet exercises if possible.</td>
<td>Gifted/Talented / الموهوبين
Creative and innovative tasks will be assigned</td>
</tr>
<tr>
<td colspan="2">Main Part of the Lesson / خطوات الدرس
The lesson will run for three periods as follows:
The 1st period: It starts with a warm-up for adding integers and locating points on the number line, activities that suit the learning styles, and then discussions about how to model adding integers with the same sign using counters and a number line. The students work collaboratively in doing the activity. Then they work individually. The closure of the lesson will be using the thinking map.
The 2nd period: It starts with a warm-up for adding integers using counters and a number line, activities that suit the learning styles, and then discussions about how to add integers with the same sign using the rule. The students work collaboratively in doing the activity. Then they work individually. The closure of the lesson will be using the thinking map.
The 3rd period: It starts with a warm-up for adding integers using counters, a number line, and the rule. Activities that suit the learning styles and discussions about how to apply adding integers with the same sign in real life will be conducted. The students work collaboratively in doing the activity. Then they work individually. The closure of the lesson will be using the thinking map.</td>
</tr>
<tr>
<td colspan="2">Elaborate/Transfer/Innovate / الابتكار
Students will be asked to create new real-life situations and word problems that can be solved using the learned concept.</td>
</tr>
<tr>
<td>Homework / الواجب المطلوب
Students will be assessed through answering the questions in the books collaboratively and individually. Students solve the rest of the exercises as a home learning.

Nour Diamond : worksheet was given as homework</td>
<td>Reflections / Notes / ملاحظات المعلم
Nour Diamond : all went well

Amel Onyx : face problem in doing the word problem but understood the concept

Ms. Amanie: Lesson went well.</td>
</tr>
</table>