

**Meeting the Needs of Mathematically Adolescent Gifted
Students in Mixed-Ability Classrooms in the Private
Education Sector of UAE: A Case Study**

**Written by:
Tarek Ibrahim**

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Dissertation Supervisor:
Dr. Eman Gaad

*Use what talent you possess:
the woods would be very silent
if no bird sang
except those who sang best.*

-Henry Van Dyke

Abstract

Gifted education is not considered a very recent field in America and Europe but it is probably still in its premature stages in the United Arab Emirates (UAE). With its official foundation in 1971, the UAE is considered by today's standards a modern state that has transformed its oil-generating wealth to serve the needs of its citizens. The UAE has two main educational sectors: governmental and private. In the recent years, particular attention has been awarded to the area of special education where the needs of students with learning disabilities have been neglected for decades. Unfortunately, the same cannot be mentioned about the area of gifted education which is typically a branch of special education. This research hopes to shed some light on this part of special education. In particular, this research aims to explore the provisions available for mathematically adolescent gifted students in mixed-ability classrooms. A special attention is given to those who attend the tenth grade in the private educational sector. On paper, there are of course, many provisions that can be applied to meet the needs of mathematically gifted students but one has to apply suitable ones that fit in within this culture.

The research was done and compiled through a thorough investigation of an adolescent gifted student through the framework of a case study. This case study was conducted at a private school in Dubai. The school has mixed-abilities classrooms and genders are segregated at higher grades. It is important to note that this research paper, however, is not intended to focus on the gifted student individually. Instead, it is meant to reflect on the private educational system as a whole. The research offers some recommendations which are based on its findings to improve the way private educational system meet the needs of mathematically gifted students. It also calls for decision makers to open doors for gifted education to be implemented. This research does not escape without severe limitations.

*To aunt Raghida
Whose consistent love & support was and still is always immeasurable*

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1 Introduction

The first time the term “*giftedness*” or “*education of gifted students*” was introduced to the researcher happened while undertaking a graduate course in special education at the British University in Dubai. So who is a gifted student? We will leave the answer to this question to our literature review section. The reasons that propelled the researcher to choose his topic are to be explored shortly under the section: Why gifted education? But before going further, the researcher likes to share an interesting story with the readers. While discussing the topic of my thesis with a close friend, the researcher explained that this research is based on a case study of a single student who is believed –by the researcher, to be gifted. The researcher explained that he hopes that one day the education system would be tailored to meet the needs of gifted pupils.

The researcher’s friend (who happens to be a graduate student himself from the British University in Dubai - Master of Science in Information Technology), protested that in order to make your research valid you will have to convince the Ministry of Education that there is a problem and according to this friend, a single case study is not convincing. The friend went on further to explain that there has to be a survey of many schools to see if gifted students do significantly exist in UAE. In his opinion, changing the regulations for a single student is not rational at all. The researcher took this suggestion into consideration and thought about changing the whole approach of his thesis. But then again, the researcher thought, this new approach might change all pre-set plans put for this dissertations (not to mention the limitations which will be discussed later). In reality, we do not want the whole system to change as much as we want it to adapt to the needs of gifted students. Then, on a fateful morning (precisely on September 22, 2007) and while driving his way to the bank, the researcher tuned in to the radio where a talk show (Al Jazeera this Morning, channel 102.6 FM) was playing. The guest speaker was a scholar in education from Egypt who happened to be explaining how gifted children in the Arab world are neglected and their needs are ignored. The scholar mentioned that many gifted students may not be as fortunate as the genius child Mahmoud Wael.

Unfortunately the researcher did not get the chance to listen to the talk show from the beginning. But the name Mahmoud Wael kept ringing in his head until he arrived home and did his investigation on this child using the Web. It turned out that Mahmoud Wael is a seven years old Egyptian child. He had the ability to master the essentials of mathematics by the age of three. At the age of four he had the ability to add, subtract, multiply, and divide at a remarkable pace. He was identified by his teachers as an exceptional child and his astonishing ability to make swift calculations led everyone to call him “Mr. Calculator.”. Professors at Mansheyat Al-Bakry Hospital gave this child an IQ of 151. But later on he was re-evaluated and was given a score of 155. His father pulled him out from the school because he was simply not convinced that his son’s needs were properly being met. He took him for an English-speaking school who demanded that Mahmoud should first take a crash course in English. The father went to the American University in Cairo (AUC) and asked to register his child in an English course. The university refused the father’s plea under the excuse that his child is too young to qualify or attend a university course. The father demanded and appealed to AUC’s president David Arnold to allow his child to enroll. Then, and at unparalleled move, the president (who got impressed by the father’s persistence) made the exception and enrolled Mahmoud. He is the youngest student ever to attend AUC. The rationale behind this story is that you do not need to rebel on a whole system as much as you need to alter just like AUC did to meet the needs of his child (Nkrumah, 2006, viewed 22 September 2007).

This dissertation is written by a former mathematics teacher at one of Dubai’s prominent private schools. He is also a current graduate student at the British University in Dubai. This dissertation is about meeting the needs of mathematically high school gifted students and it hopes that it will offer solutions that will help educators to attend to the needs of such gifted students in Dubai and UAE. Dubai constitutes one of the seven emirates that form a nation called: United Arab Emirates (UAE). Before everything, it is rather useful to learn some historical, economical, and demographic information about UAE¹.

¹ Unless otherwise stated, all information is obtained from CIA – The World Factbook 2007

1.1 Brief profile on UAE

In 1971, six states on the Arabian Gulf coast (Abu Dhabi, Dubai, Sharjah, Ajman, Umm Al Quwain, and Al Fujairah) gained independence from UK-controlled foreign affairs and defense which dates back to the 19th century. The six states merged to form UAE. By 1972, Ras Al Khaima joined the federation which has been in effect ever since and its capital has been chosen to be Abu Dhabi. UAE is considered today a leading developing nation where it plays a vital role in the region. Moreover, with its bountiful oil revenues, the size of its economy or the per capita gross domestic product (GDP) of the UAE is similar to those of leading Western European nations. The UAE is a host to multi-ethnic backgrounds. The majority of people in the UAE are expatriates (mainly South Asians) Westerners and East Asians. UAE also hosts Arabs and Iranians,. In fact, the national citizens of UAE constitute no more than 21.9% of the total population (Al Abed, 2007, p. 5).

1.2 The educational system in the UAE

As for the educational system in the UAE, Bradshaw at al. (2004) affirm that the education system in the UAE is relatively new when compared to other countries [such as U.S., U.K., and India] and is divided into two sectors: public and private. All public schools are funded by the government and primary school education is obligatory for all citizens of UAE. Public schools are strongly impacted by Arabic and Islamic culture (Gaad et al., 2006). In addition to public schools, the large population of expatriates led to the existence of many privates schools (Bradshaw et al., 2004). The authors state that it is not surprising to find many private schools with widely distinct educational curricula. Thus, it is very common to find many private schools who adopt specific curriculum pertinent to American, British, Canadian, Australian, or Indian curricula. The authors explain that typically, the Ministry of Education and Youth plays a great role in the public schools. However, the Ministry of Education and Youth plays a smaller role with private education where it acts on licensing and supervising tasks only.

In recent years, students with special needs and learning disabilities got considerably some recognition for their rights. In 2006, the rights of people with special needs to learn

and to be accepted equally into mainstream and private schools has finally emerged when His Highness Sheikh Khalifa Bin Zayed (the president of UAE) signed and approved a new federal law that was supposed to be implemented for the 2007 academic year. The core of this law was destined to provide students with special needs equal opportunities to be included in conventional education. But the law specifies that this all depends on the respective severity of their condition (Article 12, Federal Law no. 29/2006 Regarding the Rights of People with Special Needs). Although one cannot say that there is abundant literature on people with special needs in the UAE, yet there is at least some wealth in terms of literature amount available (see for example Elbeheri et al. 2006; Gaad 2006a; Gaad 2004a; Gaad 2004b Gaad 2004c; Alghazo & Gaad 2004; Gaad 2001). The same cannot be said about gifted education in the UAE.

1.3 Why there is a need for gifted education?

For the past ten years of the researcher's life, his work was restrained to the walls of the private school he taught at. Most of his teaching years focused on secondary school students. Silverman (1996) states that gifted children will continue to exist regardless of their unpopularity. She believes that it is the moral obligation of educationalist to meet their needs. Silverman (1996) believes that their major need is to be given an opportunity for a continuous progress. Mathematics is one of the subjects where this need can be fulfilled. And because mathematics has always been a hub for an ever increasingly technological world, mathematically gifted students must have their potentials nurtured properly (Diezmann and Watters, 2002). The researcher has taught secondary school mathematics for many years (especially grade 10 levels). Students come and go. Some graduate from the same school while others transfer and complete their eleventh and twelfth grades in other private schools, but the math curriculum is as stagnant as ever and refuses or at least it is destined never to change!

In the fall of 2005, the researcher and a few of his colleagues were sent by their private school to attend a conference on math and science education at the American University of Beirut (AUB) in Beirut, Lebanon. While being there, the researcher had a meeting and an open discussion with the dean of the faculty of education. The discussion was about

the general education in the Arabic world especially in the area of special education. The dean steered the researcher's attention to gifted education when he had told him that gifted education is a critical stream of special education that is often misunderstood and neglected in this region. This indeed raised an interest in the researcher's mind.

Silverman (1996) asks if schools are prepared to allow a gifted student to progress at his/her own pace. She quickly answers with a 'no'. Silverman (1996) asserts that too often a gifted student is taught to slow down his/her natural rate of learning and wait patiently for other students to learn and master skills he/she has already acquired. There is simply no challenge, no recognition, and no provision. Gifted education is a wide spectrum. It does not focus on one subject nor one group of students or on one race. It is crucial for educators to have pre-set plans and procedures ready-made to meet the needs of gifted pupils in schools. According to Tyler-Wood *et al.* (2000), secondary school gifted students come from diverse population of students (minorities, students with learning disabilities, female gifted students). In order to meet the needs of all gifted students, it is important to maintain that gifted secondary school students have appropriate curriculum.

The need to understand how to meet the needs of the gifted is becoming a necessity day after day. It is important to understand that the term *giftedness* is not exclusively meant to represent those who score highly in math and sciences. Other types are recognized (e.g. gifted underachievers, gifted students with learning disabilities, gifted minorities, and gifted girls). However, for the purpose of clarification, this research paper will focus solely on mathematically gifted students in the frame of the UAE cultural understanding of giftedness. Thus, the focus of this research will be on the students who are scoring highly in mathematics. This research will also specifically examine how to meet the needs of the mathematically gifted students at the tenth grade in the private educational sector of the UAE.

1.4 About this case study

The decision to go for a case study was not easy. The initial plan to go about this research was to conduct a full-scale research on gifted student in several different private schools that offer different curricula (e.g. Indian, American, British, Australian, etc.). This was set to be done in the summer of 2007 but most schools were closing for the vacation and the researcher himself could not conduct his research earlier because of his job commitments. Investigating the massive number of different private schools in Dubai let alone in UAE is almost an impossible mission. As mentioned before, UAE is a host of numerous nationalities and a consequence, Hughes and Chesters (2003) declare that there are many private schools designed to accommodate children of expatriates arriving from the following nations: United States; United Kingdom; France; Germany; Egypt; India; Pakistan; Philippines; Japan and many other countries. It is therefore rather difficult to cover this abundance of private schools in a single dissertation. According to The Emirates Network (2007), there are approximately 40 *different* types of private schools in Dubai alone. The research was then changed to a case study. Thus, the case study was set to be conducted in one of Dubai's private schools.

The case study in which this dissertation is investigating revolves around a 14-year old student whom we may call Omar². Omar attends the same private school where the researcher used to work as a mathematics teacher. Omar used to be the researcher's student at the tenth grade. Omar's mother tongue is Arabic. He joined the school in the academic year 2006/2007 and he started his schooling at the tenth grade. Omar's previous education was conducted at another private school in Abu Dhabi. The language of instruction in that school was English³. Generally speaking, Omar is a calm and very well-mannered student. Omar usually sits at the very back row of the class. In addition to Omar, there are 30 other students with widely mixed-abilities who share the same classroom with him. By the end of the first semester, Omar's remarkable grades⁴ captured the attention of all his teachers. Other students who had high achievements in

² For all ethical purposes, the student's name is not revealed and Omar is a pseudonym

³ Please refer to appendix 1, question 13.

⁴ Please refer to appendix 8.

Omar's class wanted to compete with him⁵. This is not very surprising especially in a culture bounded by competitiveness (Gaad, 2004). With all this in mind, Omar's outstanding school grades made teachers (including the researcher) as well as students admire him and view him as a truly bright and intelligent young man. As the year progressed, Omar was not facing any challenges in his studies. He simply found everything (as stated in his interview) to be simple.

1.5 The setting of the case: Dubai Private School

The private school that Omar attends is located in Dubai and has a long history of providing education to students from different ethnic backgrounds. We shall name it Dubai Private School⁶. The school offers K – 12 curricula that is fully approved and licensed by the Ministry of Education. The school has several branches in UAE and one more in Lebanon. Furthermore, there are current but still unofficial talks that the school will open more outlets in other Asian countries. Dubai Private School has been operating in UAE for more than a quarter of a century.

Both genders attend the school but they are segregated starting from the 5th grade onwards. The school adheres to the Ministry of Education's books and curricula in the following subjects: Islamic education, Arabic, and social studies (when taught in Arabic). Most teachers are recruited from Lebanon and some Arabic countries. There are very few European and American teachers. The school allows students who are deemed to be weak in Arabic to waive subjects like Islamic education, Arabic, and social studies that are meant for students whose mother tongue is Arabic and study instead the same subjects at a less-intensive pace. Non-Muslim students are not required to take Islamic education. Languages like Arabic, English and French are offered in simpler versions for students who are weak in any of these languages or non-Arabs. The school assesses each student individually and recommends him or her to enroll in a specific linguistic level to suit his/her needs. Other subjects like mathematics, sciences, and economics are offered in English. No special provisions or alterations are made for those subjects and thus all

⁵ Please refer to appendix 5, biology lesson observation field notes 1.

⁶ This name is a pseudonym.

students, regardless of their abilities, are required to take the same material. In essence, the school follows mosaic curricula or as the math department puts it “*a combination of different systems: partly American partly French.*”⁷ Students whom are evaluated as *weak* in math and sciences are assigned fee-charged tutorial classes after school hours. Although the school does not force parents to enroll their children in after-school classes, the administration makes it clear to parents that such classes are important. The school year used to be divided into four terms but at the beginning of the academic year 2005 the administration changed the rules and the year was divided into three terms. At the end of each term there is a comprehensive exam in each subject taken (the exception is made to subjects like computer studies and physical education where no exams are held).

All of the mentioned above is meant to give the reader an overview of the private school Omar attends. Although not all information mentioned above is directly related to mathematically gifted students, the reader is perhaps interested to learn general information about the private school.

⁷ Please refer to appendix 2, answer to question 3.

1.6 Purpose of this case study: hypothesis/ research questions

The focus of this research is solely based on meeting the needs of mathematically adolescent gifted students in mixed-abilities classrooms. Thus, this research investigates the hypothesis that the private educational system in the UAE does not meet the needs of gifted students. This hypothesis expands to include searching and finding subsequent recommendations to meet the needs of mathematically gifted students. The context in which this research is directed to be achieved shall be done through the investigative research questions:

- What are the educational needs of a mathematically gifted student?
- What are the main issues related to the provisions available for mathematically gifted students in the private education sector of UAE?
- What could be recommended to teachers to provide for the needs of mathematically gifted students in mixed-ability classrooms in the UAE?

The research shall look at specifically at gifted adolescent students in the tenth-grade.

2 Literature Review

2.1 Definition of giftedness

It is difficult to define *gifted* and *talented*. Some scholars like Bates and Munday (2005) see a difference between the terms gifted and talented. They believe that a gifted child is one who is able to exhibit high ability across one or several subject areas while a talented child is one who excels in a specific area (academic, social, sport, etc.). Bain et al. (2003) agree that the two terms must be differentiated. Furthermore, Porter (2005) asserts that gifted potential can eventually be nurtured to become a form of talented performances. She believes that translating gifts into talents is based on three imperative arguments: first, that talent is cultivated by atypical and complicated junction of many factors; second, that the precise factors which best aid learning may vary at diverse stages of pupil's developments; and third, that the environment must grant most favorable but not necessarily most perfect conditions. Porter (2005) also believes that it is possible for one to have multifaceted talents. Other scholars believe that giftedness refers to aptitude which is conspicuously above average in one or more domains of abilities (these domains are: intellectual, creative, socio-affective and sensory-motor ability); whereas talent refers to performance which is clearly above average in one or more areas of human feat (Gagné 1985 as cited in Gross, 2004).

However, Davis and Rimm (2004) choose to define gifted and talented as a one term. The authors, however, agree that it is rather very hard to narrow the interpretation of giftedness to a single definition. The U.S. Congress, for example, has revised the definition of giftedness several times. According to Davis and Rimm (2004), there are several reasons behind the difficulty of securing a single and safe definition. First, the specific definition will guide the identification process embraced by the educational board. Second, constraining the definition may translate to excluding other gifted population such as the poor and disabled. Third, a specific definition may hinder the opportunities provided for diverse types of gifted population. And finally, in some settings, labeling one as gifted may lead to negative effects. As a final thought on the issue of definition, whether we use 'giftedness' or 'talent' and whether we examine giftedness in academic subject areas or in sports and social leadership, giftedness or talent

must refer to exceptionality. And one thing for sure, we cannot claim that most or all students are prospectively gifted (Gross, 2004).

2.2 Three theoretical models linked to gifted education

Before proceeding to the theoretical models, readers must be advised that the three models presented below are not meant to represent all other models. The decision of not focusing on other models is due to the scope of the topic at hand. Focusing on other models would stray us away from the comprehensive purpose of this dissertation. To escape the dilemmas of different definitions, several scholars in the field of gifted education have presented a number of theories to explain giftedness from two different paradigms: cognitive models of intellectual giftedness and curriculum models of instruction for giftedness. The scholars adhere that there is a considerable overlap between those models. Educationalists and psychologists had proposed numerous theoretical frameworks within which specific programs may be planned. In general, scholars believe that three of the most influential curriculum and cognitive models are the *Enrichment Triad Model* and the *Multiple Intelligences (MI) Theory* and *Triarchic Theory of Intelligence* respectively (e.g. Davis and Rimm, 2004; Bain et al., 2003; Colangelo and Davis, 2003; Stepanek, 1999).

According to the scholars mentioned above, the first model was proposed by Joseph S. Renzulli in 1977 and it suggested an approach with direct application for the curriculum related to teaching the gifted. This approach involves three types of enrichments. Type I enrichment focuses on exposing the students to various activities that are not normally covered in the classroom. Those activities may include hobbies, interest areas, and places of interest. Type II enrichment is designed to promote group training activities that involve broader thinking and feeling processes. Such training activities should produce several skill categories such as: critical thinking skills, interpersonal skills, intrapersonal skills, note taking and outlining skills, library skills, etc. Type III enrichment activities involve projects that target gifted students per se. Such activities and projects prepare gifted students to become *independent* researchers and scientists by conducting original self-selected products. Such products include: designing a homepage on the Web, writing

the script of a complete play, etc. Such independent works should make the most of student interests, learning styles, and affirmative relationships. It is also helpful to mention that Renzulli created the Three-Ring Model which describes a gifted behavior as one that reflects a combination of three basic groups of human traits: *above average ability*, *task commitment*, and *creativity*. Renzulli claims that it is not necessarily for a student to be high on all traits to be gifted (Davis and Rimm, 2004; Baum et al., 1998).

Several scholars (e.g. Davis and Rimm, 2004; Bain et al., 2003; Colangelo and Davis, 2003; Stepanek, 1999) mentioned another important model which was proposed by Howard Gardner in 1983. This model is called the *Multiple Intelligences Theory* (the *MI Theory*). According to the scholars, this theorem was introduced out of the discontent with the concept of a single intelligence. Gardner had initially introduced seven types of intelligences: *linguistic*, *logical-mathematical*, *spatial*, *musical*, *bodily-kinesthetic*, *interpersonal*, and *intrapersonal*. He later added an eighth one: the naturalistic. The scholars explain that the Multiple Intelligences Theorem suggests that educational prospects should be tailored to the intelligence outline identified in a student. For example, people with an advanced logical-mathematical intelligence understand the principles of a problem like a logician does. And just like mathematicians do, those people can have their own approaches with mathematical quantities and operations (Fasko Jr., 2001).

Finally, several scholars state that Robert Sternberg had developed the Triarchic theory of intelligence which suggests that there are three dimensions to intelligence: compotential; experiential; and contextual (e.g. Davis and Rimm, 2004; Bain et al., 2003; Colangelo and Davis, 2003; Stepanek, 1999; Cline and Schwartz, 1999). Compotential intelligence consists of mental procedures for processing information. While experiential intelligence entails dealing with new tasks or situations and the capacity to use mental procedures repeatedly. Finally, contextual intelligence is the ability to adjust to, choose, and shape the surroundings (Stenberg 1989 as cited in Stepanek, 1999).

2.3 Characteristics of gifted students

Hekimoglu (2004) conducted a teaching experiment and found that unlike the “average” student, a gifted student differ in several abilities. Gifted students certainly share many positive characteristics that shape their overall personalities (Davis and Rimm, 2004).

Positive characteristics include:

- High language ability- rich vocabulary;
- Enjoyment of learning;
- Superior analytic ability;
- High-capacity memory;
- Abstract and logical thinking;
- Multiple capabilities;
- Awareness of social issues;
- Keen observation;
- High career ambitions;
- Strong empathy, sense of justice, honesty, and moral thinking;
- High motivation;
- Emotional sensitivity; and
- Good self-concept

Mulhern (2003) agrees with the above characteristics and adds:

- Personality is proportional to ingenious artists or authors

According to Hekimoglu (2004), Rotigel & Fello (2004), Greenes (1981 as cited in Johnson, 2000), (Miller, 1990 as cited in Stepanek, 1999), Mingus & Grassl (1999), and Diezmann & Watters (2002), mathematically gifted students share the following characteristics:

- Ability to understand and apply ideas quickly;
- Ability to operate with symbols and spatial concepts;
- Ability to visualize and interpret data, facts and relationships;
- Ability to generalize and reason logically;
- Ability to use flexible and creative problem-solving strategies;

- Ability to use analytical, deductive, and inductive reasoning; and
- Ability to switch from one approach to another while avoiding nonproductive approaches

However, Davis and Rimm (2004) warn that some gifted students may exhibit some behavioral problems due to frustration. Bates and Munday (2005) agree as well and believe that gifted students may exhibit impatience with school work which is seen as redundant. With their educational needs being ignored, it is the unchallenging learning atmosphere that triggers frustration among mathematically gifted students (Stepanek, 1999). Thus, the impending question is how to identify mathematically gifted students?

2.4 Identifying gifted students

Numerous intelligence tests are used to identify gifted students but most notably there is the Stanford-Binet Intelligence Scale and the Wechsler Intelligence Scale for Children (Davis & Rimm, 2004 and Colangelo & Davis, 2003). Such tests can be looked upon as indicative IQ scores (Davis and Rimm, 2004). Coleman (2003) believes that the identification process is a very crucial issue as it ensures that identified gifted pupils receive proper services. Hoeflinger (1998) argues that identifying gifted students is not an easy task. He believes that such students may or may not show interest, effort, or excitement if their needs are not met. Moreover, he argues that standardized achievement tests or proficiency tests may not reflect the true abilities of gifted students. Mulhern (2003) supports this claim by stating that IQ tests linger to be a good indicator of one's academic giftedness at the elementary level. However, he believes that in later stages, student's own achievements may well overshadow his/her own IQ as an indicator of giftedness.

Numerous authors (e.g. Davis & Rimm, 2004; Colangelo & Davis, 2003; Rizza & Morrison, 2003; Dole, 2000; Grimm, 1998) warn that limiting identification procedures to intelligence tests may exclude other twice-exceptional students (gifted with learning disabilities) from their right to thrive in their education. In fact, Coleman (2003) warns that identification procedures must not ignore students who may be gifted but have some

learning disabilities. At the same time, minorities and females need to be properly identified. For that purpose she suggests the use of several measures when carrying out the mission of identifying gifted students. Those several measures must entail:

- Several types of information (e.g. academic accomplishments, indicators of student's mental abilities, learning styles/ behaviors, ingenuity and enthusiasm);
- Several bases of information (e.g. test results, school grades, teacher comments, and nominations by parents/ peers); and
- Several identification procedures that occur periodically to ensure that some students are not neglected.

Other ways of identifying mathematically gifted students are indeed the teachers themselves. According to Stepanek (1999), teacher observations are one of the best sources of information for identifying mathematically gifted students even if those same students are not scoring highly in other subjects. But in a competitive culture, such as the one found in most Middle Eastern countries, strong prominence befalls on students' school grades and test scores (Gaad 1998 as cited in Gaad, 2004). Students scoring at the 95th percentile or above on the achievement tests signify usually a talent that is worthy for further testing (Rotigel and Lupkowski-Shoplik, 1999). Davis and Rimm (2004) agree that one of the reliable methods to identify specific academic talents is school grades and teacher-prepared achievement tests. Moreover, a Likert-like scale tool can be used to identify the mathematically gifted. In our case study, Omar can easily score a 5 on almost all items⁸. Thus far mathematically-gifted identification procedures were examined. Next, we shall look at what does the literature has to tell us about the meeting of social and emotional needs of gifted students: an area that is often neglected.

⁸ Please refer to appendix 9.

2.5 Meeting the social and emotional needs of gifted students

Omar is a 14-year old student which typically makes him an adolescent. Adolescence may well be a challenging time for individuals who possess exceptional gifts and talents (Stormont *et al.*, 2001). Buttriss and Callander (2005) believe that there are two distinct types of behavioral difficulties associated with giftedness. The first type is concerned with behavioral problems that may arise as a mask for hidden giftedness. This happens when pupils are under-challenged in their educational surroundings which often results in either withdrawn, disruptive, and even a hostile manner. Due to this form of behavior, pupils with such negative attitudes may not be identified as gifted by their teachers. And while very few gifted students act violently, many others encounter internal feeling of agitation (Cross, 2001). Sousa (2003) asserts that mathematically gifted students are not properly identified because of the conventional way mathematics is taught in mixed-ability classrooms. Sousa (2003) believes that such conventional methods (which include memorizing rules, formulas, and procedural steps) do not trigger the type of thinking process allied with the elevated mathematical capacity found in mathematically gifted students. In fact, many gifted students express their experiences in school predominantly as being bored since they are forced to wait for other 'average' students to 'catch up' (Cross, 2001).

The other type of behavioral problem occurs when the pupil is isolated because of his/her giftedness. Some gifted pupils may receive anti-social labels because of their giftedness. After all, it is not uncommon to see stereotyping of this small segment of students. Labeling and calling names such as 'nerds' is often seen and is very common in popular cultures (Little, 2001). In fact, Diezmann and Watters (2002) assert that gifted students may feel isolated and different from their classmates because of community attitudes towards them. In fact, while developing their adolescent characteristics, talented students may reject their gifted labels because they do not want to be deemed different (Holliday, Koller, and Thomas 1999 as cited in Stormont *et al.*, 2001). This isolation, however, may be rectified if a whole-school positive attitude is followed. Schools should promote that being 'different' can be strength and not weakness (Buttriss and Callander, 2005).

It is important for parents and teachers to work together and send coherent messages to their gifted children and students respectively that praise their usefulness, worth, and responsibilities (Cross, 2001). Overall, some scholars in the field of gifted education have focused their attention on the cognitive developments of high abilities. Other scholars have turned their attention to other factors like motivation and securing an appropriate nurturing environment. The purpose of this attention is to enhance outstanding achievement in gifted students (Stopper, 2000).

2.6 Provisions for mathematically gifted Students

Authors like Davis and Rimm (2004) see that there are several popular methods to serve the gifted. Namely: *acceleration, enrichment & cooperative learning (grouping), and curriculum differentiation*. We will start with acceleration and enrichment. Davis and Rimm (2004) assert that acceleration and enrichment have been in conflict and many professionals in the educational field defended one and undermined the other.

Prior to exploring the literature for and against each one, definitions of the two terms are required. Acceleration, to begin with, is defined as “[educational] flexibility based on individual abilities without regard for age” (Paulus 1984, p. 98 as cited in Swiatek, 2002). What should be added to this definition is what Davis and Rimm (2004) suggest that applying any approach that would result in higher placement or credit is called acceleration. Alternatively, enrichment, according to Davis and Rimm (2004), implies strategies that involve more depth and breadth than the standard grade-level work but do not result in higher placement or credit.

2.6.1 The many faces of acceleration

Acceleration entails many forms and some researchers believe in its benefits. According to Davis & Rimm (2004) and VanTassel-Baska & Stambaugh (2006) acceleration can have the following strategies:

- *Grade-skipping* (also called full acceleration): where it requires no gifted program coordinator or even a plan. A student is simply advanced to a higher grade;
- *Subject-skipping* (also called partial acceleration: where student remain in the same grade but studies particular subjects with students from higher grades;
- *Curriculum compacting & acceleration*: where the curriculum is compressed in such a way that a gifted student can complete it in less time;
- *Telescoped programs*: where several academic years are collapsed into a lesser period; and
- *Early Admission to College*: provided that high school requirements are met early, many gifted and talented high school and some junior high school are given the permission to enter college early.

Sriraman (2005) reveals that many papers have been written on the effectiveness of curriculum acceleration and compacting in mathematics. Although scholars such as Lewis (2002) believe that acceleration is not necessarily the appropriate answer to meet the needs of gifted students in all subjects (for example, subjects like literature and some social science require experience for understanding), still she believes that acceleration can be used successfully in math. Lewis (2002) believes that the reason can be attributed to the nature of the subject itself. Math and some sciences, for instance, are considered linear-sequential subjects that build on previous skills and knowledge. If handled appropriately, acceleration is an effective strategy.

In contrast, Rotigel and Lupkowski-Shoplak (1999) have a different point of view. The authors claim that subject-skipping acceleration has been campaigned as an excellent strategy for mathematically gifted students but the authors rebuke this strategy because it seems to be the “easy” answer for dealing with gifted students. The scholars believe that simply placing younger students with older peers does produces its share of problems. Problems such as deficiency of proper operational thought procedures on the part of the younger student, improper pacing, and a disparity between the emotional and social development of the younger student and the older peers are all common.

Other scholars like Davis and Rimm (2004) understand the great benefits of grade- and subject-skipping acceleration but at the same time, the scholars acknowledge that acceleration can be blamed for social and emotional problems. To thwart those problems, the authors suggest that the decision to accelerate a gifted student should not be implemented if social and emotional adjustments are not considered and until support from a teacher, counselor, or a gifted peer is available.

In her thorough response to accusations made by critics of some strategies of acceleration, Swiatek (2002) reaches several inferences that retaliate back at those critics. First, as she explains, accelerated students do not endure any academic loss. Instead, they acquire speed in their educational grounding. Second, accelerated students do not suffer exhaustion and lack of interest in participating in educational events. Instead, accelerated students do sustain awareness and participation in their educational quest. Finally, accelerated students expressed contentment with university-related courses and with their accelerative experiences. Moreover, she adds that acceleration is economical to apply, requires little training for teachers, and can be used in most educational settings. VanTassel-Baska and Stambaugh (2006) support this view by alleging that acceleration is the most efficient and effective method for the gifted.

2.6.2 Enrichment in the form of grouping...the ceaseless enigma

Enrichment also incorporates cooperative learning where students of mixed-abilities are placed in groups to work together and help each other to learn (Davis and Rimm, 2004). According to the authors, there are two distinct types of grouping: homogenous (ability) and heterogeneous (mixed-ability). Minguss and Grassl (1999) state that there are two different peer groups: age-based and ability-based. In the literature, we will focus on the mixed-ability grouping within the same classroom since it is more relevant to our research paper which deals with a gifted student in a mixed-ability classroom. While Davis and Rimm (2004) acknowledge that cooperative learning has great benefits on other average students, they warn that this form of grouping works against the needs of gifted students. According to the authors, gifted students

- frequently prefer to work alone because they can learn quicker;

- frequently take the role of a subordinate teacher within their group;
- might wind up doing most of the work for their group;
- may get deprived of opportunities to accelerate or join same-ability groups; and
- might evade academic concentration and incentive.

Diezmann and Watters (2002) believe that the effectiveness of work produced by gifted students in a group is only determined by the challenge of the tasks assigned and by the constitution of the group. Fiedler et al. (2002) allege that perceiving cooperative learning in a heterogeneous group as an effective method for all students including the gifted is just a myth. The authors argue that it is highly likely that the students learning least in the class are indeed the gifted. In their critical writing of inclusive classrooms, Cramond et al. (2002) speculate if decisions made to group students are made on basis of educational social change or development of the individual. The authors allege that heterogeneous grouping only aggravates the situation for the gifted as the teacher is too occupied to teach below average, average, and gifted students at the same time and in the same place. Davis and Rimm (2004) suggest other strategies such as *tracking* which indicates clustering students into class-size groups according to their abilities. According to, Fiedler et al. (2002), tracking results in students being assigned full-time instructional groups based on presumed abilities derived from test scores and teacher observations. This often implies that high-ability group assigned to a specific teacher, middle-ability group assigned to a second teacher, and low-ability group assigned to a third teacher. The authors caution that once a student assigned a certain track there is almost no progression between tracks and students are literally trapped in this surrounding. The authors argue that ability grouping does deny students the chance to explore more challenging settings.

2.6.3 To group or not to group

VanTassel-Baska and Stambaugh (2006) assert that one of the most controversial methods in instruction is grouping. The authors disclose that there are many opinions against ability grouping including the fact that it is discriminatory and may lead to behavioral problems in groups of lower abilities especially if gifted learners are separated from the classroom. Both authors also reveal that other opinions claim that grouping

gifted students alone leave classrooms with lesser intelligent students who may not be capable of communicating clever discussions and subsequently stirring the class. Moreover, Cramond et al. (2002) criticize the promoters of inclusion especially when it comes to cooperative learning and heterogeneous grouping. Despite the fact that advocates of inclusion believe that such methods help students to accept and appreciate differences and they eliminate the development of snobbish attitudes by the gifted, the authors allege that on the contrary, gifted students become aggravated with such methods and this aggravation eventually leads to discontent with the entire school experience. However, VanTassel-Baska and Stambaugh (2006) believe that both opinions lack legitimacy. They deduce that these arguments hint for gifted students to assume the role of teacher assistants instead of being offered the rights to learn properly like other students. As a concluding remark on grouping, Rogers (2002) ask educators to consider the following

- the viable grouping options to consider when grouping gifted students;
- the academic effects of these grouping options on gifted students;
- the latent social and psychological effect of these grouping options;
- the concerns to have about grouping gifted students together; and
- the detriment of not granting grouping for gifted students.

Rogers (2002) conclude by admitting that one size does not fit all and gifted learners do need some form of grouping (whether it is mixed-ability or ability grouping) but clearly there are no definite answers for the considerations mentioned above.

2.6.4 To accelerate or to enrich

Koukeyan (1977 as cited in Mulhern, 2003) admits that although a wide selection of enrichment activities in mathematics can be accomplished in the classroom they do not necessarily occupy the time of a gifted pupil. This is because, as the author explains, those activities depend on “practice and repetition”. It is very easy to assign more problems to gifted students but this is not the solution. Instead, the authors believe that an accelerated program should promote an expanded study of mathematics. Rotigel and Fello (2004) support this claim by stating that mathematically gifted students need more

than just more math problems to solve. The authors believe that teachers need to differentiate tasks and utilize additional resources and probably modifying lessons. However, Davis and Rimm (2004) believe that enrichment activities are good for all students including the gifted. Johnson (2000) admits that the role of acceleration versus enrichment as the differentiation mode for mathematics has always stirred a historical dispute. She claims that most experts in the field do recommend a combination of both.

2.6.5 Final thoughts on enrichment and acceleration

Rotigel and Fello (2004) understand that some schools face the predicament of choosing between an acceleration strategy and simply planning enrichment activities for the gifted pupils. Enrichment may well be modified assignments provided by the classroom teacher or academic competitions. In a study conducted by Bain et al. (2003), it was found that acceleration is mostly valued among teachers of middle school and junior high levels whereas enrichment is strongly valued for teachers at K – 6th grade level. Tyler-Wood et al. (2000) confirm that accelerated programs best serve the needs of some gifted students – those who prefer early college entrance or dual enrolments (attending college courses while still in high school).

2.7 Meeting the needs of the gifted in mixed-ability classrooms

For the purpose of clarification, the term mixed-ability classroom does not always suggest inclusion in its fullest sense. It does suggest, however, that there are students of varying abilities. Inclusion can be defined as simply including and clustering children in the mainstream schools regardless of their gender, nationality, race, abilities or disabilities and have the curricula accommodated to their needs (Mittler, 2000). Alternatively, the term integration implies arranging children with learning disabilities to be enrolled in regular schools without the assumption that schools will necessarily accommodate the curriculum to their needs (Mittler, 2000). In the dissertation whenever the terms inclusion or inclusive classrooms are being used it must be assumed that students with mixed-abilities (and this may include those with mild to moderate learning disabilities) are placed in the same classroom but it is not to be assumed that their needs are necessarily met.

Before talking about differentiation of math curriculum as such, the reader needs to be informed of the general differences between curriculum accommodation, curriculum modification, and curriculum differentiation. We will start with the first two. Curriculum accommodation denotes assisting students with learning disabilities accessing the general curriculum through the design of a collaborative unit plan but without changing the content or the expected learning outcomes (Jitendra et al., 2002). In other words, the student is expected to learn the same information as the rest of the class but through alternative acquisition modes (Nolet & Jitendra 2000 as cited in Jitendra et al., 2002). On the other hand, curriculum modification implies significant changes to the content and anticipated learning outcomes (Jitendra et al., 2002).

Exploring curriculum differentiation compels us to portray what the literature has to tell us about the role of the teacher in an inclusive setting where students of mixed abilities are gathered in the same classroom. We shall remind the reader that, once again, we are focusing on curriculum differentiation pertinent to the math subject. Sriraman (2005) calls out for the teachers to have flexibility and openness to alternative student approaches to problem-solving. Moreover, she requests teachers to provide nurturing classroom environment; one in which students are encouraged to interrogate and ponder the soundness of both the teacher's as well as the students' tactics to problem-solving. Along the way, the author reminds us the gifted students, where applicable, must be encouraged to generalize their findings from teacher-proposed problems and student-generated solutions. Finally, she encourages teachers to accelerate and compact the curriculum to better serve their gifted population of students. Based on their belief that regular math curriculum lacks the breadth and depth to meet the needs of a gifted learner, Rotigel and Fello (2004) demand that teachers must do something to counteract the conventional math curriculum. The authors allege that it is the sole responsibility of the mathematics teacher to establish and implement an individualized educational plan for each and every gifted student in his/ her classroom.

Bain et al. (2003) admit that many theoretical models have been written on how to attend for the needs of the gifted (e.g. Bloom's taxonomy of educational objectives⁹; structure of intellect model; multiple talent approach; enrichment triad model; autonomous learner model; multiple intelligences). In fact, this all might be brilliant but the authors like to remind us that the documentation of successful examples in the refereed literature for several models is really scarce. In a teacher survey conducted by Mingus and Grassl (1999), the researchers found that teachers admit that working with gifted student is not exactly an easy task. The surveyed teachers explained that more time and efforts are required let alone the regular class planning and the enrichment activities that needed to be available. Furthermore, Mingus and Grassl (1999) found that there are many dedicated teachers who are willing to help their gifted learners but are at the same time restrained by work pressure.

According to the authors, many of the surveyed teachers suggest for universities to be more serious in preparing pre-service teachers for excellent teaching styles. Five and Cook (1994 as cited in Crawford and Snider, 2000) affirm that committees selecting textbooks for regular classrooms are poorly trained and lack objective-rating system for the mission of analyzing textbooks. Asserting that the general curriculum does not meet the needs of gifted learners in an inclusive setting, Hoeflinger (1998) also proposes for mathematics and science teachers to provide periodically for their gifted students challenging and thought inciting problem-solving. Sriraman (2005) confesses that math problem-solving as it is implemented in the classroom today does not really reveal what is happening in the real world. Crawford and Snider (2000) suggest that teachers are able to make students achieve better results by taking the initiative and changing the curriculum. Tyler-Wood et al. (2000) also believe that time and resources are limited for most teachers who want to help their gifted. The authors encourage the collaboration of teachers from several backgrounds (sciences, social sciences, etc.) to produce a well-designed integrated curriculum that is meaningful and exciting for the gifted students instead of a dull and rigid curriculum. Lake (1994, viewed 1 December 2007) stated

⁹ Please refer to appendix 11.

many definitions of an integrated curriculum as viewed by several educational scholars¹⁰. She believes that the notion of an integrated curriculum is a brilliant educational tactic that prepares students for lifelong learning. She states that there are several scholars who went beyond a single definition of an integrated curriculum to a wide-scale spectrum of integration¹¹. She explains that all the definitions of integrated curriculum suggest that it should include

- combining different subjects;
- stressing on projects;
- bridging between concepts;
- seeking sources beyond textbooks;
- scheduling must be flexible;
- grouping of students must be flexible; and
- organizing principles are dictated by different themes (hands-on activities, in-depth study of content, strong citizenship programs, use of mathematical ideas to solve problems, etc.).

Tyler-Wood et al. (2000) go further than this and demand for teachers to be treated as professionals by granting them full autonomy to produce an integrated curriculum. In terms of problem-solving tasks, Diezmann and Watters (2002) believe that gifted learners need to be challenged; need apt timing for such tasks; and can provide support for each other as well as receive premeditated support from the teacher (i.e. scaffolding). The National Council of Teachers of Mathematics Standards (NCTM 2000) states that high school students (in general) are more able to employ complex methods to solve problems. The NCTM authors argue that this is attributed to the fact that the abilities of students to manifest their knowledge and act accordingly have developed. This is mentioned for 'average' students. If this is what NCTM states for high school students in general, then what about gifted students? Diezmann and Watters (2002) believe that mathematically gifted students are generally exposed to a superior level of cognition and possess a high level of productive mathematical activities. Despite the fact that Crawford and Snider (2000) argue that a less structured approach where gifted students are given the freedom

¹⁰ Lake (1994) listed: Glatthorn (1994); Palmer (1991); Shoemaker (1991); Oster (1993); Humphreys et al. (1981); and Good (1973)

¹¹ Please refer to index 10 for more details.

to discover and explore would not be beneficial yet not too many opinions were found to support this argument. Cain (2002) believes that in a problem-solving centered curriculum a major role a teacher should play is to guide students to their own discovery of a pattern or concept. This is very similar to what Brooks and Brooks (1999) termed as a constructivist classroom; in such a paradigm, the emphasis is on the student – rather than the teacher, to construct his or her own perception of the problems. Furthermore, Brooks and Brooks (1999) confirm that constructivism is all about harmonizing the cognitive demands of the curriculum to the cognitive abilities of the students. The notion of constructivism was also mentioned by Lake (1994 viewed 1 December 2007). She stated that an integrated curriculum is nothing but an expanded idea of constructivism where schools divert away from teaching each subject in isolation toward s holistic aspect of learning. It is the move from the traditional recitation and memorization lesson toward more meaningful concepts and bridging between ideas. And it does not stop here; instead, it leads to changes in assessment approaches.

And therefore one should ask if an integrated curriculum would provide us with the optimum answer to meet the needs of gifted students at an inclusive setting. Lipson (1993 as cited in Lake 1994, viewed 1 December 2007) summarizes the encouraging effects of curriculum integration which include

- students apply skills acquired in classroom;
- students easily retrieve information;
- students exhibit multiple viewpoints which lead to more integrated knowledge base;
- teachers are provided with additional quality time to explore curriculum; and
- students promote positive attitudes. This has several reasons including:
 - Students are occupied in their learning as they make associations across subjects
 - Students become more motivated to apply knowledge acquired to real-life problems
 - Students behavioral problems are reduced
 - Increased student attendance

- Increased homework completion and
- Teachers of different subject meet as teams to discuss problems of individual students.

Johnson (2000) declares that in order for educationalists to be able to address the needs of the gifted students properly in mixed-abilities classrooms, teachers need support and training. Moreover, she argues that teaching mathematics to adolescent gifted students requires teachers to have a strong knowledge base in mathematics. Furthermore, at an inclusive setting (mixed-ability classroom), Johnson (2000) recommends differentiation for the gifted in terms of evaluation; curriculum materials; teaching techniques; and grouping models.

Little (2001) argue that classroom teachers are in a difficult situation as it is. They are expected to teach all students of mixed abilities and at the same time challenge their gifted pupils. In their unprecedented criticism of inclusion, Cramond et al. (2002) see that inclusion is a theory that is not being applied according to its own intention. The authors believe that inclusion is impractical for the real world classroom. They allege that today's classrooms do not offer the ideal situation to implement an inclusion policy. The scholars believe there are several impediments inhibit inclusion from being successful. Such impediments are

- large class sizes prevents teachers from tailoring their teaching strategies to attend to the needs of each and every student;
- a support system at the administrative level for teachers is still evidently weak and it needs years to be properly established;
- financial resources for supporting teachers is not effective; and
- not necessarily all teachers are trained in the area of special/ gifted education.

Gallagher (2001) affirms that to serve the gifted student best at an inclusive setting, a classroom teacher must be assisted by a gifted education specialist who is capable of aiding the teacher with multiple tasks including technical assistance, special materials, demonstrations, and advice. Bates and Munday (2005) argue that the urge to have a

coordinator for gifted students is equally vital to the urge of having a coordinator for average students. In fact, Landrum (2001) calls for redefinition of the role of gifted education specialist. She argues that it is about time for coordinators of gifted education programs to stray away from the once isolated and segregated single responsible person for providing differentiated service to more of a direct involvement in total school programs. This total involvement will happen once there is a total collaboration between gifted education specialist, policymakers and teaching staff members. For the success of collaboration efforts, Landrum (2001) asserts that guiding standards must embrace

- staff development;
- voluntary participation;
- frequently listed planning (short term and long term) and
- administrative support.

This indeed should complement the roles of a gifted education specialist effectively. Bates and Munday (2005) explain that those roles are

- direct the identification process;
- develop provision for gifted students in the curriculum and through extra-curricular activities; and
- mediate with policy makers and parents.

After conducting a teaching experiment, Hekimoglu (2004) found that a differentiated curriculum (which represents an aspect of an integrated curriculum) with greater depth, diverse mathematical topics, realistic and open-ended problems along with an accelerated pace would surely allow gifted students to benefit the most. According to Little (2001), the focus of our thinking should be shifted from identification, administration, or grouping to the development of the curriculum itself. So how to design a math curriculum that is capable of meeting the needs of mathematically gifted learners at an inclusive setting?

To answer this question properly, VanTassel-Baska and Stambaugh (2006) assert that three dimensional topics, namely: content, process, and product need to be differentiated. To simplify terms¹², content is the “What” of teaching and "What" we want students to

¹² Adapted from Adaptive Dimensions in the High Schools (2003), viewed 5 August 2007.

learn; process is the “How” of teaching; product is “Show what you know” of learning. Each of the three dimensions shall be explored below.

2.7.1 Differentiating contents

The first step in differentiating content is to systematize the curriculum around major topics and ideas (Stepanek, 1999). According to Marker and Nelson (1996 as cited in Stepanek, 1999), increasing the level of abstractness and complexity is recommended for adolescent mathematically gifted students. Johnson (1993 as cited in Stepanek, 1999) believes that a math curriculum for the gifted should carry the following vital constituents

- superior depth and advanced level of difficulty within the content;
- support of students to follow a discovery approach and exploration of concepts;
- application on complex, open-ended problems; and
- prospects for interdisciplinary connections

2.7.2 Differentiating processes

When mathematically gifted students are capable of absorbing new information, processing it and constructing on their preceding knowledge, it is then we can say that learning has been achieved¹³. Furthermore, differentiating process can occur according to the willingness, interest or learning profile of a student. The process skills of mathematically gifted students should embrace¹⁴

- advanced thinking;
- innovative thinking;
- problem solving; and
- research skills.

2.7.3 Differentiating products

Evaluating gifted students by testing their creative capacities through core activities in the curriculum and through the selections of individual projects is extremely important (VanTassel-Baska and Stambaugh, 2006). Anticipation of real audience and concentration on real-world problems is recommended for gifted students (Stepanek,

¹³ Adapted from Adaptive Dimensions in the High Schools (2003), viewed 5 August 2007.

¹⁴ Adapted from Gifted Education – A Resource Guide for Teachers, BC Ministry of Education, (n.d., retrieved 5 August 2007)

1999). In regards to products for mathematics, teachers are advised to choose different textbooks that emphasize the notion of constructivism and distinguish assignments instead of giving extra work of the same type.

It is believed that students show a passionate care when the intended audiences of their developed products surpass the boundaries of the classroom¹⁵. Some suggestions of gifted students' products for real audiences include¹⁶

- giving math puzzles to children's magazines;
- discussing community problems through televised arrangement;
- creating invention conference for other students; and
- crafting business plans and having them reviewed by business experts.

¹⁵ Same source

¹⁶ Same source

In essence, to serve the gifted properly, teachers need a consistent support from the administration to adapt their approaches in accordance with their teaching styles to their students' learning needs (Stepanek, 1999). The figure¹⁷ below illustrates how a curriculum is spanned amongst different learners. Typically, high-end learners are high achievers while low-end learners are low achievers.

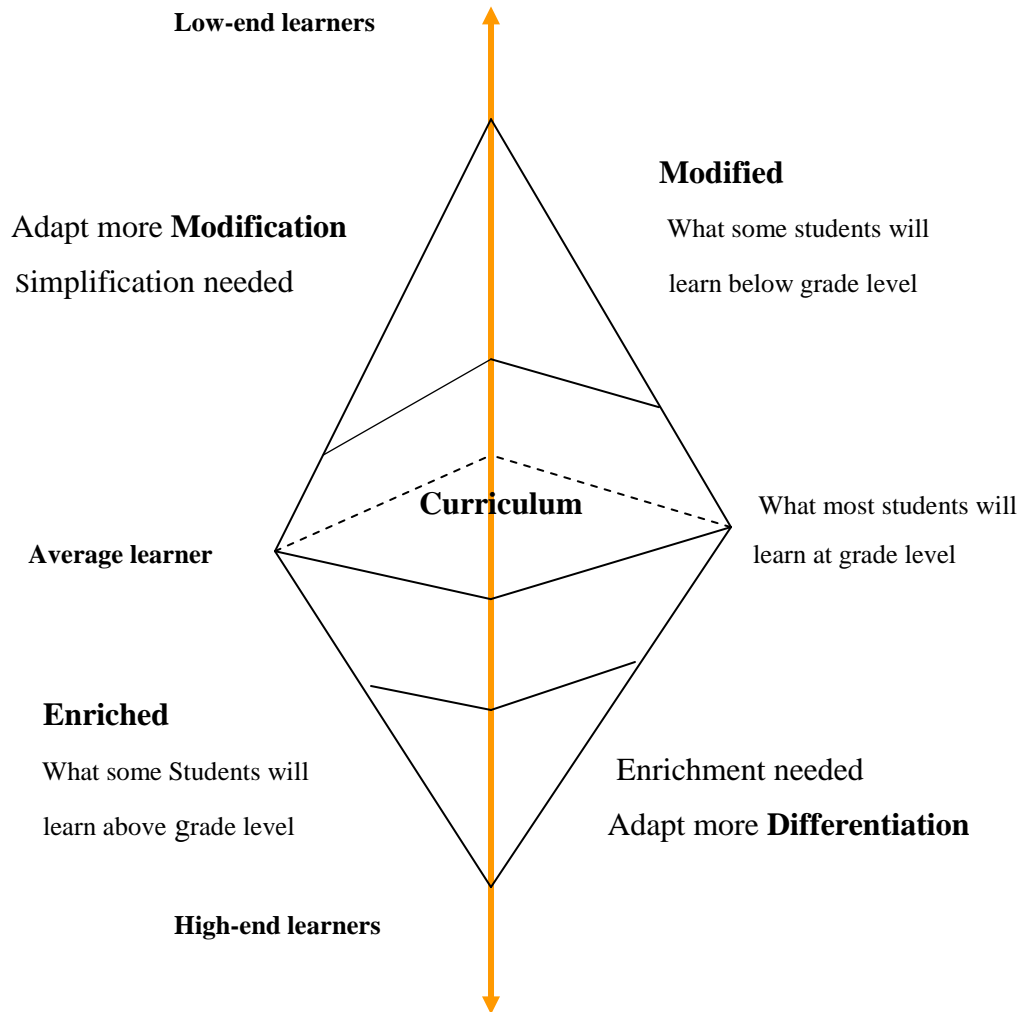


Figure 1: Planning pyramid

¹⁷ Adapted and adjusted from Schumm et al. (1994).

3 Methodology of Research

3.1 Is case study a convincing choice?

Gross (2004) affirms that there are certainly limitations and weaknesses with case study research. First, some case studies can be time-consuming (especially if data is collected across a large span of time). Second, the success or failure of qualitative case studies is hugely dependent on the honesty and integrity of the researcher. Third, many social scientists are suspicious of case study methodology (especially case studies that lack direct experimentation) and its consequences on validity, reliability, and generalizing the findings. Validity can be thought of as being “*concerned with whether the findings are ‘really’ about what they appear to be about.*” (Robson, 2002, p. 93). On the other hand, reliability refers to the steadiness with which a measure evaluates whatever it is measuring (Popham, 1993). Robson (2002) believes that despite genuine commitment and intent, biased and discerning explanations can undeniably surface from case studies. He argues that the term ‘generalization’ reflects the extent to which the findings of the investigation are more, in general, pertinently appropriate beyond the restrictions of the case studied. Bell (1999) admits that the case-study method is criticized because, unlike survey research, its findings cannot be generalized. Denscombe (1998 as cited in Bell, 1999) argue that generalizing the findings of a case study depends largely on the extent in which the case study exemplar is similar to others.

Despite all of the above, interestingly enough Gross (2004) believes that the strengths of case study research still prevail over its weaknesses. The prominent strength of case study research appears from the fact that it is able to offer a holistic inspection of an event or an individual through a variety of confirmations such as observations, interviews, and document analysis. According to Bell (1999), a single researcher may find a case study to be an appropriate choice since it yields the opportunity to study one aspect of a topic at a greater depth within a limited timeframe. In addition, she argues that the case-study method has a great advantage in that it allows researchers to focus on a specific situation and recognize crucial interactive processes that may otherwise be hidden in a large-scale survey. Moreover, she believes that even if generalization is a problem, a case study approach may well be relevant in a way that will allow members of

similar groups to identify problems and, possibly, seek out ways of solving similar problems in their own group. Gromm et al. (2002) believe that researchers who argue against generalization of a case study do so only because it lacks large statistical sampling. But the scholars believe that some case studies represent a model of a larger system or of a whole society. In addition, some researchers affirm that “more discoveries have arisen from intense observation than from statistics applied to larger groups” (Kuper & Kuper, 1985, p. 95 as cited in Flyvbjerg, 2006, p. 226). Moreover, Flyvbjerg (2006) believes that it is a common misunderstanding for social scientist researchers to consider case-studies as an unsuitable reasoning when it comes to generalizing findings. According to the scholar, it is rather incorrect to assume that it is impossible to generalize from a single case study. Any assumption should depend on the case one is investigating and how it is chosen. Stake (1994 as cited in Gromm et al. 2002) identifies an intrinsic case study as one that involves the investigation of a particular case for its own. Finally we conclude with what Gromm et al. (2002) propose. The scholars contend that case studies can escape the problem with the generalization issue as long as they have some caution with regard to the ‘intrinsic’ relevance. In essence, case studies are well-suited for investigating and exploring individuals or events depicted by their uncommonness such as exceptionally or superbly gifted children (Foster 1986 as cited in Gross, 2004).

3.2 Limitations of research

As mentioned above, this research is to be conducted through a case study. The reader must be advised that cases are cases and are not meant to be personal. One of the first limitations is that it is a case study where the researcher is trying to reflect on the findings rather than generalizing the findings. Moreover, this case study is not meant to focus on this student per se. We understand that each student is different and indeed gifted students are very unique. The reader should also understand that in a country like the UAE it is factually impossible to examine each and every curriculum in each and every private school. This will be simply an overwhelming and almost impossible task to accomplish. Having said this, our case study will take this particular student and contemplate the findings to understand how the private educational system is meeting the needs of mathematically gifted students.

The second limitation of this research, as mentioned in the introduction, is the scarcity of the academic writings and journals on gifted education pertinent to the UAE. As a consequence, all literature reviews are extracted from different parts of the globe and subsequently different educational perspectives.

Moreover, most teachers had overloaded teaching schedules and lesson-preparation commitments which typically leave them with no time to spare for interviews. To avoid such obstacles, teachers' opinions were also gathered during their brief break gatherings in the staffroom and the teachers' lounges. This was done in the form of focus-group-like meetings (this is to be covered in later sections below). Some were interviewed during the academic year of 2006/2007. But as mentioned above, the fact that the researcher himself was occupied with work, and fulfilling requirements for other modules forced him to postpone interviewing Omar's teachers to the fall of 2007. In other words, the researcher wanted to interview Omar's teachers at the start of the new academic year. In August 2007, the researcher started a new job (as he left his old job at the private school). This made the data collection task even harder for the researcher as he was forced to wait for teachers to come back from their summer vacations (to be interviewed). Unfortunately, by the arrival of the new academic year in the fall of 2007, some of Omar's teachers not only had left the private school and went to different places to work but others had already left UAE. In essence, a handful of teachers were only interviewed.

3.3 Ethics of research

Before exploring ethics of research, one has to distinguish between two terms that are often considered to be the same: ethics and morals. According to Robson (2002), ethics usually refer to general main beliefs of what one should do, while morals are usually related to with whether or not a precise deed is reliable with the conventional notions of right or wrong. Whether or not the researcher is from ‘inside’ or ‘outside’ the organization or whether or not the researcher is experienced or inexperienced, Bell (1999) reminds us that any researcher cannot be excused for relinquishing ethics at all times. Hart (2005) believes that the ethical value of a behavior should be made as a consequence of a commitment to a responsibility that articulates respect for the behavior itself despite the consequences or effect.

The first three general ethical principles are extracted from the American Psychological Association (viewed 18 August 2007) and Hart (2005). All ethical principles must be considered before conducting any research

1. integrity: avoid statements that may otherwise be considered misleading, false, or illusory. Adopt fairness, respect, and honesty towards others (the author of this dissertation avoided leading interviewees to produce false or otherwise statements that may help in the research) ;
2. secure privacy, confidentiality, and people’s rights and dignity at all times (the author assured the interviewees that all interviews are confidential and no identity of any interviewee shall be revealed);
3. contribute to society’s benefit by offering the public your knowledge (the author wishes to share the findings of his research in the future for the sole purpose of benefiting the academic society in UAE) and last but not least
4. informed consent: approval from the subject of the research was granted (Omar was informed of the research and he was contacted at home under the permission of his parents to seek approval of the interview);

3.4 Data collection methods

3.4.1 Qualitative argument

Before we explore the data collection methods it is imperative for the reader to understand why this dissertation is based on qualitative research. According to Merriam (1988) and Creswell (1994), qualitative research involves fieldwork where the researcher actually heads to the site and record behavior. Moreover, qualitative research is evocative since the researcher is interested in process (rather than outcomes) and meaning (how people interpret their own experiences). Marshall and Rossman (1980) assert that there are several arguments to support qualitative research

- researchers must take into account many contextual variables when human behavior is recorded. Such variables include: traditions, roles, norms, and values;
- researchers in the past did not necessarily draw meanings from experimental designs;
- subjects exposed to experimental techniques (e.g. labs) can become suspicious and wary or adversely try to please the researcher;
- researchers may not understand human behavior without interpretation of thoughts, feelings, and actions; and finally
- field research is able to investigate the procedures and meanings of events.

According to Merriam (1988 as cited in Gross 2004), there are four characteristics that are normally deemed as indispensable properties of decent qualitative case study research: *particularistic*, *descriptive*, *heuristic*, and *inductive*. Case studies are particularistic in that they focus on a particular individual, event or situation. Case studies are descriptive in that the end product has a prosperous interpretive account of the individual or situation under investigation. Case studies are heuristic in that the reader understands the individual under investigation. And finally, case studies are inductive in that the researcher begins his/her research with cautious hypothesis and perceptions that are subject to be revised as the findings of the case study is analyzed and appraised.

Robson (2002) assert that there are three typical features of a case study:

- a single case of an individual or a situation of interest must be selected;
- the case must be studied in context; and
- information collection happens through several channels of data collection methods such as observation, interview, and documentary analysis.

The last point about data collection can be termed as *triangulation*. According to Bell (1999) and Robson (2002), triangulation occurs when the collection of data is channeled via more than one method. Both authors believe that triangulation is a valuable strategy to escape any threat to the *validity* of one's findings.

3.4.2 Interviews and questionnaires

The rules for interviews and questionnaires are almost the same: no commanding or provocative questions (Bell, 1999). According to Robson (2002), there are three types of interviews: fully structured; semi structured; and unstructured interviews. The more the interview is structured, the more the wordings of the questions are preset and fixed. In this dissertation, most interviews conducted were semi-structured. In semi-structured interviews explanation can be given to clarify a question. In the case of this particular research, some interviewed teachers did not understand English very well and the questions had to be explained for them in Arabic. Only one interview was unstructured and that was the one with the biology teacher where the researcher just listened to what the teacher had to say¹⁸. Omar's other teachers were not available for interviewing but throughout the academic year and as a colleague of them, the researcher did not find a problem in noticing that they were pleased with Omar's performance in class. The only structured interview conducted was with the school's principal herself.

¹⁸ Please refer to unstructured interview 3 in appendix 4.

Robson (2002) states that face-to-face interviews propose the possibility to change the line of a question. In other words, bias in interviews may emerge. Bell (1999) explains that bias can sneak in to interviews when the respondent (the interviewee) try to please the interviewer. Moreover, if the interviewer hold strong views about a particular topic or if the facial expressions of the interviewer change while listening to an answer, he or she may 'lead' the respondents to change or modify their answers. To escape the dilemma of bias in interviews, Robson (2002) suggest that interviewer should

- listen more than he or she speak;
- state questions in a straightforward and non-threatening form;
- eliminate signals which may lead the interviewee to modify their responses; and
- show an interest in whatever the interviewee has to say.

Finally, one disadvantage of interviews is that they might be time consuming. Anything less than half an hour may not be valuable and at the same time anything over an hour may be unreasonable if the interviewee's schedule is busy already (Robson, 2002). The people interviewed in this dissertation were the following: the gifted student himself, the teachers, the director of the boys' block (grades 9 -10) at the school, the coordinator of the math department, and the school's principal. Most questions were designed to be open-ended in order to allow the interviewees the chance to talk as much as they wanted to and to obtain more information.

The interview with Omar was semi-structured. And although Omar's English is quite excellent, the researcher explained to him some questions in Arabic. The interview with Omar¹⁹ aimed at extracting information from Omar on his

- perception of the challenges of the subjects;
- outlook during the lessons;
- social network of friends;
- keenness to help other students who are academically weaker than him; and
- suggestions on to how to meet his needs in a math lesson

¹⁹ For more details, please refer to appendix 1.

The interview with the math department coordinator²⁰ aimed at understanding

- identification procedures of gifted students in school;
- provisions available for mathematically gifted students;
- ways in which the school assists its teachers in meeting the needs of their mathematically gifted students; and
- level of satisfaction of what the school has to offer its gifted students.

The interview with the tenth-grade academic coordinator²¹ aimed at understanding

- methods used generally to identify gifted students;
- provisions available for gifted students (in any subject);
- ways in which the school assists its teachers in meeting the needs of their gifted students;
- whether the school notify and provide advices for parents of the gifted; and
- level of satisfaction of what the school has to offer its gifted students.

The interviews with Omar's teachers²² aimed at understanding

- Omar's academic achievements and behavior in class;
- methods that helped teachers identifying Omar as a gifted student;
- how the current curriculum (of which the interviewed teacher is using) meets Omar's needs;
- provisions made for Omar in the teacher's particular subject; and
- teacher's opinion on how the school can meet the needs of its gifted learners.

The interview with the school's principal²³ aimed at understanding

- whether or not it is possible to designate special classes for gifted students.

The questionnaire part of the data collection comes as a supplement for the interviewed teachers. The researcher wanted to make sure that teachers feel as much comfortable as

²⁰ For more details, please refer to appendix 2.

²¹ For more details, please refer to appendix 3.

²² For more details, please refer to appendix 4

²³ For more details, please refer to appendix 3.

possible in expressing their opinions. The researcher gave the questionnaires to three of Omar's teachers who were still working at the private school. The questionnaire²⁴ started with a cover letter to explain its purpose. Robson (2002) cautions that the questions on the questionnaire should be designed to facilitate the achievement of the research's goals and, specially, to answer the research questions. To avoid ambiguity and confusion, Robson (2002) also warns that respondents must be able to understand the questions in the way that the researcher has intended. For that purpose, some questions on the questionnaire were structured and listed with options (questions 1 through 5 in the questionnaire were given with options while the last question was an open-ended one). Simply speaking, some teachers simply may not be aware of the types of provisions available for gifted students all together.

3.4.3 Focus groups

This data collection tool was meant to gather data from teachers about their perspectives and opinions on private schools. A focus group is a group of 6 to 12 participants who share similar characteristics (occupation, education, and interest) and together they would discuss a specific point raised by a moderator. It is certainly not meant to generate quantitative information that can be anticipated by a larger group but it would certainly provide a wealth of information and data about the feelings, sensitivities, and opinions of participants regarding the issue of discussion. In essence, the objective of a focus group is to provide a testimony of the views held by the participants about a certain topic. The discussion would start by raising introductory questions that allow the participants to share current and past experiences. The discussion happens in friendly environment and affable settings. From this point onwards, collection of data begins. The data analysis used with this focus group is note-based analysis where the researcher relies on summary comments²⁵. The researcher and his fellow teachers would sit in the staff room and discuss topics pertinent to the teachers' own feeling and attitudes about working at private schools in general. Those attitudes were expressed through individual opinions. The meetings and gatherings occurred several times during the year. Consequently, the qualitative data gathered and recorded were the result of several gatherings.

²⁴ For more details, please refer to appendix 5.

²⁵ Adapted from <http://www.cas.psu.edu/docs/casover/aefs497/focus.html> (n.d., viewed 16 November 2007).

3.4.4 Observations

Observing Omar was done in and outside the classroom. Inside the classroom, the observation aimed at examining how Omar responds to lessons, Omar's attitude and behavior inside the class and whether or not he gets a special treatment from his teachers. Outside the classroom, Omar was observed during recesses to examine more on his social behavior and whether or not he is socially isolated from others. Also, it was quite interesting to observe how Omar treats other students while he is not in class.

Bell (1999) believes that observation is not an easy task. Moreover, Hopkins (2002) asserts that the justification behind any school observation should surpass classroom research to teacher's development. According to the Bell (1999), there are two types of observations: *participant* and *non-participant*. In a participant observation, the fieldworker (the observer) lives completely in the observed settings around him/ her. While in a non-participant observation, the observer sits away and record events without involvement. Moreover, the observation can be *structured* (where the researcher has checklist, charts, tally sheets, etc.) or *unstructured* (where the researcher start without any preconceived ideas about what he/ she wants to observe and field notes are written as soon as possible after the observation is completed). Robson (2002) sees that observation is advantageous because it has direct involvement with people but its downfall is that it is time consuming. Brophy and Good (2003) warn that biases and pre-judgments may create problems with the observations. And so in order to evade data contaminations, observers must avoid predilections. This agrees with what Bell (1999) suggests that whether an observation is structured or unstructured and whether the observer is a participant or a non-participant, the observer must be as objective as possible.

For this particular dissertation, the observations were of a non-participant and unstructured nature. Randall and Thornton (2005) affirm that in a non-participant observation, the observer is required not to engage in any interaction with people being observed. Alternatively, the observer should direct his/ her attention to meticulous activities. The observations were recorded through the method of written accounts which is similar to taking field notes in unstructured manner.

Wragg (1999) see that the advantages of this method are the instant information available where the observer has a comprehensive view of events. There is also an efficient use of time and the accounts can be discussed immediately after the lesson. On the contrary, the disadvantages are that the observer must be able to make quick and immediate decisions on what is and what is not to be recorded. There is simply no possibility of ‘action replay’. Moreover, in some instances, the class behavior may be distorted due to the presence of the observer. For that purpose and to avoid any distortion, the focus of the observations was solely on the gifted student himself.

Two lessons were observed: biology and math.²⁶ Since the researcher happens to be Omar’s math teacher and taking in mind the researcher’s busy teaching schedule, he decided to observe Omar in the math class itself! The researcher basically asked another math teacher to teach Omar’s class while the researcher carried on with the mission of observing the math lesson. The other math teacher was nice enough to do so while the researcher started to observe Omar during the math class. In the next section we shall examine the findings that were based on the data collection methods mentioned above.

²⁶ Please refer to appendix 5.

4 Findings

First and foremost, it is important to mention that the results collected from questionnaires and interviewing teachers were remarkably similar. A teacher would be interviewed and is also given a questionnaire to complete. Although the questions from the interviews and questionnaires were similar yet questionnaires gave more options to teachers to choose and helped them in understanding more about provisions that are used for gifted education. Omar's grades and final marks spoke a lot on his behalf²⁷. Moreover, he was able to manage an A- average on his French despite the fact that it was the first time for him studying this foreign language²⁸ (this is based on his school records). Although, as mentioned before, not all of Omar's teachers were available yet it was clearly understood that this student has a great potential in his future. Overall, three of Omar's teachers were interviewed and given questionnaires to complete. They all agreed that Omar is a gifted student but at the same time adhered to the fact that it is rather difficult to attend to Omar's needs amongst the existence of twenty plus other students along side Omar. Apparently, the huge discrepancy in the students' mixed-abilities within the same classroom may take its toll on the teacher. In fact, one teacher complained that "*there is a huge variation in the students' academic abilities which in return obstructs the teacher from giving any extra attention or material to the gifted students.*"²⁹

The observations made in the two classes, math and biology, displayed a very clear picture about Omar from two different perspectives: Omar the bright student and Omar the adolescent. Omar would sit and fix his eyes sharply on the teacher as if he is absorbing all the information being mentioned³⁰. In terms of class work, Omar showed absolutely no struggle in recalling science information during a biology class. Thanks to his sharp memory, Omar was able to recall information quickly. The boy did not have to make any efforts in his answers or participation in class. It is true that while Omar was contentedly giving out answers, others were struggling³¹.

²⁷ See appendix 8 for more details on Omar's report card.

²⁸ See appendix 1, question 15.

²⁹ See appendix 4, question 5 in interview 1.

³⁰ See appendix 5, math lesson observation, and Filed notes: paragraph 1.

³¹ See appendix 5, paragraph 2 in the biology lesson observation.

Omar told the researcher in his interview that a math lesson is just perfect when the teacher gives challenging questions and at the same time offer little help for students³². Omar's facial expressions gave the impression that he was interested in the biology lesson because he was stimulated by the teacher's tone. On the other hand, he was not looking that impressed in a dull mathematics class session. The tone of the biology teacher was certainly different from that of the math teacher during the observed lessons. And while the former was stimulating, the latter was matter-of-factly³³. Indeed, there are several types of questions that can be asked in a classroom³⁴.

However, it is equally important to state that Omar did not always display the image of a quiet and calm student. It was indeed surprising to see Omar joking and laughing during the class. In the biology class, Omar did share some laughs with his friends and was completely distracted away from what the teacher was saying. Surprisingly, Omar did manage to answer some questions posed by the biology teacher later on. Outside the classroom (during recess) he did not make any disturbing remarks and he certainly did not behave in any inappropriate manner. It seems that his boredom in the classroom stirred his tendency to be receptive to other student's jokes³⁵. During the math class, the substitute math teacher started with a challenging math problem that almost everyone found to be very hard. Omar shared his solution to the challenging problem posed by the math teacher. He was one of the very few who shared their opinions³⁶. According to Omar's teachers, his grades and performance in class were predominantly the obvious indicators of his giftedness³⁷.

Questionnaires, interviews, and focus groups with teachers revealed more information. In terms of provisions available to meet the needs of Omar, all teachers agreed that there are not any provisions available. Teachers revealed that with a rigid curriculum, it is certainly hard to attend to the needs of a gifted student who constantly needs challenging material.

³² See appendix 1, question 22.

³³ See appendix 5, math lesson observation field notes paragraph 1

³⁴ See appendix 6 for more details.

³⁵ See appendix 5, paragraph 3 in the biology lesson observation.

³⁶ See appendix 5, paragraph 1 in the math lesson observation.

³⁷ See appendix 4, question 2 in interview 1 & 2.

One teacher said that he would “*ask challenging questions*” to attend for Omar’s needs³⁸. However, the three interviewed teachers agreed that the main obstacle that prevented them from giving more to their gifted students was the huge variation in mixed-abilities within the same classroom. This was also supported by other teachers (which included teachers who did not teach Omar but they teach grade 10 and senior grades in high school) who expressed their frustration with their overloaded schedules and the lack of support from the school’s administration who does not listen to their complaints. This lack of support from the administration was expressed in what teachers believed that the administration easily blames teachers for any decline in students’ grades without taking into consideration the fact that teachers try to solve student behavioral problems, accommodate the huge number of students within the same classroom and at the same time find a concession for the huge variation in the students’ individual academic abilities. To most if not all teachers, this was truly a headache³⁹. But in unprecedented disclosure, the school’s principal admitted⁴⁰ that there is little she can do with the mixed-abilities classrooms. She simply cannot segment students and allocate them in different classes according to their academic abilities. This simply, she explained, will not be approved by the Ministry of Education. She never gave a reason.

In essence, the teachers certainly did not mind supporting and providing for their gifted students. In fact, they all admitted that the pace of the class and the general atmosphere changes to a positive way whenever there are high achievers and talented students in the classroom. Moreover, gifted students make the teaching and learning process an enjoyable one. But again teachers complained that generally the administration does not provide them with proper support to attend to the needs of their mixed-abilities students let alone the gifted⁴¹. The most common concern among teachers was the lack of any training in the gifted education stream. Teachers have indicated that the school does not offer them any assistance to prepare them for gifted students.

³⁸ See appendix 4, question 2 in interview 2.

³⁹ See appendix 4, Focus groups.

⁴⁰ See appendix 3, line 7

⁴¹ See appendix 4, Focus groups.

The math department coordinator stated during the interview that there is an enrichment material for students who wish to explore more advanced math problems. This enrichment material is in the form of a practice book that is given to all students at the beginning of the year (as a part of their package).⁴² When the coordinator was asked whether or not he was satisfied with what the school has in offer for its mathematically gifted students his reply was “*I think we can do more.*”⁴³ For Omar, who is the case of our concern, there was a different point of view. Omar and his class mates were regularly assigned homework and class work questions from their textbooks and practice books. But when asked about his opinion in the math presented to him in class (in addition to other subjects), Omar admitted that he felt bored in class because he found the subjects very easy and provided no challenges for him.⁴⁴

The surprise came with what the tenth-grade co-director had to reveal during his interview. The coordinator confessed that despite the fact that there is no formal system to identify gifted students yet the school is totally aware of the existence of gifted students on its premises. The coordinator added that these very students are only recognized at times when the school needs to be represented in public events or conferences⁴⁵. It is more or less like showing the good face of the school. Furthermore, the co-director mentioned that the school asks its teachers to encourage and focus on weaker students so they do not fail. This is in a way similar to what the teachers have mentioned during the focus groups that the administration put the blames on them for any shortcoming on the part of their students. “*Teachers are not asked by the administration to report or inform about gifted students*”⁴⁶, the co-director of the tenth grade added.

⁴² See appendix 2, question 2.

⁴³ See appendix 2, question 4.

⁴⁴ See appendix 1, replies 4 & 8.

⁴⁵ See appendix 3, questions 3 & 5.

⁴⁶ See appendix 3, reply to question 3.

Alternatively, the math department coordinator felt that the school provides the teachers with the content and does encourage teachers to assume a bigger role than being just teachers. But there are no specific guidelines from the school to help its teachers to cater for the needs of their gifted students⁴⁷. On the contrary, the co-director of the tenth-grade admitted that he himself was not satisfied with what the school has in offer for its gifted students. Describing the current situation for the gifted students at the school, the tenth-grade coordinator stated that “...so far there exists no devised plan to serve this category of students.”⁴⁸

Omar himself did not feel that he was being challenged at all. The mathematics department coordinator felt that proper provisions for mathematically gifted students can be in the form of “*math Olympiads [and] puzzle tournaments*”⁴⁹. Omar was already thinking ahead-despite his young age, for better ways to meet his needs. Omar suggested that in order to make math lessons just perfect the questions need to be complicated and challenging. He suggested that teacher should give students hard questions and offer little to no assistance⁵⁰. What Omar probably never knew is that his suggestions are similar to those of some scholars in the field of gifted education. As a final thought on our findings, there seemed to be great contradictions in the replies obtained from teachers, math department coordinator and tenth-grade co-director. Once more, in a qualitative data everyone is entitled to freely express his own opinions and attitudes.

⁴⁷ See appendix 2, question 3.

⁴⁸ See appendix 3, question 5.

⁴⁹ See appendix 2, question 4.

⁵⁰ See appendix 1, reply no. 24.

5 Analyses and Discussion

First and foremost, the reader must be reminded that the scarcity to the nonexistence of articles and journals on gifted education in the UAE made this research more challenging. As a consequence, the majority of articles used to assist in the analyses were based on research conducted in different educational settings in other countries. In the following paragraphs the researcher will attempt to explore the research questions presented earlier on by analyzing and bridging the findings with the literature review available at hand. The hypothesis questions will not be necessarily answered in order. Instead, a thorough discussion will encompass all of the research questions posted above.

5.1 What are the educational needs of a mathematically gifted student?

Hekimoglu (2004) believes that the educational needs of the mathematically gifted are still a comparatively unexplored area. One of the common myths about gifted students is that they do not need any assistance since they can learn on their own but this cannot be more further from the truth (Davis and Rimm, 2004). Quite the opposite, their needs request a curriculum that is more in depth, breadth, and speed of delivery (Johnson, 2000). Silverman (1996) asserts that gifted students need an opportunity for continuous progress

Lacking proper challenges in his educational environment, Omar's educational needs were not properly fulfilled. Subsequently this has reflected on his behavior in the classroom. During the biology lesson observation, Omar has displayed a behavior that was indeed an eye-opener. Although the tone of the teacher was stimulating yet Omar was already aware of all the answers before even the teacher completed the question sentence. Sousa (2003) indicates that lessons that are focused on memory work and procedural steps signify dismay for gifted students. The scholar warns that in such atmosphere, gifted students are more likely to get bored, withdrawn, and act out-of-character. Long (2005) warns that the learning stages for students may change especially if students become dissatisfied with subjects they find boring. Omar's results may not drop today but they may eventually if he is consistently exposed to unchallenging

learning environments. In other words, Omar's motivation towards his studies may drop. The following figure⁵¹ explains this drop:

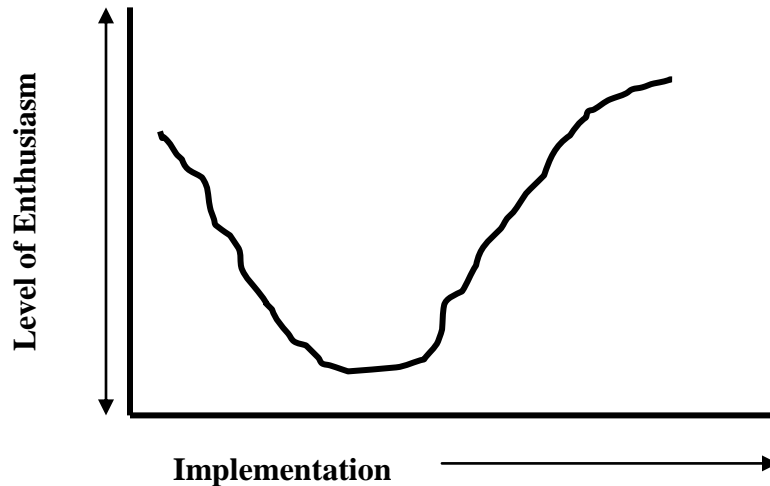


Figure 2: The motivational dip

In fact, this supports what Diezmann and Watters (2002) have observed. Both scholars recorded undesirable behavioral patterns executed by gifted students. According to the scholars, these uninvited behaviors included boredom, lack of interest in class tasks, and disinterest in group cooperation. Having highly gifted students in mixed-abilities classrooms may have adverse effects that are reflected by the attitudes of these gifted students toward their peers. This is at least what Fiedler et al. (2002) warn about when it comes to placing highly gifted students with 'average' and 'below average' ones. Thankfully, such a snobby attitude was not observed in Omar's attitude toward his peers but this of course cannot be generalized. Mingus and Grassl (1999) who interviewed gifted students in their qualitative study found that those very students (who easily comprehended concepts) needed constantly to be challenged. Interviewed gifted students in their study have confirmed their discontent with rigid classroom progressions. The idea then becomes crystal clear and that is gifted students must always feel challenged to express interest in their subjects.

⁵¹ Adapted from Long (2005).

5.2 Addressing the issue of provisions available for gifted students

When we speak about implemented curricula in private schools in UAE it is as if we are talking about the concept of *one size fits all*- where the same material is offered to all students despite their academic abilities. Omar, as revealed in the findings, finds all of his subjects (including mathematics) easy, dull and often lack challenges. To work around the issue of provision, one can think about enrichment. However, enrichment means providing the gifted student with extra harder material to work with while other students are working at a slower pace. As mentioned before, the math department coordinator did mention that enrichment exists in the form of ‘practice’ books. However, Omar-as he told the interviewer, never found any real ‘challenges’ in the exercises in these books. Any hard-working student can also attempt these practice books. Scholars like Hoeflinger (1998) believe that the general math curriculum does not reach to the expectation of gifted students. Other scholars had also raised similar concerns in the past such as “...*the regular [math] curriculum is insufficient in depth, breadth, and pace to meet the needs of the gifted child.*” (Wolfe, 1986 as cited in Rotigel and Fello, Fall 2004, p. 48). Many schools and teachers believe that assigning harder and more problems for the mathematically gifted students (as an enrichment method) would be the best way to fulfill their needs but not all scholars necessarily agree. Hoeflinger (1998) affirms that students who are labeled and positioned as hard-workers can do the same task. As an alternative, the scholar advocates for math teachers to present their gifted students problems that include a variety of discrete levels that can be solved and approached using different approaches.

As mentioned in the findings, the math coordinator believed that students have enrichment material provided for them in a form of a math practice book. However, being a former math teacher at the school, the researcher understands that it is quite known that these practice books are just a collection of previous mathematical problems and exams that were given in the past years. At the end of the day, all students would be exposed to the same type of questions in the exams. Moreover, the findings showed that the math department coordinator and the director of grades 9 – 10 in the school had different opinions provisions for mathematically gifted students. Whereas the former believed that

gifted students (especially in math) have an enrichment opportunity, the latter acknowledged that no such offerings are available for the gifted in general at the school. Someone might suggest that teachers should prepare extra enrichment activities for gifted students to complete within class hours. But does not this add more burden to teachers? Others may raise the point of providing after-school extra-curricula activities as enrichment means for gifted students. But how much an already-exhausted and demotivated teacher will be expected to give after school hours? Moreover, most math teachers who teach after-school tutorial sessions do so for ‘mathematically weak’ students. Of course this is not a suggestion that enrichment is not valid but to what extent can a teacher provide enrichment to gifted students in mixed-abilities classrooms? Some enrichment methods may be possible like differentiation of assignments but others like taking the talented students in specialized field trips to see and assess real-world applications may be a bit difficult.

So what about acceleration as a provision method? Unfortunately, reality hits hard as this method is rarely executed at our private school. Accelerating the gifted student might result in probably a ‘harder’ material but not necessarily interesting or stimulating. The teachers will still be exposed to other students to cater for. Moreover, we have to recall that hard-working students, once again, may achieve the same level when exposed to harder conditions but is this necessarily enough for the gifted? Furthermore, many concerns should arise before one decides to accelerate a gifted student (whether it is a single subject skipping or grade-skipping). These concerns include: the emotional and social needs of gifted students and the extent to which gifted students of the tenth grade are ready to be placed with eleventh or twelfth graders. It is probably healthier to keep Omar with his peers but expose him to more stimulating curricula. Moreover, one has to assess the responsibility of older students in terms of respecting their ‘younger’ peers. It is not really uncommon to see physical fights break between younger and older peers. During the years in which the researcher has worked at the private school there was almost no incident of full-grade acceleration. In essence, it is very uncommon at the private school to see students being accelerated to higher grades.

5.2.1 The teachers and the gifted students

And last but not least, are teachers ready to attend to the needs of ‘gifted’ students in their mixed-abilities classrooms? As mentioned before, Mingus and Grassl (1999) conducted a survey and reached a conclusion that teachers do want to attend to the needs of their gifted students but they are simply overwhelmed and pressured by attending to the needs of mixed-abilities classrooms and other work-related tasks. During the discussion conducted in the focus groups (as mentioned in the findings), it was noted that teachers from several disciplines have expressed their concern that the school’s administration does not provide any support to help them attend to the needs of gifted students (an analyses of education and policy makers shall follow later on). This leads us to an important sighting of what is truly happening on the ground.

The findings made the researcher realize that it is not only that the school does not offer any type of gifted programs to its students but teachers were unintentionally prevented from offering any help. An important point was raised during the focus group discussions and it was stated in findings and that is: teachers were willing to offer and facilitate all means to attend to the needs of their gifted students. Unfortunately, many problems obstructed the teachers from doing anything to their gifted students. The main problems can be summarized as follows⁵²

1. an overwhelming work (several classes to teach, frequent grading of many quizzes and tests, supervision duties, completing school paperwork, fulfilling extra curricular activities) given to teachers by the school which literally leave them exhausted to prepare anything for the gifted students;
2. a rigid curriculum that does not allow flexibility;
3. number of students within each class is rarely below 30 students; and
4. massive differences in the abilities of the students within the same classroom.

The disclosure of the information collected in our findings indicates that the teachers would like to attend to the needs of their gifted students but at the same time they are exposed to several ‘obstacles’ in their environment. These obstacles include: class sizes,

⁵² See appendix 4, focus groups

mixed-abilities of students, overcrowded curriculum and multiple tasks to be fulfilled in a single school day. Despite all of the above, some scholars believe it is all within the hands of the teachers. Such scholars call for teachers to create a good atmosphere of learning. Hargrove (2005) state that ‘great’ teachers share common approaches in their teaching and should be able to

- create and establish a natural atmosphere that fosters critical thinking through a medium of provocative and interesting questions;
- challenge, stimulate and support gifted students without necessarily following one teaching strategy;
- aim for high expectations and commitments that go beyond the students to the teachers themselves;
- willingness to help students outside classrooms;
- engage students in punitive thinking; and last but not least
- provide diverse learning experiences for gifted students who themselves have the ability to innovate with their different learning and thinking styles.

On paper, all of the above sound logical and great. In fact, the discussion within our focus groups showed that teachers love to have gifted students in their classrooms because they make the lesson interesting when they respond and participate in class discussions. But in classrooms of mixed-abilities and with the existence of several duties, the question then becomes how to expect teachers to be ‘great’ in their own environment and at the same time attend to the needs of their gifted students amid such mayhem? In other words, how can one provide for the needs of the mathematically gifted students in mixed-abilities classrooms?

As mentioned before, Gallagher (2001) suggests the need for gifted education specialists to be available to support classroom teachers. The scholar affirms that the role of a gifted education specialist is to assist the classroom teacher with technical issues, provide access to extra materials and demonstrations, and of course offer advices to teachers. Moreover, gifted education specialists must be able to help classroom teachers in differentiating lessons in terms of contents and delivery.

Moreover, they should emphasize for teachers to use problem-based learning approaches, help teachers compacting lessons, and supply teachers with special assessment practices. To be able to do all of the above, the scholar calls for immediate training sessions for teachers that will result in further developments. These training sessions can be implemented as summer programs. He also calls for local universities to adopt identification programs that are ready to identify talented students (such as the Center for Talented Youth Program at John Hopkins University or the Talent Identification Program at Duke University). The only concern is how viable is this suggestion in the UAE? The author of this dissertation found it hard enough as it is to find any article written about gifted education in the UAE. What are the odds to have an abundance of gifted education specialists available to help classroom teachers in the UAE! Even the United Arab Emirates University does not offer yet a specialized program in gifted education.⁵³

Mulhern (2003) admits that in a classroom of 30 or more students whose I.Q. scores swing between 60 and 150 does not exactly allow the teacher to attend to the needs of gifted students in the classroom. Rationally speaking, a single teacher cannot design an individualized educational program (IEP), sustain control of the classroom, teach all required materials, and make sure that every student has passed the math assessment. Mingus and Grassl (1999) found in their qualitative study that math teachers working with gifted students (who often represent a small portion of students in a single class) found the teaching task ‘tougher’ in mixed-ability classrooms. Since these students needed to be challenged all the time, this translated to teachers preparing for them extra enrichment and investigation activities; something that needs considerable time and effort from already-busy teachers. The experienced teachers suggested that it is time for universities to start engaging and preparing pre-service teachers to be well-equipped for gifted students. This preparation should include a thorough grounding in mathematics as well as new exciting methods of teaching mathematics. This is very similar to what the teachers have expressed through interviewing and focus group discussions.

⁵³ The author referred back to UAEU official Web site and found no existence of such program.

Teachers mentioned in interviews and questionnaires that they did not receive any training or assistance in dealing with gifted students in their classrooms. As mentioned before, Cramond et al. (2002) question if in classes of inclusive nature (where teachers are already overworked) is ever realistic to expect from teachers to be able to attend to the needs of such disparate crowd. The authors see no point in assigning gifted students in cooperative learning groups as the gifted ones will end up waiting for their 'average' peers to finish the tasks. Since it is unrealistic to escape inclusion in the present day, the scholars instead urge for the need of a thought-provoking curriculum that meets all levels. Fundamentally, mixed-ability classes are almost everywhere. Omar and gifted students like him are more likely to attend mixed-ability classes. Johnson (2000) admits that math books available in schools of mixed-abilities classrooms generally target the general population and are not suitable for the gifted. What schools need are books that emphasize on a constructivist learning that explore ideas beyond the scope of most textbooks. She gives us the offer teachers several suggestions for differentiating instructions for mathematically gifted students

- selection of textbooks of multi-sources (textbooks with enrichment activities and college textbooks);
- integration of technology into the lesson. This can be also done through class work and homework assignments (World Wide We, spreadsheets, computer programming, and graphic calculators);
- differentiation of assignments and problems that go beyond the normal curriculum; and
- provide opportunities for students to participate in mathematical concepts such as the Mathematical Olympiad (this suggestion is raised by the mathematics department coordinator at our private school and is expected to take effect next year).

These suggestions are suitable for schools and teachers who cannot go further in terms of differentiating the curricula and assessments as a whole. Otherwise, if curriculum differentiation is possible then the following section is probably the answer for attending to the needs of the gifted in mixed-abilities classrooms.

5.2.2 What is an optimum way to reach for the needs of the gifted in mixed-abilities classrooms?

The frustration that most teachers expressed in their interviews as well as in focus group discussions is concerned with the rigid curriculum. The frustration was quite noticeable. The curriculum can be at times a mix-up between rich & poor contents and sometimes can have meaningless repetitions⁵⁴. Scholars like Hoeflinger (1998) and Crawford & Snider (2000) view curriculum as a decisive factor for student achievement plus fulfilling the needs of gifted students. Curriculum is a major contributor to student success and scholars believe that teachers must be given the opportunity to produce enhanced educational products by granting them access to “tools that work.” (Carnine, 1992 as cited in Crawford & Snider, 2000).

After their extensive study of five geographically dispersed high schools⁵⁵ of heterogeneous student population, Buchanan and Woerner (2002) found that in today’s world and with the demands for inclusions there is nothing better than an integrated curriculum to serve the academic, social, and special needs of gifted and talented students. One should not forget that mathematically gifted students are very interested (as seen from their characteristics) in the applications of mathematics in real-world problems. Their explorative minds will unleash an inexorable interest in technology and sciences. In their observations of the five schools, the scholars noticed something different...something deeper than enrichment and acceleration. The common factors that the scholars found about all of the examined high schools are that students have a mutual relationship with teachers and a substantial choice and control over curricular affairs.

With teachers acting as mentors, gifted and talented students established well developed problem solving techniques to embark upon real world problems (Gardner 1991 & Renzulli 1979 as cited in Buchanan and Woerner 2002). In other words, the role of a teacher becomes a facilitator of resources rather than a dispenser of information. All schools believed in the adaptation of a curriculum that is built around imperative “Big Ideas”.

⁵⁴ See teachers’ interviews in appendix 4 and in particular questions 3 and focus groups, point 9.

⁵⁵ These schools are: Beacon High School, Oakland; The Foshay Urban Learning Center, L.A.; Jefferson County Open, Colorado; School of Environmental Studies, Minnesota; Vancouver School of Arts and Academics, Washington.

The curriculum in all schools was extended beyond regular school tasks to include research, volunteer work, and contribution to the community. And this according to Buchanan and Woerner (2002) is the way the high schools would meet the needs of all students (including the gifted and talented). Cain (2002) agrees on the same issue and deeply believes that a teacher's role should be a guider for students to solve real world problems in an educational context. For this matter, the curriculum needs to be flexible in terms of what units to be taught and in what order.

Warnod (2002) is another proponent of integrated curriculum. She believes that if educators consider broadening key learning areas like mathematics, arts, sciences, technology, health and physical education, and studies of society & environment then an integrated curriculum is the answer. She proposes that students need to see the 'big picture' through conveying knowledge across curriculum areas. She suggests that integrating the curriculum can be augmented when one includes the learning objectives of Bloom's Taxonomy⁵⁶ along with Gardner's Multiple Intelligences in a matrix framework. Bloom's Taxonomy of learning objectives describes six levels of cognitive levels and may be used to plan assignments that cover a broad range of mixed-abilities found in a single classroom. While Gardner's Multiple Intelligences take care of all learning styles. Exploring all of the intelligences bounded by Bloom's taxonomy would surely go beyond the scope of this research. For this dissertation, the focus will be on Garden's logical-mathematical intelligence⁵⁷. According to Warnod (2002), following this sample of integrated curriculum would definitely change the conventional roles and responsibilities of teachers and students; possibly forever⁵⁸.

Most probably we will not going to expect the same thing to happen in the educational system of UAE (at least not in the few years to come). One needs a lot to change a traditional grounded perspective about teaching. However, we are at least hopeful to expect a level of autonomy awarded to teachers in the selection process of curricular material.

⁵⁶ Please refer to appendix 11

⁵⁷ To see an example of the matrix, please refer to appendix 12.

⁵⁸ Please refer to appendix 13.

Teachers may know best what to offer students simply because they are directly involved and on the frontlines of the educational process. Subsequently, many gifted students understand technology very well and can provide insight into the interest of today's generation. Teachers can then design an integrated curriculum that is offered in an attractive fashion. What matters is that sincere, experienced, and knowledgeable teachers understand what information students need to possess. Authors like Tyler-Wood et al. (2000) saw a curriculum that was produced as a project⁵⁹ by a year-long work of 10 teachers specialized in: biology, chemistry, physical science, algebra II, and geometry. The teachers spent more than 1100 hours working and seeking the advice of consultants until the curriculum was finally produced and implemented. Some of the methods used were curriculum compacting and acceleration. This integrated curriculum was perceived as a tool to meet the needs of gifted students. The teachers were able to present a content that is significantly different from a typical high school curriculum. In other words, Tyler-Wood et al. (2000) explain that teachers redesigned the curriculum in a way that mutually reinforced concepts could be delivered across subjects like math and sciences. For instance, before students were introduced to balancing equation in chemistry, relevant mathematical concepts were offered and mastered. In such situations overlapping topics were covered during the math period. Furthermore, science-related activities and projects happened under the discretion of a science teacher assisted by a math teacher.

Surprisingly, at our private school, there were many occasions where chemistry and biology teachers asked math teachers whether or not students covered certain concepts in algebra (like percentages, algebraic equations, etc.). Although the math teachers confirmed that such concepts have been covered, the science teachers noted that students sometimes missed out the application of these concepts in physical and life sciences. This is due to the reason that math should not be taught in isolation from the sciences. There were many occasions when students (including the gifted ones) asked the writer of this dissertation (during his years as a math teacher) about the purpose of studying several concepts in math (examples would be factoring of polynomials, solving equations, and

⁵⁹ This project was called Project Ga-GEMS and it took place at a large mid-Georgia High School.

matrices). Most students did not see any connection to algebra with real life. Although the researcher tried to convince that the connection is there yet he could not do so because the rigid curriculum failed to show the students any bridging between math and other disciplines and subsequently the need for such concepts. Students will not see math problems alone in the real world. Instead, there has to be an integration of science and math concepts that clarify to students the importance of what they are learning. The implementation of math curricula in the classroom should be approached through a problem-solving based-learning. A mathematically gifted student needs to be given mathematically-enriched material through an integrated curriculum because one day the student needs to make the connection between what he/she learns in the classroom and what he/she experiences in the real world. Indeed, an integrated curriculum offers an effective opportunity for increased learning (Tyler-Wood et al., 2000). This is not to suggest that gifted students should only learn through integrated curricula. However, 'average' students who may already be suffering with the current math curriculum may not be too pleased with the idea of studying math and science at the same time. It is the advice of scholars in the field that mathematically gifted students, in particular, thrive in learning with challenges and real-life problems.

Essentially, a teacher would know best about his/her students' abilities and learning styles because of the substantial time teachers spend with students. Real life situations, workplaces, and careers would require future students to have a well-rounded knowledge. If approved by decision makers, an integrated curriculum can be laid by experienced teachers to serve the needs of all adolescent high school students in mixed-abilities classrooms (including the mathematically gifted ones). Teachers of several disciplines can be grouped in teams to produce a fine curriculum that lives up to the standards of today's modern world. The school needs to be supportive by removing trivial congesting duties away from teachers. No one can claim that this project will happen swiftly because it might take years to happen but it will be at least the first step towards the right method of teaching and meeting the needs of mathematically gifted students in the 21st century.

5.2.3 Policymakers and gifted education

The interview with the school's principal was very clear in that she has little say in segregating students according to their academic abilities. And whether we agree or disagree with the advocates of inclusion, the reality is that sometimes the way education is delivered at some private schools goes beyond a single school principal. Although Omar studies in a private school (which means it is not totally inspected and supervised by the Ministry of Education) yet like any other school it has to operate properly to retain its licensing. Unfortunately, functioning properly does not extend to understanding the needs of gifted students. It just means covering all required material. Some scholars believe that there is incoherence in the UAE educational system (Shaw *et al.* 1995 as cited in Gaad *et al.*, 2006). In a thorough investigation of the UAE educational system, Gaad *et al.* (2006) found that many supervisors and teachers who work for the the Ministry of Education are totally ignorant and unaware of the national plans pertinent to education. The co-authors have discovered that, at least on paper, there are plans put forth that involve development of school curriculum; methods of curriculum delivery; and monitoring & evaluation. Thus far no such plans have been executed in most schools. Gaad *et al.* (2006), suggested that supervisors and teachers need to be made fully aware of such plans and how to effectively implement them on ground. To do so, the co-authors suggest running seminars and workshops for both supervisors and teachers.

Gallagher (2001) proposes that gifted students (unlike average student who try to avoid schoolwork) surprise school administrators as they demand and call for more rigorous and challenging work. The scholar adds that these gifted students ask for more complex and sophisticated content where they can work independently towards mastering such an important content. Omar and other gifted students were no exception to this⁶⁰. The question that arises now is how carefully are the policymakers listening to these calls and demands? One of the major obstacles that face those in gifted education is persuading policymakers of the necessity for specialized differentiated learning models to attend to the needs of gifted students including the mathematically gifted ones (Gallagher, 1997; Renzulli & Reis 1998 as cited in Hekimoglu, 2004).

⁶⁰ Please see the end of appendix 1.

Many researchers believe that educational policy makers have in a way or another neglected to cater for the needs of gifted education (Cline and Schwartz, 1999). Ross (1993 as cited in Davis and Rimm, 2004) believe that this neglect has caused many gifted students to miss out great opportunities to succeed in life by losing interest in their studies. He chose to define it as a: “quite crisis”. And with political attention being steered towards inclusion due to demands for equity, some advocates of gifted education are wondering if gifted education is still feasible (Plucker, 1998 as cited in Buchanan and Woerner, 2002). Up to date, there is no clear policy in the UAE that is intended or steered towards gifted students.

In the UAE, a federal law has been issued to serve the needs of people with special needs. This law has been drafted after calls for equity for people with special needs. The law specifies that if a school accepts to place a student with learning disabilities (excluding severe ones), then it has to provide and care for the needs of this child (UAE Federal Law no. 29/2006). But one has to wonder if similar laws are applicable or even exist for gifted students in the UAE? Why gifted students cannot be treated as students with special needs? Except that their needs, of course, are much different. Here we would like to raise a point whether or not gifted students should be considered themselves as people with special needs. Cramond et al. (2002) see for instance that gifted learners need to be treated just as other students with special needs. In other words, and be granted equal rights. In fact Reis (1989 as cited in Bain et al., 2003) implied that often there are inadequate relationship between educational policy decisions and research findings. It is probably indispensable to recognize gifted students as students with special needs. Silverman (1996) states that it is unrealistic to expect a regular classroom teacher to teach one student addition and teach another pre-calculus! Instead, gifted students need to be treated as students with special needs. In this regard, Silverman (1996) insists that we cannot adopt the notion that one curriculum fits all. She adds that strengthening the curriculum and allowing gifted students to go as far as possible is a must.

Several policymakers complain that funding and financial resources of gifted programs are the main obstacles but advocates of gifted education warn that forcing the gifted pupils to progress at the pace of below-average students may have adverse effects on them (Davis and Rimm 2004; Little 2001; Colangelo and Davis 2003). But is budgeting the reason why traditional teaching methods and rigid curricula are still in effect? Thankfully, wise politicians are calling for a revolutionary change in an obsolete educational system. While Wragg (1999) states that long gone are the days of the 'recitation lesson' where the teacher is the sole presenter and the student is the sole listener, one has to wonder if the same is applicable in private schools of UAE?

During a presentation on UAE Government Strategy, apprehensive calls have been raised from H.H. Sheikh Mohammad Bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai. The Sheikh understands that huge funding has been set and allocated from UAE budget to serve and improve education. However, Sheikh Mohammad raised important concerns when he asked, *"What does the budget have to do with obsolete teaching methods and curricula? Does the budget force the quality of the curricula? Is the budget limiting educators to resort to the same old fashioned teaching methods that encourage memorization instead of research? Is the objective of education to measure the memory capabilities of students, instead of providing them with the knowledge necessary to meet life's challenges and the ability to think and choose."* (Salama, 2007 viewed 22 April 2007).

6 Conclusions

In conclusion, the author of this dissertation never claimed that this research is the answer to the issue of gifted education in the UAE. However, the author does claim that there exists a problem. This research was done based on a single-case study and therefore there are, of course, huge limitations to this research (as mentioned before). Further research is massively needed in the area of gifted education. More studies should be implemented (both qualitative and quantitative) to learn more about the needs and provisions of mathematically gifted students. The research should extend to examine and explore how decision makers can support teachers to attend properly to the needs of the gifted students in mixed-abilities classrooms. The eventual findings discovered must be utilized immediately to optimize the best learning atmosphere for gifted students. This further research should not be probably limited to UAE but should also spread to include all Gulf States.

There are many methods to meet the needs of mathematically gifted students but in today's world where inclusion is applied almost globally, researchers need to be realistic about their anticipations. Logically speaking, most private schools are marked by huge mixed-abilities classrooms. This means that gifted/ talented students may be seated next to students with learning disabilities. Gifted students may engage in unproductive behaviors if bored and unchallenged. The teacher becomes responsible to attend to the needs of his students. However, it is almost certainly unrealistic to expect of the teacher to attend to the needs of every single student (not to mention the needs of the gifted students as well). Although it is not claimed by the author of this dissertation that it is the ultimate method but probably one of the best methods to serve and attend to the needs of adolescent gifted students (including the mathematically gifted ones) in mixed-abilities classrooms is the integration of school curriculum. Teachers across several subjects can gather in teams and produce the lessons of math, technology, and sciences in a form of a curriculum. In an integrated curriculum, students can see the 'big picture' or in other words, the point of studying what they are studying in math.

With the support of politicians, policy and decision makers it is possible to foresee this happening, even moderately, in the future years to come. If convinced with the effectiveness of this method, educational policy makers can force the implementation of an integrated curriculum. Local universities should also start preparing specialized programs to train pre-service teachers in the field of gifted education. After all, the world around us is evolving scientifically and technologically. A nation will prosper better through proper investments in its intellectual youth: *the gifted*. Thanks to its rulers, the government of UAE has been generous enough to inject and provide money to improve its educational system and serve the students best. Now it is time for all educationalists to pay back the favor.

7 Recommendations

Bases on the analyses above, some recommendations are needed in order to facilitate for decision makers and educationalists the process of attending to the needs of mathematically gifted high school students in the private sector of UAE.

For teachers of mixed-abilities classrooms, the recommendations needed for mathematically gifted students are:

- Choose multiple textbooks that encourage students to learn concepts through inquiry, investigation, and exploration;
- Change teaching methods to adapt to more of students' learning styles;
- Use problem-based learning approaches in classrooms where gifted students can see a valid connection between math concepts and real-life problems;
- Differentiate tasks through giving challenging ones (not repetitive ones);
- Stressing on projects that elicit thinking, group work, and research;
- Provide prospects to contribute and take part in contests such as Mathematical Olympiads; and
- Incorporate the use of technology tools into class work and homework assignments. These tools may include (Internet, spreadsheets, graphic calculators, etc.).

Recommendations for policy and decision makers:

- Advise local universities to start embracing specialized programs in gifted education and train pre-service teachers to be well-grounded in their subject matter and in the field of gifted education;
- Recruit gifted education specialists and allocate them to assist and help in meeting the needs of mathematically gifted students;
- Allow some level of flexibility to private school administrators and teachers in deciding how to set forth delivery of educational methods;
- Encourage schools to start model curricula by integrating math, science, and others subjects;

- Construct advisory boards of gifted education specialists, consultants, and teachers that can assist in building a new integrated curriculum;
- Ask teachers across different disciplines to prepare exercises that constitute a mixture of different subjects;
- Encourage the participation of gifted students with their teachers to aid in providing ideas for a suitable modern curriculum that lives up to today's standards and generation.

Recommendations for school principals and administrators:

- Listen to teachers comments and complaints and try not to overload them with several tasks;
- Encourage teachers to alter their roles from information dispenser to knowledge-inquiry facilitator; and
- Support teachers with workshops and seminars that communicate new and interesting teaching methods to motivate gifted students;

This study was designed to examine the provisions available for mathematically gifted adolescent students at the private education sector in UAE. The research was done based on a case study and it used several methods like interviews, questionnaires, observations, document analysis and focus groups. The study recommends all of the above. Further research could be developed in the area of gifted education in the private educational sector of UAE based on the findings. This further research should include solid data that includes the number of private schools offering programs to the gifted students and the methods those private schools are implementing to attend to the needs of mathematically gifted students. Different private schools may have different curricula and it is a useful thing for private schools to share knowledge instead of dominating it.

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Appendix 1

Open-ended interview with the Omar

1. *Interviewer:* How are you Omar? I am doing some research on gifted students especially those ones who are gifted in math and I need to collect some information so as your former math teacher, I believe that you are one of the mathematically gifted students and I would like to collect some information from you and I will start by asking you about your age.
2. *Omar:* 14.
3. *Interviewer:* Generally, do you find the subjects you study in class to be challenging?
4. *Omar:* No, I find them easy.
5. *Interviewer:* Do you feel bored in class?
6. *Omar:* Yes.
7. *Interviewer:* Why?
8. *Omar:* Because I find subjects very easy.
9. *Interviewer:* Which subjects?
10. *Omar:* I find chemistry, biology, and math very easy. [*Omar did not mention physics because they simply do not take physics till grade 11*].
11. *Interviewer:* So in general you find math and sciences to be easy?
12. *Omar:* Yes.
13. *Interviewer:* What was the medium of instructions in other schools you attended?
14. *Omar:* English
15. *Interviewer:* As I remember, French was the only new subject to you when you moved to this school last year, is this correct?
16. *Omar:* Yes
17. *Interviewer:* What was your final average in French?
18. *Omar:* A-
19. *Interviewer:* Would you like to help weaker students?
20. *Omar:* Yes, I have no problem.
21. *Interviewer:* Do you have friends in school? I mean close friends.

22. *Omar:* Yes sir, I have some close friends.
23. *Interviewer:* How do you see a math lesson to just perfect?
24. *Omar:* If the questions are challenging and have many tricks. I like when teachers give us hard questions and we solve on our own without receiving help from the teacher.
25. *Interviewer:* Thank you Omar. That was helpful.

Outside this interview two other gifted students shared their opinions on the issue of boredom and challenges. One of them shared the same classroom with Omar, while the other was a twelfth-grader. One revealed his opinion that lessons are sometimes boring because of the way teachers present them. He believed that it is most boring when the teachers base their teaching on repetition. The twelfth-grader added that he would like to see more challenges in his school work since he understands very clearly that this what universities will be all about: challenges. It is probably healthy to mention that the latter got a scholarship to Yale!

Appendix 2

Open-ended interview with the math department coordinator

1. How do you identify mathematically gifted students at your school?
We identify mathematically gifted students mainly through the grades and test scores. But from my personal experience I know that there are gifted students who don't like to study regularly and if they are not challenged they lose motivation in studying. But you will be amazed that the student who you do not expect to answer is the only one who does he is challenged. They [*some gifted students*] participate when they are challenged. Also I believe that the teacher's questioning techniques can help in identifying gifted students. So teacher observations [*and nominations*] are also important for identification.
2. What types of provisions are available for mathematically gifted students?
There is enrichment material. You can provide enrichment. At our school we provide a practice book [*with every math course*] that contains higher-level questions. It depends on the teacher how to use the book. There is no reward for students who solve such high-level problems other than that they become satisfied with their performance. We [*as a school*] can [*in the future*] offer problem-solving of the week after school. We bring a really difficult problem [*where gifted students gather and try to solve it*].
3. In what ways does the school assist its math teachers to help them meeting the needs of its mathematically gifted students?
[*Long pause with a smile*]. Mainly we provide them [*the teachers*] with the content...we encourage them to be more than just teachers [*but there is no devised plan to tell the teachers how to go about meeting the needs of gifted students*].
4. In what ways are you satisfied with what the school has to offer for its mathematically gifted students?
I think we can do more. I am thinking for next year to research international competitions; math Olympiads, puzzle tournaments; etc.

Appendix 3

Open-ended interview with the director of the boys' block (grades 9 – 10) and the school's principal

1. What methods are used to identify gifted students in your school?
Identification is based on student's scores and academic achievements. It is also sometimes based on student's own projects and extra –curricular activities.
 2. Do you offer any kind of provisions for gifted students in any subject?
No not really. We do however give an award (merit or distinction) based on the performance at the end of the academic year.
 3. In what ways do you assist your teachers in meeting the needs of the gifted students?
Teachers do not ask our assistance. What we focus on is to encourage students with special needs or those who are not studying enough. We do ask teacher during meetings to focus on those types of students. Teachers are asked to encourage weak students to work harder so that they do not fail. We do not have a system to discover the gifted and subsequently teachers are not informed of anything. On the other hand, teachers are not asked by the administration to report or inform about gifted students.
 4. Do you notify and advise parents about their gifted children's talents?
Meetings with parents usually happen over their weak children. It is not customary for the school to conduct a meeting with a parent because of his/her gifted child. Our busy schedules, as a school, give us really no time to communicate with parents over their gifted children. However, I have to say that the only exception to this rule happens by coincidence. In other words, a meeting with a parent over his/her gifted child will happen if the parent asks for a meeting.
 5. In what ways are you satisfied with what the school is currently offering its gifted students?
I am not satisfied. So far there exists no devised plan to serve this category of students. But again I have to say that school [*as an administration*] chooses some of its gifted students to represent the school on certain events (for example, gifted students represent the school when university representatives visit the school for a lecture or conference and those representatives must be greeted by some of our students). In such cases, the school asks its gifted students to represent it.
-

Interview with the school's principal

Although the school's principal was not exactly free yet she was kind enough to allow me to ask her few questions.

6. *Interviewer:* It was quite noticeable that students have different abilities in math. Some students have great difficulties in math while others are just perfect. Why can't the school designate classes for each type?
7. *Principal:* It is not that easy. The ministry of education does not allow us to have such classes where we give general math for weak ones and advanced math for top-achievers. All students are expected to cover the same material.
8. *Interviewer:* But I remember that the school used to have teach materials that are not heavily-loaded academically weaker students. And some of these students used to be placed within one classroom.
9. *Principal:* This is why we closed those classes down. The ministry does not allow this anymore.
10. *Interviewer:* Thank you so much for your time.

Appendix 4

Open-ended interview with Some of Omar's teachers & Focus groups

Interview 1: Arabic teacher

1. Can you describe Omar in terms of his academic abilities and behavior?
Very well-raised and he has a good faith. He does not tell you the answers unless he is really sure. And if he ever makes a mistake it shows on him that he is affected by that. He is very much careful to say the right things.
2. What methods helped you identifying Omar as a gifted student?
Well, his [high] grades; his ability to grasp concepts quickly. He is very bright. His grades are excellent.
3. In what ways does the current curriculum meet Omar's educational needs?
The Arabic curriculum is mixed: there are easy lessons and hard lessons. Typically, the easy lessons were very simple for him and the hard ones he knew how to work with them.
4. What kind of provisions on offer in your subject for Omar?
There are no provisions offered [there is no time to do any kind of preparation because of our overloaded schedule]. But I used to ask them [my student] to prepare lessons on the computer as PowerPoint presentations. Some get excited to do so.
5. In what ways can the school fulfill the needs of its gifted students?
The problem is that within the same classroom there is a huge variation in the students' academic abilities which in return obstructs the teacher from giving any extra attention or material to the gifted students.

Interview 2: Islamic education Teacher

1. Can you describe Omar in terms of his academic abilities and behavior?
His manners and academic results were excellent. He has been always A+.
2. What methods helped you identifying Omar as a gifted student?
He always participates and gives out correct answers.
3. In what ways does the current curriculum meet Omar's educational needs?
The curriculum is not that rich to meet Omar's needs. Sometimes there are repetitions in the curriculum.
4. What kind of provisions on offer in your subject for Omar?
There are no provisions offered so [to counter that] I got accustomed to ask challenging questions to top students including Omar.
5. In what ways can the school fulfill the needs of its gifted students?
The student should be asked to do extra-curricular activities.

Unstructured interview 3: Biology teacher

The biology teacher was tight on schedule and to counter this issue a rather unstructured-interview was set. When asked about Omar's academic abilities, his reply was: "Omar is an excellent student." But the biology teacher had more to add:

"Omar is an excellent student but let me be frank with you, the material for him is too simple and he knows it all. Recently he has started to develop a habit of joking with his friends and laughing with them. He does calm down whenever I instruct him to do so but still he knows that the material is too easy for him. There are other students [who are academically weaker than him] in the classroom and I cannot accommodate to one individual."

The reader is to be advised that not all teachers were available for interviewing. And for those who were physically available, main obstacles like tight schedules and other commitments came in the way. To counteract this problem, another form of data collection method would be followed where the researcher would sit with teachers in the staff room during their brief breaks and talk with them about several issues of concern.

Focus groups

- Discussion time** : 15 – 20 minutes.
No. of participants : 6 to 7 teachers
Location : Senior high school teachers' lounge (staffroom)
No. of Meetings : Meetings happened weekly to bi-weekly and the collection of Information happened over the course of several gatherings (approximately 5 meetings).

Outside these interviews and in other occasions, most teachers of grades 10, 11, & 12 (senior high school) have indicated that it is rather impossible to attend to any gifted student's needs given the limited amount of time and the number of students within the same classroom (which translates to various mixed-abilities). Being a colleague for most of those teachers for a period that exceeded 9 years, most teachers have mentioned during meetings in the staff room or other settings that pressure they suffer a lot. It is important to recall that many teachers who joined our school came from other private schools and they carry similar experiences (this was quite visible during their talks in the staff room). Many teachers shared similar concerns and raised so many issues of the same nature that were of great sensitivity to them. In the last years of my stay at the school, such meeting would happen frequently in the form of a focus group where a point is being raised and all participants would share their opinions. The general impression projected by teachers after our gathering was rather close to a sense of apprehension. Teachers felt that they face many obstacles that make them uncomfortable and unhappy in working at some private schools. The talks did not stop at our private school but it also extended to include

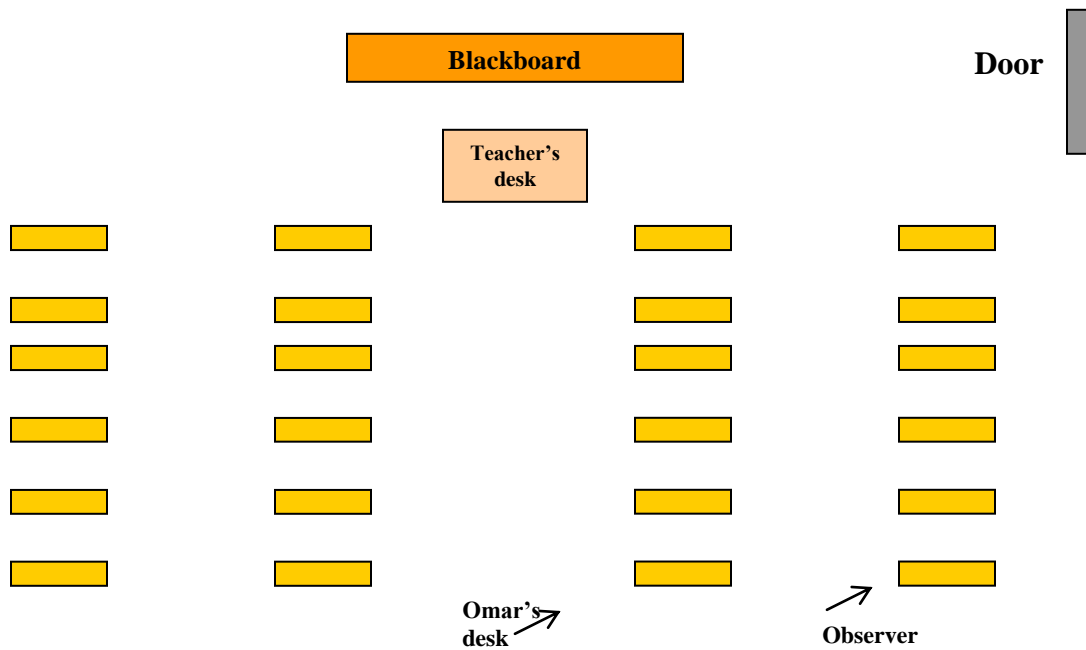
teachers' experiences in other private schools where they used to work. Those meetings happened across a span of time. The points that teachers have raised can be summarized in the following points:

1. Overloaded schedule. Many classes are assigned for them to teach with few breaks in between. The number of students in each classroom may exceed 30 and is rarely below 28.
2. Teachers feel that many students are placed at class levels that do not match their capabilities. Some students must be lowered in their class level.
3. Teachers love to have gifted and talented students in their classrooms. They believe such students make classes go at a faster pace, supplement classes with positive learning atmosphere, and make the whole teaching and learning experience enjoyable. But teachers believe that this is simply unattainable due to the following reasons:
 - ❖ Overwhelming work that they have to tolerate;
 - ❖ A rigid curriculum that cannot be modified;
 - ❖ the huge difference in abilities within the same classroom; and
 - ❖ number of students in each class is rarely below 30 students
4. Teachers feel frustrated with the fact that there are some students in their classrooms that literally 'slow' the class because of their incapacity to go with the flow and such students need an expert in special education to attend to their needs.
5. Teachers do not feel that they are professionally trained to deal with students with learning disabilities let alone they are not aware that some students have learning disabilities. In return, teachers feel unable to attend to the needs of high-achievers, gifted and talented students because of the scattered various abilities of the students.
6. Despite standing up for 8 periods a day (and a period is 50-minute long), teachers are also requested to conduct duties during breaks and recess as well as bus duties at the end of the school day (to make sure that all students registered in school transportation are assembled at their busses).
7. Teachers feel that they are assigned many tasks that are not related to their professions. Many of them feel that they are overworked and underpaid. They strongly feel that the administration does not listen to their complaints.
8. The school's grading system which is based on marking conducting many tests and quizzes during the year makes most teachers overly occupied with grading papers all year long and subsequently prohibits them to do anything else.
9. Teachers have little to no saying in suggesting modifications to the curriculum and they have to abide by the rules. Some complained that the curriculum is sometimes too simple. Others have mentioned that the curriculum puts too much pressure on the teacher to fulfill. .
10. Teachers expressed how they were frustrated with the lack of support from the school's administration to better-discipline misbehaving students. The lack of a

- clear discipline policy towards the students made some teachers lose their motivations to teach amid some chaotic environments.
11. Teachers also felt that they are the first ones to blame whenever there are declines in students' academic results.
 12. Another major point is resentment. Many teachers feel resentment towards the fact that some managements and administrations in private schools where they give leeway to their students and unintentionally *spoil* them (unlike their treatment with teachers). Teachers feel that private schools do so to please students are looked upon as the main source of private schools' income (since most private schools charge fees). Teachers felt that education nowadays is becoming more or less like a business rather than a humanitarian mission. It is this very reason that teachers feel that they lack inspiration to work.
 13. Teachers feel that all of the above issues are connected with each other. A good administration that provides support and understanding to its teachers (better wages, non-condensed classrooms, and firm management of student behavior) would result in better education settings and hence better productions.

Appendix 5

Observing Omar in the Classroom



Biology lesson observation Classroom settings

Structure : a classroom with 25+ students
Observation type : non-participant
Observation duration : approx. 20 minutes.
Observation started : 10 minutes after class started
Observation terminated: 10 minutes before lesson ended

The biology teacher has an extensive teaching experience that expands to more than 12 years. He has a good idea of what does it mean to be a talented student in sciences.

Field Notes

- 1) Omar was sitting and sharing a laugh with some of his friends. He seemed to very relaxed and happy around his friends. It is quite obvious that Omar fixes his eye-sight clearly on the teacher once he started the lesson. It seems that that biology teacher was revising with the classroom and posting question on the board. The class now started to actively respond to the teacher's questions. Some students, however, seemed to hesitate to answer. The teacher just asked a question and no one seems to be sure. Omar is answering the question and the teacher agrees with him. Omar and other top achievers are the ones who are mostly delivering the

- answers. It seems, however, that students were interested in the lesson because the teacher's tone was stimulating.
- 2) For the rest of the classroom, the teacher was asking questions and students were answering. Needless to say, Omar was the one most prominently raising his hand to answer and he is capable to answer the questions most students finding hard. The teacher decides to write some more questions on the board. Whenever Omar decided not to participate I see him quietly writing the answers on his sheets. The biology lesson seemed to be a review of concepts for a preparation of an exam. Most of the lesson was strictly depending on memory work. Biology involved many scientific terminologies that needed a good memory. Although Omar was able to recall most if not all terms and answer many questions yet he probably started to look not very much interested. Omar who eventually started to turn away from the lesson.
 - 3) Occasionally, Omar would talk and laugh with his friends. He was laughing a bit and one of his friends leaned and whispered something like a joke to him where he started laughing [but it was not a loud]. I believe my presence, though I made my best not to look him in the eyes or even make him feel uncomfortable, made his laughing short and limited. Despite his laughter with friends, he did manage to answer some questions later on. It seems to me that Omar was feeling bored since he was already aware of all what is being presented in class. It seems that he did have any motive to study because all the material posted and explained seemed to be quite easy for him. The remainder of the lesson is about the teacher asking questions and students trying to answer. This is when I decided to leave. There is simply nothing to add.

Math lesson observation

Classroom settings

Structure : a classroom with 25+ students
Observation type : non-participant
Observation duration : approx. 20 minutes.
Observation started : at the start of the lesson
Observation terminated: 10 minutes before lesson ended

The reader must be advised that the researcher happens to be Omar's math teacher. However, for the observation below, another math teacher was asked to teach Omar and his class instead while the researcher made his non-participant observation. Although the field notes mentioned below has to do with another math teacher being observed yet at the same time I feel compelled to say that during all those times I taught Omar's class this boy never failed to impress me. I believe that Omar is one of a kind because of his quick wit and sharp abilities.

Field Notes

- 1) Omar fixes his eyes on the teacher and listens carefully as the teacher starts. Omar looks as if he is absorbing the information being mentioned. Math teacher starts the lesson by explaining a set of geometry problems that were given to students a day earlier as part of their homework. It seems that most students have struggles with this problem. Students are listening carefully as the teacher is re-phrasing the questions and using mathematical representations (like drawing and sketching) to explain the problem well. But it is quite noticeable that the teacher's tone is not necessarily stimulating. In fact, he was just stating facts in one rhythm. Now the teacher is asking if there is a volunteer to do this problem from the geometry book on the board and possibly explaining it to the class. Omar is raising his hand and asks the teacher if he can possibly share his solution with the classroom. Omar suggests his own solution to the teacher. Although the solution was still incomplete yet he was the one of the few ones who actually participated. As a math teacher, I know that this is not exactly the easiest question for grade 10 geometry level. As a matter of fact, this has to be one of the toughest problems in the book and many students struggle in this problem.
- 2) After listening to his own solution, the teacher starts to explain more about the problem. Some students (especially those sitting beside Omar in the back row) make quite comments to Omar (it seems that those comments and remarks are about Omar's intelligence) in a funny manner. Omar takes the jokes lightly and smiles in a shy way without responding to the jokes made about him. He does not seem to be offended by the jokes. As a matter of fact, it seems that he got used to that. As a math teacher, At this point, the math teacher hands me the chalk and thanks me for giving him the chance to teach my class. I thank him in return for his services and I turn to my students to continue the lesson. The observation is completed.

Observing Omar during recess

Observation type : non-participant
Observation duration : approx. 10 minutes.
Number of times observed: at least 2 times

Field Notes

Omar during recess was surrounded with his friends. He seems to enjoy himself through joking and laughing with his friends. He has two friends who are with him in class. Omar sometimes spend part of his recess in the classroom eating his lunch and solving a question for his friends on the blackboard. There is absolutely no indicator whatsoever that Omar is mistreated by others. There are also no evidences that Omar does not enjoy any social network of friends. Omar spends most of his recess walking and talking to friends. I am not sure what are they conserving about. Omar certainly does not seem to be isolated or shut away by others.

Appendix 6

Types of Questions and Tone of Teachers*

Tone and Manner of Teacher
Challenging and simulating
Matter-of-factly
Threatening or testing

Types of Questions Asked	
Academic	Non- Academic
Stating facts or postulates	Questions that deal with personal and/or procedural matters and disciplinary issues rather than curriculum
Specific correct answers	
Opinions where no clear-cut response may be presented	

*Source: adapted and modified from Brophy and Good (2003).

Appendix 7

Teacher Questionnaire

Dear teacher,

This questionnaire has **6 questions only**. The purpose of this questionnaire is to serve as a data collection tool for a master's dissertation research on gifted education in Dubai's private schools. The responses you choose to write are to be used for research purposes only and no respondent identity shall be revealed. Below are some definitions¹ of terminologies used in this questionnaire:

Acceleration: *implies moving quicker through academic content, which usually includes offering standard curriculum to students at a younger-than-usual age.*

Enrichment: *refers to richer and more varied educational experiences, a curriculum that is modified to provide greater depth and breadth than is generally provided.*

Grade-skipping: *sometimes referred to as full acceleration and it implies moving the gifted student through the school system ahead of schedule.*

Subject-skipping: *Sometimes is called partial acceleration and it involves the gifted students taking classes or studying particular subjects with students in higher grades.*

Telescoped programs: *it means for example collapsing three academic years' work into two and so if enough mathematically gifted students are available in grade 10, a normal three-year algebra, pre-calculus (algebra 2), and calculus sequence might be taught at an accelerated pace in two years.*

Curriculum compacting: *sometimes called curriculum compressing is a technique where the curriculum is compressed in such a way that gifted students can complete it in less time.*

Pullout programs: *Gifted students are pulled out of their regular classes once or twice per week to participate and meet in special enrichment activities usually held at resource rooms.*

Special classes: *gifted students within a particular grade level or age are grouped in a class and exposed to advanced subjects (i.e. college preparatory subjects).*

Heterogeneous classes: *some schools simply do not have special programs for the gifted but many gifted-conscious teachers in regular classes volunteer and use their ingenuity to provide differentiated and enriched learning activities to their gifted students.*

Individual tutoring in advanced subject matter: *instead of acceleration, tutoring can be used to attend to the gifted student's learning needs.*

Kindly tick the desired choice where appropriate. Please feel free to use the back of the paper if more space is needed.

Question 1

What subject do you teach? _____

Question 2

**How do you identify gifted students in your subject?
(You may select more than one choice)**

- Intelligence tests & IQ scores Student's test grades
 Student's participation in class Administrator nominations
 Others (please specify)
-

Question 3

Do you have any provisions for gifted students in your subject?

- Yes No

Question 4

**What types of provisions are available for gifted students at your school?
(You may select more than one choice)**

- Grade-skipping Subject-skipping
 Telescoped programs Curriculum compacting
 Heterogeneous classes Individual tutoring in advanced subject matter
 Pull-out programs Special classes
 School clubs
 None
 Others (please specify)
-

Question 5

**How does the school assist you as a teacher in teaching the gifted students?
(You may select more than one choice)**

- Workshops Guest speakers Teacher assistants Resource rooms
- None Others (please specify)

Question 6

In what ways are you satisfied with what the school is currently offering its gifted students?

Thank you for your time and efforts.

ⁱⁱⁱⁱ All definitions are extracted from: Davis, Gary, A. & Rimm, Sylvia, B. (2004) *Education of the Gifted and Talented* (5th Ed) Allyn and Bacon: Boston and VanTassel-Baska, J. and Stambaugh, T. (2006). *Comprehensive Curriculum for Gifted Learners* (3rd Ed.) Boston: Allyn and Bacon.

Appendix 8

Omar's Report Card

Courses	1st	1st	2nd	2nd	3rd	Final	Final Annual
	Term	Exam	Term	Exam	Term	Exam	Average
Islamic Education	A	A	A+	A+	A+	A+	A+
Arabic	A+	A-	A	A	A+	A	A
History	A+	A-	A+	A+	A+	A+	A+
Geography	A+	A+	A+	A+	A+	A+	A+
Economics	A+	A	A+	A+	A	A	A+
English	A-	B+	A+	B+	A+	A	A-
French	A-	B-	A-	A-	A-	A-	A-
Algebra	A+	A+	A+	A+	A+	A+	A+
Geometry	A+	A-	A+	A+	A+	A-	A
Chemistry	A+	A+	A+	A+	A+	A+	A+
Biology	A	A	A+	A+	A+	A+	A+
Computer Science	A-	**	A-	**	A+	**	A-
Physical Education	A-	**	A-	**	A-	**	A-
Average	A+	A-	A+	A+	A+	A+	A+
Honor	HSH	HRH		HSH	HSH		HD

Comments

**Promoted to Grade 11. Congratulations!
You earned a Highest Distinction Award**

A+ = 97 - 100	A = 94 - 96	A- = 90 - 93
B+ = 87 - 89	B = 84 - 86	B- = 80 - 83
C+ = 77 - 79	C = 74 - 76	C- = 70 - 73
D+ = 67 - 69	D = 64 - 66	D- = 60 - 63
E+ = 57 - 59	E = 54 - 56	E- = 50 - 53

Passing grade is 60%

** = No Mark

This subject has no exam

Appendix 9






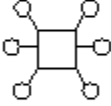
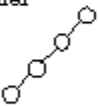
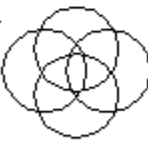

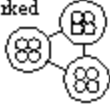
Identifying the mathematically gifted*

The student...

	A little	Some	A lot
1. Learns and understands mathematical ideas very quickly	1	2	3 – 4 – 5
2. Displays multiple strategies for solving problems.	1	2	3 – 4 – 5
3. Engage others in problem solving.	1	2	3 – 4 – 5
4. Sustains concentration and shows great tenacity in pursuing problems.	1	2	3 – 4 – 5
5. Switches approaches easily and avoids nonproductive approaches.	1	2	3 – 4 – 5
6. Operates easily with symbols and spatial concepts.	1	2	3 – 4 – 5
7. Quickly recognizes similarities, differences, and patterns.	1	2	3 – 4 – 5
8. Looks at problems more analytically than holistically.	1	2	3 – 4 – 5
9. Works systematically and accurately.	1	2	3 – 4 – 5
10. Demonstrates mathematical abilities in other subject areas.	1	2	3 – 4 – 5
11. Prefers to present information through charts, tables, and graphs.	1	2	3 – 4 – 5

* If the student is rated with scores 4 or 5 on more than half of the characteristics, then more assessment is necessary. Source: Sousa, David A. (2003).

Appendix 10
Integrated Curriculum*

Name	Description	Advantages	Disadvantages
Fragmented 	Separate and distinct disciplines	Clear and discrete view of a discipline	Connections are not made clear for students; less transfer of learning
Connected 	Topics within a discipline are connected	Key concepts are connected, leading to the review, reconceptualization and assimilation of ideas within a discipline	Disciplines are not related; content focus remains within the discipline
Nested 	Social, thinking, and content skills are targeted within a subject area	Gives attention to several areas at once, leading to enriched and enhanced learning	Students may be confused and lose sight of the main concepts of the activity or lesson
Sequenced 	Similar ideas are taught in concert, although subjects are separate	Facilitates transfer of learning across content areas	Requires ongoing collaboration and flexibility, as teachers have less autonomy in sequencing curricula
Shared 	Team planning and/or teaching that involves two disciplines focuses on shared concepts, skills or attitudes	Shared instructional experiences; with two teachers on a team it is less difficult to collaborate	Requires time, flexibility, commitment and compromise
Webbed 	Thematic teaching, using a theme as a base for instruction in many disciplines	Motivating for students, helps students see connections between ideas	Theme must be carefully and thoughtfully selected to be meaningful, with relevant and rigorous content
Threaded 	Thinking skills, social skills, multiple intelligences, and study skills are "threaded" throughout the disciplines	Students learn how they are learning, facilitating future transfer of learning	Disciplines remain separate
Integrated 	Priorities that overlap multiple disciplines are examined for common skills, concepts, and attitudes.	Encourages students to see interconnectedness and interrelationships among disciplines, students are motivated as they see these connections	Requires interdepartmental teams with common planning and teaching time
Immersed 	Learner integrates by viewing all learning through the perspective of one area of interest	Integration takes place within the learner	May narrow the focus of the learner
Networked 	Learner directs the integration process through selection of a network of experts and resources	Pro-active, with learner stimulated by new information, skills or concepts	Learner can be spread too thin, efforts become ineffective

*Source: Lake, Kathy (1994) <http://www.nwrel.org/scpd/sirs/8/c016.html> (viewed 1 December 2007)

Appendix 11

Bloom's Taxonomy of educational objectives*

Levels	Processes	Products
Knowledge Rote memory, learning facts	List, tell, describe, draw, timeline	Lists, description, fact sheet
Comprehension Understand or interpret information, make use of the idea in a similar situation	Rewrite, summarize, explain, discuss	Essay, diagram, drawing
Application Use ideas, concepts etc. in a new situation	Dramatize, demonstrate, translate, calculate	Models, role plays, map, journal,
Analysis Breaking down the big picture into its components, examining components closely for better understanding	Analyze, examine, compare/contrast, group, survey, classify	Survey, graphs, interviews, book review
Synthesis Bringing together parts to create a whole, original thought or original product	Rearrange, invent, predict, improve, combine, plan	Invention, story, song, play, poem
Evaluation Judge against criteria or develop/apply standards	Judge, evaluate, debate, recommend, prove, criticize	Conclusion, summary, report, jury, review, evaluation form

*Adapted from Coli (1996 as cited in Warnod, 2002)

Appendix 12

Integration of Bloom's Taxonomy and Gardner's Mathematical-Logical Intelligence*

Logic and Math	
1 Knowledge**	<p>Example: Explain and use the procedure for the quadratic formula:</p> $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} .$
2 Comprehension	Write a paragraph of 10 to 15 lines about describing the background of the mathematician who created the formula and his timeline. Explain in your own words how the formula helped many in factoring difficult polynomials did.
3 Application	<p>In groups of 3, find the factoring of the following questions:</p> $x^2 + 9x + 20$ $x^{-4} + 5x^{-2} + 6$ $2x^{-6} + 9x^{-3} + 7$ $ex^{-8} - 26x^{-4} + 13$
4 Analysis	The first group that finishes all questions must take command of the classroom and asks all students to halt. The group must then list all of its answers on the board and compare and contrast answers with that of other groups. Teacher will act as a facilitator only.
5 Synthesis	Try to find where the quadratic formula comes in practical in sciences (think of any science subject you have studied). Do you believe that the quadratic formula makes a good bridge between math and science?
6 Evaluation	Develop a proof of the quadratic formula from previous knowledge you have acquired about completing a square. Justify each step you use.

*Adapted and modified from Warnod (2002)

**According to Selden & Selden (1996, viewed 6 December 2007), some scholars see mathematical knowledge as either explicit or implicit. Theorems, proofs, problems and questions are seen as explicit whereas meta-mathematical views, symbolism, techniques, strategies, aesthetics, and values are seen as implicit.

Appendix 13

Responsibilities of Teachers and Students*

	Teacher Responsibility	Student Responsibility
Prepare & present	Activates background knowledge Explains Models	attends participates
Practice	Coaches with extensive feedback	practice strategies with guidance
	Encourages Transfers Assesses	evaluates strategies uses strategies independently

*Adapted from Chamot & O'Malley (1993 as cited in Warnod, 2002)