A Contribution to Cummin's Thresholds Theory: The Madaras Al Ghad Program

مساهمة لنظرية كومين: برنامج مدارس الغد

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ABSTRACT

Since its implementation in 2007, the MAG schools (*Madares Al Ghad* – Schools of the Future) as a bilingual education program has not been evaluated. This study sought to answer two main questions to evaluate the MAG program: (1) Is there a significant difference in the achievement of MAG students after three years of implementation of the program compared to MOE students in math and English? (2) Is there a significant difference in the achievement of boys and girls within the MAG program and compared to boys and girls in the MOE program? The study utilized a fixed methods approach to gain quantitative data using internal Ministry of Education math and English tests in a quasi-experiment to compare student outcomes on the exams. The results of the study revealed that while the students in the MAG program scored better than their MOE counterparts in English, the outcomes of the math test for the MOE students were greater. The study concludes by recommending future research into the types of bilingual education available in the UAE and their impact on student achievement in addition to studies into student outcomes of the MAG program in Arabic to learn if their mother tongue is developing to such a degree as to support academic success.

لم تقيم تجربة مدارس الغد منذ تأسيسها في العام 2007. تهدف هذه الدراسة إلى تقييم برنامج مدارس الغد عبر الإجابة عن سؤالين بحثيين هما: (1) هل هناك فرق احصائي ملحوظ في تحصيل الطلبة في مدارس الغد مقارنة مع زملائهم في المدارس الحكومية الأخرى؟ (2) وهل هناك فرق احصائي ملحوظ في التحصيل العلمي بين الذكور الإناث؟ استخدمت الدراسة منهج بحثي ثابت مكنها من الحصول على بيانات كمية عن تحصيل الطلبة وذلك عبر استخدام امتحانات معدة من وزارة التربية والتعليم لقياس معرفة ومهارات الطلبة حسب مراحلهم العمرية. كشفت الدراسة بأن تحصيل الطلبة في مدارس الغد كان أعلى بشكل ملحوظ من تحصيل زملائهم في المدارس الحكومية في مادة اللغة الإنجليزية ومن الجانب الأخر فلقد كان تحصيل طلاب مدارس الغد أقل بشكل ملحوظ من تحصيل زملائهم في الرياضيات. كما وخلصت الدراسة بتوصيات لأبحاث مستقبلية في مجال الأنظمة التعليمية التي تتبنى في تعليمها لغتين في دولة الإمارات العربية المتحدة وتأثير هذه الأنظمة على تحصيل الطلبة بالإضافة إلى دراسة مدى تأثير برنامج مدارس الغد على تحصيل الطلبة في مادة اللغة العربية (اللغة الأم) ومدى مساهمتها في تطوير معارفهم ومهاراتهم بما يدعم نجاحهم الأكاديمي.

Key Words: MAG (*Madares Al Ghad* – Schools of the Future), MOE (Ministry of Education), Bilingual Programs, Program Evaluation, Student achievement, Bilingual, Bilingualism, Cognition, Medium of Instruction, Language Policy, quasi-experiment.

DEDICATION

I dedicate this work to our Creator, the All Merciful, All Wise for all the favors He has bestowed on me; in creating me and bringing me into this world. His Love, His Mercy, His Graciousness, His Forgiveness, His Compassionateness, His Relentlessness, and His Bountifulness are above any humble person like me, to be able to thank Him enough and to praise Him. May He accept my humble work and forgive my shortcomings.

ACKNOWLEDGEMENTS

In the name of Allah, the Beneficent, the Merciful

Read: In the name of thy Lord who createth,
Createth man from a clot.
Read: And thy Lord is the Most Bounteous,
Who teacheth by the pen,
Teacheth man that which he knew not.
(Holy Quran, Surah 96; verses 1-5)

In the name of Allah, the Beneficent, the Merciful

O Mankind! Lo! We have created you male and female, and have made you nations and tribes
that ye may know one another. Lo! The noblest of you, in the sight of Allah, is the best in
conduct. Lo! Allah is Knower, Aware.
(Holy Quran, Surah 49; verse 13)

"... Muslims invented almost every aspect of modern science, medicine, technology, and social
organization, but that attribution has not been given them, and they have been disenfranchised."

Michael Hamilton Morgan, *Lost History*

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Chapter One: Introduction

Educational policies throughout the world have evolved to meet the needs of the global society. Many countries have joined in the knowledge economy to keep up and participate in the newest technological advancements. In order to do so, many countries have had to implement language policies in their education systems so that their citizens have access to the most recent educational resources. Many of these policies have caused much apprehension among educators and parents in these countries. Officially, diversity or assimilation and access to knowledge are cited as the objectives in these policies. However, the main concerns are maintenance of the first language and the effect of the spread of the English language which may "not encourage bilingualism but rather a shift towards English as the preferred language, especially in schools" (Baker, 2006, p. 91). Since a language is the medium of a culture's thoughts, the heated debates surrounding medium of instruction policy are grounded in evolutionist, conservationist and preservationist attitudes of language planning (Baker, 2006). Evolutionist attitudes approach language of instruction planning through Social Darwinism where "if a language fails to adapt to the modern world, it deserves to die … [therefore] [l]anguages must survive on their own merits without the support of language planning" (Baker, 2006, p. 48). Conservationists on the other hand, see language of instruction planning as a way to maintain the variety of languages in a society while preservationists differ from conservationists in that they are more conservative and purist and view change as a threat to the survival of their language (Baker, 2006, p. 49). It is the Arabic preservationist attitude that makes some believe that the Arabic language does not support the learning of modern science and technology since it is said to be disinclined to borrow from other languages (Newman, 2002).

Although the UAE is an Islamic country with moderate practices, many concerns have arisen in the society about the relationship between Islam and English, particularly since the unfortunate events of 9/11 and the resulting issues surrounding it. The Arabic language to Muslim Arabs and non-Arab Muslims is not just a way to communicate and learn in the secular sense, it is the language of the Quran and the religion. According to Rahman (cited in Baker, 2006, p. 90) there are three Islamic responses to the learning of English: acceptance, rejection or resistance, and pragmatic utilization. The UAE prefers the latter since the Quran advocates the learning of other

languages not only to spread the religion but also to increase one's wisdom through the other culture's language resulting in a "bilingualism and biculturalism [having] additive effects" (Mohd-Ashraf, cited in Baker, 2006, p. 90), or the perspective of language as a resource, "an asset, both for communities and for individuals… [to] aid individual participation in public, leisure and private lives" (Baker, 2006, p. 390). Islam is more than just a world religion; it is a culture with its own identity, world view, politics and societal functions as a way of life. It has had learning as its foundation since its advent. Even before modern education, opportunities were given to all to acquire an education, whether basic or advanced. This is evident, from east to west, in countries such as India, Iran, Iraq, Syria, Egypt, and Spain where the oldest institutes of education were erected by Muslims hundreds of years ago. In the times that Arabic was the lingua franca of civilization (Graham, 2006, p. 31), in these institutes the groundwork of modern knowledge and technology in science and mathematics were founded and practiced by the masters of the era such as Al-Khwarizmi *(Algorismi)* in mathematics, Al-Battani and Al-Tusi in astronomy, and Ibn Al-Baitar, Al-Razi, and Ibn Sina *(Avicenna)* in medicine just to name a few. It is in this time that Arabic set the foundation for a body of vocabulary for these fields in other languages.

1.1 Background

Since its inception, the educational policies in the United Arab Emirates (UAE) have evolved rapidly over the past four decades to meet the demands of modernization and globalization. It is only in the past decade that the UAE has adopted a more global role.

Figure 1.1: Education in the UAE
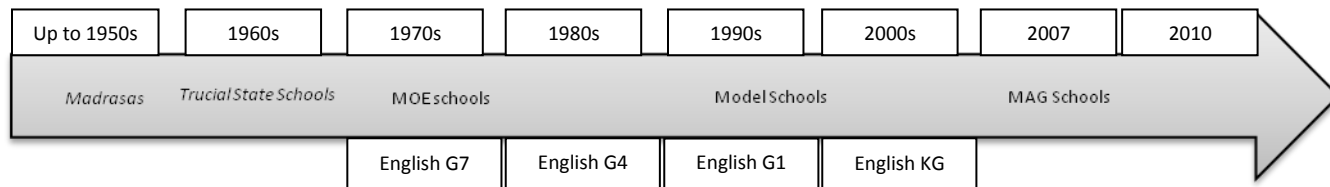
Up until the 1950s when modern education was established in the Gulf (see Figure 1.1 above), countries in the region such as the United Arab Emirates (UAE), depended on the community *madrasa* for education which consisted of writing, reading and recitation of the Holy Quran, and basic arithmetic. These were all studied in the native Arabic language and were taught by a more

knowledgeable elder or someone brought in from another more educationally advanced Arab state such as Egypt or Kuwait. In the early 1970s, the Ministry of Education (MOE) was formed to oversee educational standards in all the emirates of the UAE. Initially, English was taught as a foreign language starting in grade seven. In the 1980s, English instruction was introduced in grade four; then in the 1990s in grade one; and recently, in the early 2000s, in kindergarten. In the mean time, the world has made great advances in technology and science, requiring more comprehensive skills creating many challenges in education the world over, in particular the Arab world, which "include illiteracy, appropriateness of educational systems to serve development plans, and greater openness to the fruits of contemporary scientific knowledge" (Mohammed bin Rashid Al Maktoum Foundation, 2009, p. 97). In order to respond to the specific needs of the UAE workplace, the MOE introduced the Model schools to the MOE umbrella of schools in the late 1990s. The model schools are a venture by the ministry of education in response to nationals desiring MOE curriculum schools for their students with the same teaching standards as the private schools in Dubai, but without the sometimes exorbitant school fees (see Figure 1.2 below).[1]

Recently, the UAE participated in the worldwide standardized tests TIMMS and PISA. These tests revealed the need for urgent reforms in the government curriculum in order to be on par with the rest of the world since results showed the UAE scored below international levels (KHDA, 2009). This drew the attention of educational experts in the UAE who have been discussing the problem of public school students not getting enough English particularly since "[it] is the medium of a great deal of the world's knowledge, especially in science and technology" (Crystal, 2003, p.110). Some believe that Arabic does not support the learning of modern science and technology since it is disinclined to borrow from other languages (Newman, 2002). In addition, peer reviewed scientific publishing from the Arab world accounts for just over one percent of the global publishing (Mohammed bin Rashid Al Maktoum Foundation, 2009, p. 197). As a result, this has some experts and teachers asking for a change in the curriculum where English would be given higher priority (Issa, 2006, p. 5) mainly since

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[1] In the academic year, 2009 – 2010, the Princess Haya Schools were officially opened to students and has been added to the umbrella of MOE schools. The focus of this paper is on the more established schools of the MOE – government and MAG schools.

education at tertiary level in the Gulf region is predominantly in English, especially in science and technology (Troudi, 2007, p. 6). Although, parents and students alike view English as a way to advance professionally and economically (Graddol, 1997, p. 38), in the UAE, concerns have been voiced about the position of Arabic in the society when English is given higher priority, particularly in education, a trend which seems broad spread where English is taught as a second or foreign language (Kirkpatrick, 2009; Fouché, 2008; Hiyama, 2002). Some countries in the Far East and many in Europe have realigned their educational objectives to give priority to the language of the country with the learning of other languages mandatory (The European Commission, n.d.) in an effort for cultural diversity through multilingualism. In the UAE, this is echoed in the MOE's aim to improve the national curriculum while retaining the national identity (*Gulf News* 17 February 2006; *Gulf News* 22 June 2008).

In addition to the MOE's goals, the Ministry of Higher Education plans to gradually remove the foundation year in the federal colleges and universities (Moussly, 2010) so that Emirati students graduating from public high schools can directly enter degree programs. Presently, many colleges and universities in the UAE, such as the Higher Colleges of Technology (HCT) have the policy of English as the medium of instruction (Troudi, 2007, p. 6). Most courses at tertiary level in the Gulf region are in English, especially those in "medicine, chemistry, physics, engineering, and other science subjects" (Troudi, 2007, p. 6). The foundation year supplements the students' education in math and English in order for them to enter degree programs at college and university. Before the foundation year can be eliminated, the standards in math and English have to be raised starting in Cycle 1 (grades 1-5) all the way through to Cycle 3 (grades 10-12). In an effort to reach these objectives in Dubai, the Madares Al Ghad (MAG) schools and the Knowledge and Human Development (KHDA) were established.

Figure 1.2: School Systems of the MOE
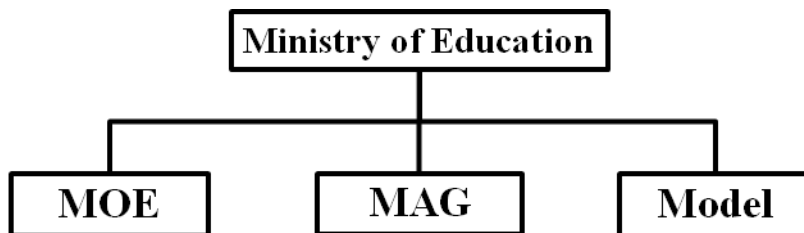
1.1.1 Madares Al Ghad (MAG) Schools – Schools of the Future

Unlike other countries in the world, most parents in the UAE send their children to private schools (Ahmed, 2009; Lewis, 2009). In Dubai alone, nearly fifty-five percent, over half of Emirati students attend private schools (Dubai Statistics Center, 2010) which is almost double what is reported for the capitol, Abu Dhabi where twenty-nine percent of Emirati families choose private education (Lewis, 2009). The rationale for this trend is that parents feel that their children get a better education in the private schools since improvement of the system in the public schools is quite slow (Ahmed, 2009; Lewis, 2009). In view of this and the Ministry of Higher Education's plans to eliminate the foundation year in colleges and universities, the MOE in conjunction with HCT designed the MAG program to meet the specific challenges of the education system in the UAE, in an effort not to import regional or international initiatives[2]. It was initiated in the academic year 2007/2008 in selected Cycle 1 MOE schools. Its standards were adopted from the Abu Dhabi Educational Council (ADEC) which are aligned with the Common European Framework Reference (CEFR). The goal of this initiative is to create bilingual UAE citizens who are able to meet the challenges of the 21st century. In addition, it aims to serve as an example for reform in education in the public schools. The main focus of the program is on teaching English to a level that enables students to enter directly into tertiary education without the necessity of a foundation year. Six of the seven emirates in the UAE (Dubai, Sharjah, Ajman, Ras Al Khaimah, Fujeirah and Um Al Qiwain) have two schools for each cycle, one for each gender in each cycle. However, the MAG program falls within the jurisdiction of the MOE.

The MAG approach promotes the use of modern management techniques in the MOE schools regarding planning and distributed management structure in addition to "promoting the use of English as the medium of instruction in the core subjects of mathematics and science, as well as in English" (DSIB, 2009, p. 96). There is more flexibility in the deliverance of the MOE curriculum and in the "capacity of the school management to bring about change" (DSIB, 2009, p. 96). The Cycle 1 curriculum for Arabic has been reformed on par with English pedagogy. Yet, the Arabic for the other cycles at present follow the traditional MOE curriculum.

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[2] The researcher is an employee of the Ministry of Education.

The program is supervised by an Academic Program Coordinator (APC), who is assigned to manage each cycle using weekly/monthly reports, school visits and analysis of students' performance on exams. Other participants have various roles and responsibilities within the program, such as an Instructional Leadership Coordinator (ILC), two Teacher Development Specialists (TDS), who help the administration of the school, co-teach and mentor teachers as well as develop instructional materials and ensure teachers make effective lesson plans which can be delivered in real learning settings. In addition, participants in the program (program director, APC, ILCs, and TDSs) are evaluated through surveys, interviews, meetings with concerned stakeholders and students' results. The MAG schools are also rated by the DSIB and given reports with recommendations.

According to the DSIB report (2009), the MAG program fares better in Cycle 1 girls' schools where "the commitment of the school leaders and the skills of the teachers were evident in the ability of the students to make choices, think for themselves" (p. 96). However, at present, the MAG schools in Dubai face many challenges, evident in the program's "mixed record of success" (DSIB, 2009, p. 96). Some of the challenges faced by MAG are the need to change the culture of teachers and support of stakeholders. In May 2010, a university from the US, evaluated the MAG program and gave recommendations to be considered and implemented were the program to continue. Recommendations include a needed focus to support science and math teachers in using English more effectively in their classrooms, specifically teachers' professional development programs, intervention plans to improve students' skill levels in reading and writing and concentration on developing teaching science and math in English in Cycle 1. The MAG program was planned to expand to other MOE schools, but during four years no other schools have been added. The turnover of staff is relatively high due to the uncertain future of the program and changes at the senior level. Additionally, the program is in need of solid and stable leadership as continuous turn-over has a negative effect on morale of the program staff.

1.1.2 Dubai Schools Inspection Bureau (DSIB)

Evaluation is important in the process of educational change. In order to do so, aspects of student learning have to be assessed. As a result, in 2006, the Knowledge and Human Development Authority (KHDA), Dubai's education authority was created under the directions of Sheikh Mohammed bin Rashid Al Maktoum to develop the existing schools to international

standards through "the planning, provision and development of knowledge and human resource requirements in cooperation and coordination with the concerned federal entities in the country" (KHDA, 2011). In 2007, KHDA initiated the Dubai Schools Inspection Bureau (DSIB) whose purpose is "to inspect and report on the quality of the education being provided in all the schools in Dubai" (DSIB, 2009, p. 132). Dubai is unique in that there is a variety of schools and curricula from which parents can choose for their children. The purpose of the reports is to "help schools improve their performance; help parents make the right choice of school for their children; [and] help policy makers make strategic decisions about the development of education in Dubai" (DSIB, 2009, p. 132). The inspection teams reflect an international dimension which consists of highly qualified experts in their fields from different countries and authorities which correlate to the inspected schools' curricula (DSIB, 2009, p. 133).

In 2008, inspections of schools in Dubai commenced, adding the schools of other national curricula the following year. Since then, the DSIB has had yearly inspections of public and private schools in Dubai, including the MAG schools. After each cycle of inspections, reports are given which outline the areas of improvement for each school. The areas in which inspectors make judgments are as follows (DSIB, 2009, pp. 9-10):

- The students' progress in key subjects: Arabic, Islamic Studies, English, mathematics and (from Grade 6) science.
- The students' personal and social development.
- Teaching quality and how well the students are learning.
- How well the curriculum meets the educational needs of the students.
- How well the school protects and supports the students.
- The quality of the leadership and management.
- The school's overall performance.

A four-point rating scale is used by the inspectors of the DSIB as follows (DSIB, 2009, p. 10):

- **Outstanding:** Exceptionally high quality of performance or practice.

- **Good:** The expected level for every school in Dubai.

- **Acceptable:** The minimum level of acceptability required for Dubai. All key aspects of performance and practice in every school should meet or exceed this level.

- **Unsatisfactory:** Quality not yet at the level acceptable for schools in Dubai. Schools will be expected to take urgent measures to improve the quality of any aspect of their performance or practice that is judged at this.

The MAG and MOE schools in this study have had the same overall rating over the two inspection cycles in the academic years 2008/2009 and 2009/2010 (DSIB, 2010, p. 114-123). Three of the schools received good ratings while one received unsatisfactory. This school has had in the mean time three follow through inspections to raise its rating.

1.2 Rationale and Research questions

This paper is a report on a comparative analysis carried out in selected MOE and MAG schools in Dubai to ascertain the achievement of grade three students in these schools in math and English using internal MOE math and English tests. This kind of study is important since there is little empirical research showing the progress of the MAG schools since its inception in 2007 compared to other MOE schools to evaluate the English as the medium of instruction policy in the MAG schools. This study will evaluate the program using students' outcomes from English and mathematics exams[3] and asking the following research questions:

1. Is there a significant difference in the achievement of MAG students after three years of implementation of the program compared to MOE students in math and English?

2. Is there a significant difference in the achievement of boys and girls within the MAG program and compared to boys and girls in the MOE program?

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[3] Due to research constraints, other aspects of policy evaluation, e.g., qualitative data from observations and surveys will not be covered in this study. The focus will be on student outcomes.

8

Chapter Two: Literature Review

Our understanding of how people learn a second language and how teachers should teach a second language has progressed as a result of the many contributions of intellectuals like J. Dewey, B.F. Skinner, N. Chomsky, J. Piaget, and L. Vygotsky and more recently in second language learning S. Krashen and J. Cummins. The ideas of Piaget and Vygotsky seem to have taken the forefront in teaching concepts in subjects such as math since the 1970s in North American and UK schooling traditions, but not without criticism. Their assumptions, as well as supporting research, in learning and teaching language and mathematics have influenced many of the bilingual programs which in turn have had an influence on the policies governments have made in relation to national education.

This section will be divided into three parts:

Bilingualism and cognition − in this section the theories of how bilingual students learn will be discussed. It will look at research in this area in terms of gender and learning language and mathematics in L2.

Bilingual programs − the different language learning program will be studied in this section in terms of L1 maintenance and their attitudes based on social philosophies. In addition, issues arising from these courses will be addressed. Finally, the bilingual programs used in the UAE will be reviewed in relation to research and how evaluations are important in the process of reforms in education.

Policy making − issues of the research study in terms of policy making and evaluation will be discussed through the structure of the UAE government. It will review the processes in policy making and evaluation and the actors in these who influence the educational goals and develop and evaluate language programs such as MAG.

2.1 Bilingualism and Cognition

Usually, when one speaks of bilingualism one thinks of having the ability to speak and understand two or more languages. But, the definition of bilingualism has been refined over the past thirty years. It now includes the notion, initiated by Skutnabb-Kangas (cited in Orr

Easthouse, 2003, p. 3) in 1981, of *cognitive competency*, or "the ability to reason and think, as a fifth ability factor in bilingualism" (Cummins, cited in Orr Easthouse, 2003, p. 3).

It is through the four modes of language (listening, speaking, reading, and writing) that humans communicate and so learn. From birth until school age, children learn about their world in their mother tongue through two language modes (listening and speaking). Once children start school, their language has developed to a level where they can start learning at a higher order. It is at this time that they learn to read and write. From then on learning activities at school use all the modes of language in one way or another. The situation is more complicated, though, for those who learn through another language other than their mother tongue.

2.1.1 Learning Language

There are many theoretical approaches to how languages are learned contributed by many experts in the field. Two approaches which seem to endure are the innatist and the interactionist. One innatist theorist, Krashen has had great impact in the field of language learning and has contributed to our understanding of the processes of language learning. He considers language as a "vehicle for communicating meanings and messages" (Richards and Rodgers, 2001, p. 180). His 'monitor model' is made up of five hypotheses which make a distinction between learning and acquisition. One of these is the 'input hypothesis' which, not only is applicable to L2 learning, but also to L1, emphasizes that language learning occurs through exposure to input which is comprehensible and "just beyond the learner's current level of competence" or 'i+1' (Lightbown and Spada, 1999, p. 39). In the context of the UAE, this has been of great concern. Not only do students not get adequate English language input but also, the input is not always correct nor challenging enough.

The interactionist approach to language learning includes the sociocultural theory of learning put forward by Vygotsky which supposes that "all cognitive development, including language development, arises as a result of social interactions between individuals" (Lightbown and Spada, 1999, p. 44). A vital component to this theory is the zone of proximal development or "the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers…" (Vygotsky cited in Lloyd, 1995, p. 21). In the UAE, efforts are being made to move from teacher-centered to more student-centered teaching

based on these theories which are very similar. The innatist approach focuses on the message being communicated where as the interactionist approach focuses on the development of knowledge. In essence, the 'message' is the content of learning to be reached by learners.

Even though these two approaches are widely acclaimed, they are subject to some criticisms. Critics of the innatist approach argue that the focus of learning should be on the development of knowledge (Lightbown and Spada, 1999, p. 45) which is what the interactionist approach attempts to concentrate on. However, critics of the interactionist approach dispute the input students receive as lacking since not enough emphasis is given to the schemata which learners already have about language (Lightbown and Spada, 1999, p. 45) as well as other experiences.

2.1.2 Language and Concept Learning
Many bilingual language programs "tend to underutilize the knowledge and experience that … children bring to school" (Malone, 2003, p. 1). What learners bring to class as previous knowledge is referred to as frames, scripts or schema (Pressley and McCormick, 1995). Although 'scripts' is preferred in the context of second language learning since it involves the aspect of culture in common knowledge, for the purposes of this discussion, 'schema' will be used since it is the more recent theory in cognitive psychology and has had a greater influence in education (Pressley and McCormick, 1995, p. 61).

Language and learning are complementary since it is through the language in the classroom that children learn to direct the behavior of others in addition to their own and "both to exchange ideas and as a means of organizing one's own ideas" (Lloyd, 1995, p. 53). In Vygotsky's view, language is "central as the mediating tool by which cultures transmit ideas and by which these ideas become internalized" (Lloyd, 1995, p. 30) or form the child's schemata. In view of this, learning in a language other than the mother tongue can put students at a disadvantage academically especially if they do not continue learning in their mother tongue.

There are many theories which have informed our beliefs about the abilities of bilinguals. In the past, it was commonly believed that bilinguals are deficient in their thinking abilities because of their bilingualism (Baker, 2006, p. 143). It has been, until recently, that research would consistently show negative results of bilinguals' cognitive abilities. Today, empirical evidence shows that bilingualism can be a cognitive asset. Contrary to older beliefs, if bilinguals are

taught in a program using a curriculum which supports their bilingual abilities, there are no negative cognitive effects. However, bilinguals who are not supported in their abilities through development of L1 underperform academically and become semi-lingual (Baker, 2006; Cummins, 1979). Studies such as those by Clarkson (1992) and Abedi, Lord, and Plummer (1997) give insight into the advantages of L2 learners continued support in L1 to have a better understanding of concepts and the problems encountered by them in math when it is taught in English.

2.1.2.1 SUP, CUP and the Thresholds Theory

It was earlier believed that bilinguals stored information in separate parts of the brain or what Cummins called Separate Underlying Proficiency (SUP) Model of Bilingualism (Baker, 2006, p. 168). He proposed that bilinguals operate on a central operating system called Common Underlying Proficiency or CUP (Baker, 2006, p. 169). This theory holds that L2 learners can develop their information processing skills through one language or two well developed languages. However, if these languages are not well developed then "cognitive functioning and academic performance may be negatively affected" (Baker, 2006, p. 170). The Thresholds Theory postulated by Toukomaa and Skutnabb-Kangas and by Cummins, supported by other researchers and their studies, proposes two threshold levels in order to attain balanced bilingualism where there are positive cognitive advantages (Baker, 2006, p. 170). Below the first threshold is the stage where young L2 learners are not competent enough in both L1 and L2 to succeed in school. At this level, without the support and maintenance of L1, there is likely to be negative cognitive effects, which if not checked can lead to semilingualism. However, once students go above the second threshold, this is where they can benefit cognitively from bilingualism since they have age appropriate competence in both L1 and L2 to succeed academically. Therefore, the first level of linguistic competence must be surpassed in order to avoid the negative effects of bilingualism, but in order to gain cognitively from it, the student must go beyond the second threshold. Refinements to this theory will be further discussed in the next two sections.

2.1.2.2 Developmental Interdependence Hypothesis

The Threshold Theory has been refined by other theories of bilingualism such as the Developmental Interdependence Hypothesis postulated by Cummins which asserts that "the level

of L2 competence which a bilingual child attains is partially a function of the type of competence the child has developed in L1 at the time when intensive exposure to L2 begins" (Cummins, 1979, p. 233). This hypothesis has great implications on the success of learners who study in a language other than their mother tongue, especially in mathematics, since it is "not just the vocabulary of math that causes difficulty. The syntax in which mathematical ideas are expressed is often more complex than children are accustomed to in other areas of the curriculum" (Frederickson and Kline, cited in Baker, 2006, p. 174). The development of L1 in this subject is especially important since it requires abstract thinking. Skutnabb-Kangas and Toukomaa (cited in Cummins, 1979, p. 235) report "[i]n the upper level [L1] seems to be even more important for achievement in mathematics than [L2] – in spite of the fact that mathematics too is taught in [L2]. This result supports the concept that the abstraction level of the mother tongue is important for mastering the conceptual operations connected with mathematics …".

2.1.2.3 BICS and CALP

A question that reoccurs in research and policy making is "How long does it take for non-native speakers of English to be academically proficient in English?" To answer this question, one must first make a distinction between the ways language is used. Language proficiency has many facets to it. One sees how language is used in everyday contexts and then how it is used in academics. In addition, the amount of time to reach proficiency in these two contexts differs as well. Cummins (1999) distinguishes them conceptually since "there are clear differences in acquisition and developmental patterns" (p. 2). He refers to them as basic interpersonal communicative skills (BICS) and cognitive academic language proficiency (CALP). BICS can be acquired within two years but it takes five to ten years to acquire CALP (Collier, cited in Cummins, 1999, p. 2). This distinction is important to the Threshold Theory previously discussed in that BICS occurs in the context imbedded situation of everyday interactions whereas CALP occurs in the context reduced settings in schools (Baker, 2006, p. 174). This can be explained through the model of Cummins' iceberg (cited in Baker, 2006, p. 175) where what shows above the water surface are the BICS language skills such as knowledge, comprehension, and application where the speaker has good pronunciation, vocabulary, and grammar. But beneath the surface are the CALP language skills, analysis, synthesis, and evaluation which helps

the speaker understand semantic meaning and functional meaning needed for academic success (see Figure 2.1 below).

Figure 2.1: BICS and CALP Iceberg
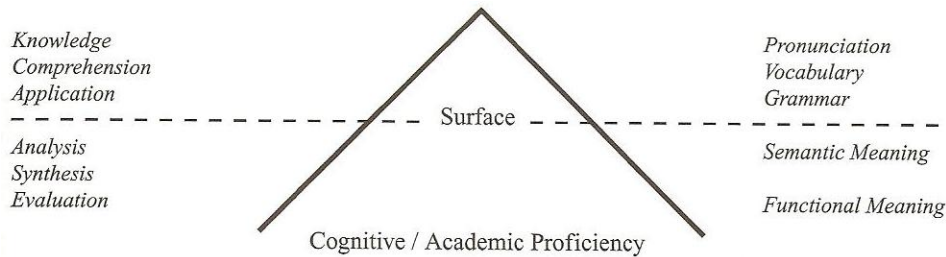
Source: (Baker, 2006, p. 175)

This is in agreement with Vygotsky and Bruner, who consider language development and cognitive growth as interdependent. Children need to develop their language as a learning tool in order to classify, reorganize and analyze information (Hamers and Blanc, 2000, p. 84).

In a study by Hakuta, Goto Butler, and Witt (2000), two to five years is needed to acquire oral proficiency in English while it takes four to seven years for academic English to develop (see Figure 2.2 below).

Figure 2.2: Context Embedded vs Context Reduced Language Proficiency
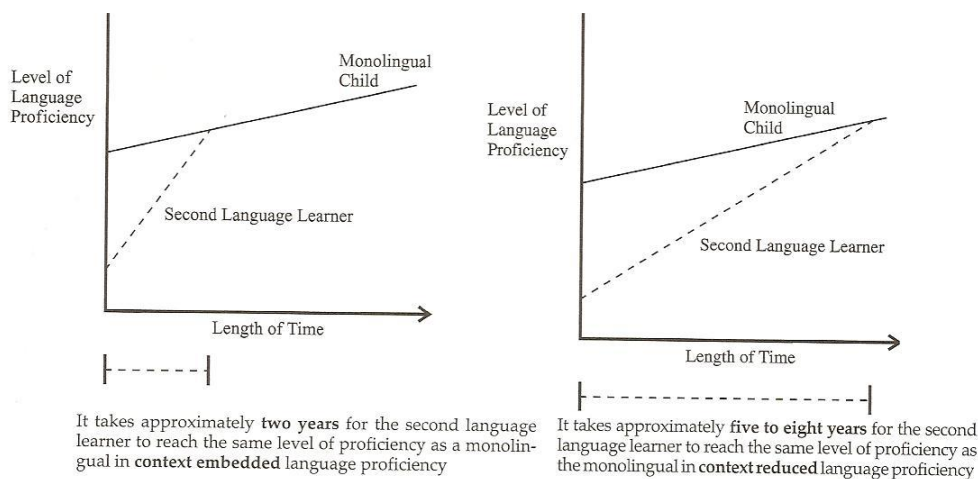
Source: (Baker, 2006, p. 179)

They noted that one of the tested groups showed marked gains in grades one and three where they were one grade level below their native speaking peers in basic reading, reading comprehension, and broad reading. But this trend reversed by grade five where they fell to two years below their native speaking peers. The other test group in the study, on the other hand, showed steady gains over the grades. Studies in CALP are very difficult to generalize since there are many factors involved in a child's acquisition of school language, such as socioeconomic status, parents' level of education, and previous learning in L1.

2.1.2.4 Critical Period Hypothesis

A key factor in second language research in relation to bilingual programs is the Critical Period Hypothesis (CPH), a "casual explanation for the differential success in acquisition of a second language by younger and older learners" (Bialystok and Hakuta, 1999, p. 162) accredited to Penfield and Roberts in the 1950s and perchance more notably to Lenneberg in the late 1960s (Hakuta, 2001, p. 193). This hypothesis suggests that "first language (L1) acquisition is a biologically constrained process, with a specific timetable ending at puberty" (Hakuta, 2001, p. 194) and has a critical role in linguistic theory and cognitive science (Hernandez, Ping, and MacWhinney, cited in Nikolov and Djigunović, 2006, p. 234). This process has been applied to second language (L2) acquisition but it is being debated if L2 acquisition processes are a repetition of L1 learning or if it is an add-on process (Hakuta, 2001, p. 195). Studies (Bialystok and Hakuta, 1999; Hakuta, 2001; Nikolov and Djigunović, 2006) which investigate CPH view data from two points of view, 1) rate of acquisition and 2) ultimate attainment (Nikolov and Djigunović, 2006, p. 236). These studies concluded that CPH is not correct (Hakuta, 2001, p. 204) or at least cannot be applied in its strictest sense since there are exceptions where adults can learn a language quite proficiently. After summarizing forty studies, Ekstrand (cited in Hamers and Blanc, 2000, p. 75) concluded the same that, children are not better learners as such, instead they have more time to learn and learning is made simpler for them. An article by Krashen (2000) describing a twenty-nine year old Mexican immigrant to the US whose Hebrew, learnt while working in a Jewish restaurant for twelve years, was better than his English is evidence that the CPH cannot be applied generally.

Marinova-Todd (cited in Baker, 2006, p. 129) concluded that age is only a factor in language learning because of its relationship with social, psychological, educational as well as other

aspects which affect L2 proficiency. One of these is motivation and is mostly found in reference to older learners. Baker (2006, p. 132) mentions two main categories of motivation: integrative – affiliation with another language community in terms of relationships, and instrumental – functional use of the language for personal gain. In regard to young learners, one could presume that children's motivation for learning L2 would be more integrative since their basic needs necessitate the formation of relationships, although there is no empirical evidence to support this. Rather than a critical period, "advantageous periods" (Baker, 2006, p. 129) would better describe the periods of early childhood and elementary and secondary school where L2 acquisition is less constrained. A study by Collier (1989) supports this and the previous studies by Bailystok and Hakuta (1999) and Hakuta (2001) in the area of age of language acquisition. She reports that "[o]lder children (ages 8 to 12) who have had several years of L1 schooling are the most efficient acquirers of L2 school language. Adolescents with solid L1 schooling are equally efficient acquirers of L2 school language, except for pronunciation" (Collier, 1989, p. 517). Her study stresses the maintenance of L1 development since children, who discontinue their L1 development too soon, may encounter problems in L2 cognitive development (Collier, 1989, p. 517). More recent studies of language programs which allow young L2 learners to maintain L1 development show the learners do better overall.

2.1.3 Gender and Learning

Gender and sex have been used synonymously in research. However, these terms have nuances which are important and politically driven since the former entails maleness and femaleness "as a cultural construct" (Litosseleti, 2006, p. 10) and the latter biological (Litosseleti, 2006, p. 10). Gender differences in education have been the topic in research for over a century. In the past, claims have been made about the reasons for these differences which today would be considered ludicrous particularly in relation to the study of mathematics (Leder, 1992, p. 598). Today, research in this area offers more scientific and logical understandings of what the differences are but is many times misrepresented as "deficiency" (Litosseleti, 2006, p. 42). It must be noted, results of research which show differences between the genders in intellectual ability is "so small and so variable that they have few practical consequences" (Slavin, 2009, p. 113). What is of more concern, are the differences in gender as a result of culture and stereotyping (Slavin, 2009, p. 113). Also, the issues which surround diverse groups such as gender challenge the

'democracy' of education and the opportunities offered as a result of a system which is inequitable (Secada, 1992).

The focus of many research topics in education, specifically in mathematics, is problem solving, attitudes, student achievement, and gender differences (Leder, 1992, p. 599). Studies in the US on achievement show that boys outperformed girls on tests of general knowledge, mechanical reasoning, and mental rotations but girls performed better than boys on tests in reading and writing assessments, and on attention and planning tasks (Slavin, 2009, p. 113). In addition, girls get better grades than boys, even in math and science, maintaining this into high school even though they score lower on standardized tests in these subjects (Slavin, 2009, p. 113; Pressley and McCormick, 1995, p. 441). In terms of language learning, a UK study shows similar results as the US studies where boys score lower on the national exams such as the General Certificate of Secondary Education (GCSE) as well as second and foreign language learning (Swann, cited in Litosseleti, 2006, p. 76). Interestingly, bilingualism among women generally seems to be less than among men (Baker, 2006, p. 382).

Other studies reveal that girls have more negative attitudes towards math than boys and are less likely to feel confident about doing well in math (Pound, 2006, p. 66; Ma, 2001, pp. 222-223; Leder, 1992, p. 614; Pressley and McCormick, 1995, p. 442). Another issue which influences achievement not only in math, but in overall academic success, is socioeconomic background which denotes not only wealth, but parent education and home language as well (Brisk, 2006, p. 76). Students from low socioeconomic backgrounds tend to have lower achievement in math and generally throughout the grades (Slavin, 2009; Secada, 1992, p. 640). Neuroscience and developmental psychology have shown that babies are born with a predisposition towards math since they can differentiate between patterns, distance, size and shape (Pound, cited in Pound, 2006). So, whatever discrepancies students may have are founded in their home environment. However, the results from most of the studies in relation to math are predominantly from junior to senior high school students and older. Studies which show gender in lower-primary are few so opinions about gender and learning are based on studies of older learners (Yelland, 2001, p. 394).

Today there has been much debate over the empirical evidence which shows a difference between gender and learning. The worldwide trend today seems to favor girls so much so that there seems to be a "boy crisis" (Slavin, 2009, p. 113). It has been long known that males are more likely "to be assigned to special education, to be held back, to drop out and to be in trouble with the law … and learning disabilities and ADHD (attention deficit hyperactive disorder) are significantly more common (and damaging) among boys" (Slavin, 2009, p. 113-114). In the UAE, schools and the MOE face many of the same worldwide problems with boys not only in school but also in college (El Shamma, 2010; *The National* 20 June 2010; *Khaleej Times* 18 May 2010a; Al Najami, 2008b). These are pressing issues which are in part being dealt with by changing laws which will raise the compulsory school age to 18 (*Khaleej Times* 19 July 2010b).

2.2 Bilingual programs

Traditionally, in the west, foreign language learning was a requirement which students took in order to graduate. However, in some countries, studying a second language, usually English, was a prerequisite for tertiary studies outside of the native country. Since the meaning of bilingualism has been refined to include cognition, bilingual learning programs have been researched to identify which ones bring students to these higher levels of cognitive use in a second language and where each program falls on a spectrum of cognitive competence in L2.

2.2.1 Language Learning Programs

Theories in second language acquisition (SLA) have been modified since the 1980s, from the Structural/Behaviorist/Audio-lingual model of the 1940s to the Generative/Cognitive model of the 1960s to a now more balanced and developing theoretical stand on how languages are learnt and how they should be taught (Orr Easthouse, 2003, p. 2). Language programs at these times reflected these models. Nowadays, there is more awareness of the needs of L2 learners in order to achieve better in school. What has been learnt in over twenty years of research is that maintenance of students' L1 helps them achieve better in school supported by studies of the Threshold Theory and the Developmental Interdependence Hypothesis previously discussed.

Bilingual education are "programs for students who are acquiring English that teach the students in their first language part of the time while English is being learned" (Slavin, 2009, p. 108). There are two kinds of bilingual language programs – subtractive and additive. A subtractive

approach to a program is when "the development of the second language is done at the expense of the native language … [and an additive approach] foster[s] the development of both the second and native languages" (Lambert cited in Brisk, 2006, p. 46). The attitudes of these kinds of programs are based in the social philosophies previously discussed; e.g., evolutionist and conservationist. Bilingual education is of four basic types: English immersion, transitional bilingual education, paired bilingual education, and two-way bilingual education (Slavin, 2009, p. 108). The first two of the programs are considered subtractive while the last two are additive (Brisk, 2006, p. 46). Additive bilingual programs are categorized to better meet students' specific needs in relation to their society. These categories[4] are (Malone, 2003, p. 4-5): programs where students must learn the medium of instruction (MOI) in order to succeed in school; programs where ethnic minority students speak the MOI as L1; programs for adults who are monolingual with no previous education; and programs for adults who have previous education and are bilingual in their own language and the MOI (see Figure 2.3 below).

Figure 2.3: Categories of Multilingual Education

Type 1. ML→LWC for children	**Type 3. ML→LWC for adults**
For educational success and maintenance of heritage language	For employment, access to information, education, socioeconomic integration, etc.
Type 2. LWC→ML for children	**Type 4. LWC→ML for adults**
For revitalization and/or maintenance of heritage language	For access to heritage language texts, for revitalization and/or maintenance of heritage language

Source: Malone, 2003, p. 4

The distinction in terms of learner outcomes between subtractive and additive bilingual programs becomes evident in high school where "the importance of language ability increases as children move up through school" (Clarkson, 1992, p. 418). Studies in the US and elsewhere show that the high school underachievement and drop-out rate of students in immersion programs is very

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[4] For the purpose of this paper, the focus will be on Type 1 since this study looks at elementary school.

high (Baker, 2006; Malone, 2003). The high drop-out rate in the UAE, especially among boys, is alarming and is being addressed as urgently as possible (El Shamma, 2010; *Khaleej Times* 18 May 2010a; *Khaleej Times* 19 July 2010b; *The National* 20 June 2010). Compulsory bilingual programs in the MOE system which are subtractive in nature could compound the problem.

In the UAE, bilingual education responds to the learning of English through pragmatic utilization since one of the reasons is supposed to be for educational success. Its attitude is based in conservation in order to maintain Arabic as the national language and as L1 for Emiratis. However, the programs mainly used in national private schools, start English as the medium of instruction in the core subjects math and science in addition to English language studies from as early on as kindergarten. The bilingual education model in these schools is a form of immersion since students learn math and science in English only where the content and teaching strategies are specially designed "to build students' vocabularies, simplify instructions and help … students succeed in the content" (Slavin, 2009, p. 108). The reports from the DSIB (2010) show that Arabic language is not being maintained at these schools at an acceptable level and that they are more literate in English than they are in Arabic. The concerns are in all the skills but specifically writing and speaking (DSIB, 2010, p. 66). In addition, they are not able to use their native language in the core subjects even though they come from predominantly Arabic speaking families. This would make these programs more subtractive. On the other hand, students in the public schools learn English as a foreign language starting in kindergarten as well but fare only slightly better concerning their Arabic language skills particularly writing and speaking. These are ESL programs with limited academic content. The MAG program is similar to the private schools' in that math and science are taught in English with the first language used only to explain new concepts making it a form of immersion program. The MAG program is still new compared to other language programs in the MOE system and its effectiveness has still to be determined.

2.2.2 Evaluation of Programs

Bilingual education programs all over the world are evaluated in order to assess the effectiveness of a program. Success of a program is measured by "the impact that a program or school has on its students. A successful bilingual program develops students' language and proficiency, leads them to successful academic achievement, and nurtures socio-cultural integration" (Brisk, 2006,

p. 11). In research which examines the effectiveness of bilingual programs, outcomes of student achievement in bilingual education are obtained from measures of basic skills in literacy and numeracy as well as other areas (Baker, 2006, p. 261). The DSIB reports give insight into what is needed in education in Dubai in terms of these skills to bring it up to international standards in these areas through its evaluations. Evaluation has many varying definitions but generally it means "a process whereby people gather data in order to make decisions" (Ornstein and Hunkins, 2009, p. 278). Educators at times use these two terms interchangeably, but there is a distinction between them – measurement "assign[s] numerals to objects or events according to rules" (Kerlinger cited in Ornstein and Hunkins, 2009, p. 279) where as evaluation "assigns value and meaning to measurement … is not content-specific … [and] consists of gathering data and relating them to goals" (Ornstein and Hunkins, 2009, p. 279).

Formative and summative evaluations inform the procedure. Formative evaluation occurs during the program implementation and focuses on student learning and ways to improve it "provid[ing] frequent, detailed, specific information … takes place at a number of specific points in the … process … [in order to] allow educators to modify, reject, or accept the program as it is evolving" (Ornstein and Hunkins, 2009, p. 283) while summative evaluations usually occur at the conclusion and "informs educators that students have met the school's or state's educational standards" (Ornstein and Hunkins, 2009, p. 284). DSIB uses formative evaluation in their follow through inspections in addition to summative reports. These help schools to develop their weaknesses and keep up their strengths. Such evaluations help to inform the making of policies.

2.3 Policy Making
A policy is "a statement by government of what it intends to do or not to do, such as a law, regulation, ruling, decision, or order, or a combination of these. The lack of such statements may also be an implicit statement of policy" (Birkland, 2005, p. 139). They are made when "something needs to be done about a problem" (Birkland, 2005, p. 159). As a country, the UAE is quite young compared to other countries. It has had to make big strides in all aspects of its society and government to keep up with the demands and problems of globalization through reforms based on evidence, a "movement toward the use of programs and practices found o be effective in rigorous research, … advocated in federal policies" (Slavin, 2008, p. 5). Evidence of this is the newly instated school inspections which have revealed how education in the UAE

needs to be modified in order to be on par with international standards. As a result, many new policies have been put into effect in education to bring it up to these standards showing how the government is dedicated to these reforms. Policy making in the UAE follows comparable processes as those in other democratic countries since the government is structured in a similar way.

2.3.1 Structure of UAE Government
In 1971 the constitution of the UAE was formed as a legal and political outline for the union of what are now the seven emirates of the United Arab Emirates (UAE). The structure of government (see Figure 2.4 below) applied by the UAE constitution is federalist, which is "a system of government in which power is shared between a central or federal government and other governments, such as those of states or provinces" (Birkland, 2005, p. 26). In 1996 the government was restructured to include the Supreme Council; the Council of Ministers, or Cabinet, is the parliamentary body called the Federal National Council (FNC); and the Federal Supreme Court (Vine, 2010, p. 27).

Figure 2.4: Structure of UAE Government

President
Sheikh Khalifa bin Zayed Al Nahyan
Vice-President
Sheikh Mohammed bin Rashid Al Maktoum

Supreme Council	Supreme Court	Federal National Council

Abu Dhabi	Dubai	Sharjah	Ajman	Ras Al Khaimah	Fujeirah	Umm Al Qaiwain
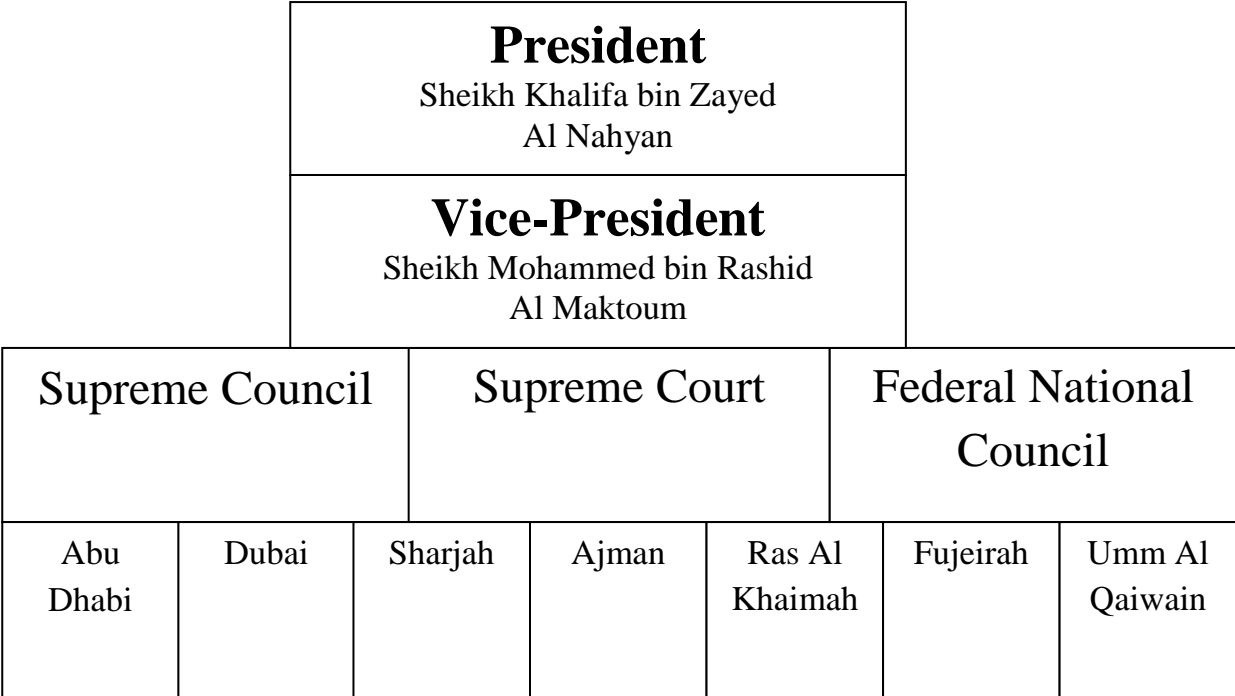
According to Articles 120 and 121 of the UAE Constitution, the federal authorities have sole legislative jurisdiction in matters concerning foreign affairs, security and defense, nationality and immigration issues, education, public health, among others (Vine, 2010, p. 26). Articles 116 and 122 give all other powers of authority, which are not given to the federal authority by the Constitution, to the individual Emirates (Vine, 2009, p. 24). The FNC, the advisory council of the government, consists of 40 members from the different emirates, allocated by seats based on population and size. Its role is as follows:

- Discussing constitutional amendments and draft laws, which may be approved, amended or rejected.
- Reviewing the annual draft budget of the federation.
- Debating international treaties and conventions.
- Influencing the Government's work through the channels of discussion, questions and answer sessions, recommendations and following up on complaints.

(Vine, 2010, p. 30)

The Federal Judiciary consists of the Supreme Court and Courts of First Instance where five judges are appointed by the Supreme Council to "decide on the constitutionality of federal laws and arbitrate on inter-emirate disputes and disputes between the Federal Government and the emirates" (Vine, 2009, p. 28).

Each emirate has its own government which operates in unison with and parallel to the federal institutions. Its elaboration depends on population, area, and the extent of development (Vine, 2009, p. 28). The largest and more complex of the local governments are those of Abu Dhabi and Dubai. The other emirates have local central governments but function differently than those of Abu Dhabi and Dubai. Due to advancements in social and economic development, especially population growth and advancing educational standards, many of the emirates have accepted federal roles that are not constitutionally a federal responsibility (Vine, 2009, p. 30). One of these is the role in education as is seen in the formation of the Abu Dhabi Education Council (ADEC) and Dubai's Knowledge and Human Development Authority (KHDA). Each of these bodies has regulatory powers, such as inspections and human resource and development, in education in its respective emirate.

2.3.2 Medium of Instruction Policies

Medium of instruction policies have been "developed and implemented to advance particular political viewpoints or to address problems perceived as pressing" (Heck, 2004, p. 1). News articles discussing the 2007 policy plan in the UAE point to educational reforms at all levels in the new strategic agenda. These articles stressed the importance of the Arabic language and the plans to improve the Arabic curricula from grades 1 to 12 while at the same time highlighting the importance of English (*Khaleej Times* 6 May 2008a; Al Najami, 2008a; El Shamma, 2008; *Khaleej Times* 22 June 2008b).

Historically, the UAE has had English in the curriculum as a subject since it was previously a British protectorate. The policies of the status of English in the government school curriculum have changed as the role of UAE changed globally. Initially, English was taught as a foreign language starting in grade seven. In the eighties, it was moved to grade four; then to grade one in the nineties; and recently to kindergarten. In 2007, the Madares Al Ghad (MAG) schools were started as an experiment in medium of instruction policy at school level. These schools similarly follow the private school curriculum in that the core subjects, math and science, are taught in English in addition to English as a subject.

The UAE, as well as other Gulf countries have English as the medium of instruction at tertiary level. For the past ten years HCT has had an English only policy on all its campuses. Recently, MOE decided to drop the foundation program in public colleges and universities so that students graduated from the public schools can enter directly into degree programs (*The National* 23 February 2010a). However, when this policy will be put into effect is not clear. In the mean time it has caused much debate from Emirates Centre for Strategic Studies and Research (Salama, 2010).

2.3.2.1 Policy Process

The past twenty years has produced many frameworks of policy process such as the Punctuated-Equilibrium Theory by Paul Sabatier and the Advocacy Coalition Framework by Frank Baumgarten and Bryan Jones (Birkland, 2005; Heck, 2004). It suffices here to use the conceptual framework below (see Figure 2.5) since it is a simple representation of the complex processes of policy making. Lipsitz (cited in Heck, 2004) defines political culture as "the

collective beliefs and values of policymakers and citizens about how political institutions and policy processes work, about the role of each institution in the policy process, and the proper rules of the game" (p. 83). The structure of the UAE government, as mentioned above, is the political culture of the UAE. Additionally, there are a number of cultural and social factors and personal variables which influence the process of policy implementation such as "belief systems of policymakers, perceptions of the challenges of particular policy situations, strategies, and the availability and use of information" (Heck, 2004, p. 61). This involves the "official" and "unofficial" actors (Birkland, 2005) in the policy process. In the UAE, the official actors are the rulers, heads of ministries and those in the Supreme Council, Supreme Court, and FNC; the unofficial actors are those in the media, interest groups such as environmental groups, and research organizations such as the Emirates Centre for Strategic Studies and Research as well as the HCT system and select private universities. Figure 2.5 below shows how these actors interact in the process.

Fig. 2.5: One possible conceptual framework for studying policy activity.
Note. Shaded ovals are multilevel.
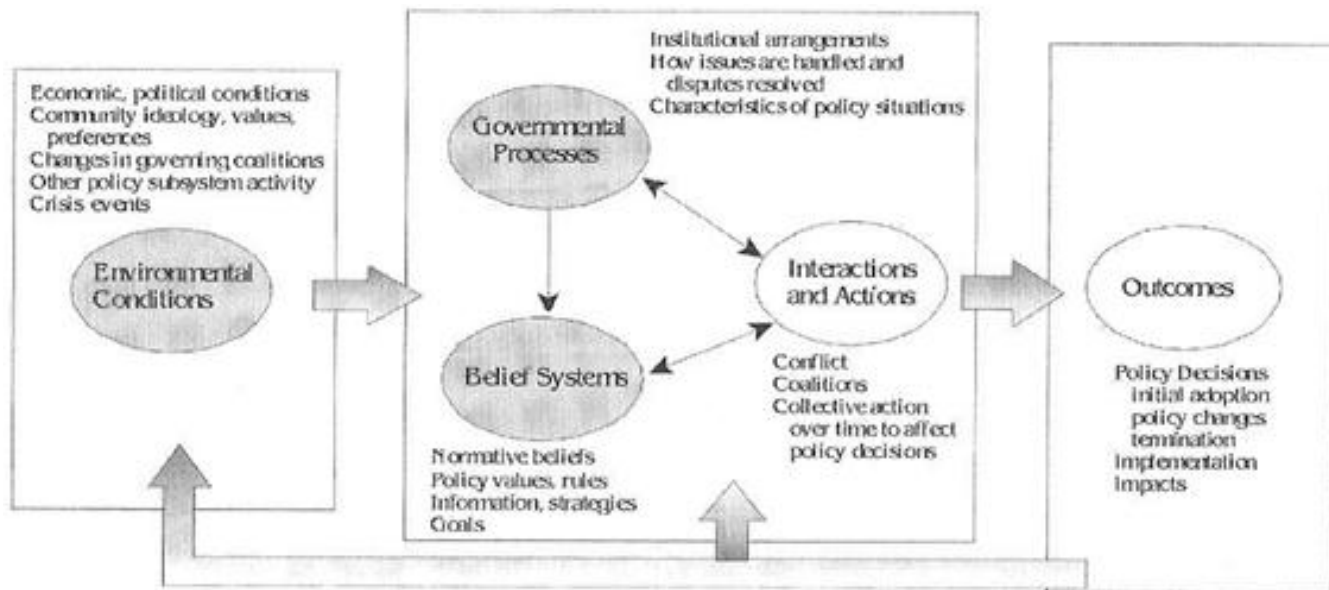
Source: Heck, 2004, p. 61

Using the example of educational reform and the process model above the implementation of a policy such as medium of instruction in the UAE would be as follows: *Environmental Condition*s – the global role of the UAE changes and certain areas of improvement are identified (e.g., Nationals are not proficient enough in language and other skills to keep up with the demands of the UAE's new role); *Governmental Processes, Belief System, Interactions and Actions* – this is discussed among the official and unofficial participants, as identified above, until a decision is made on an educational goal (see table below) and a policy and/or program (e.g., English needs to strengthened throughout the public school system and the foundation year at tertiary level needs to be cut to focus on skills needed in the job market); *Outcomes* – official participants ratify the decision and the policy/program is put into effect and evaluated (e.g., introducing the MAG program; evaluating the student outcomes in relation to the program goals). This is called a 'top-down' approach to implementation since it "first understands the goals and the motivations of the highest level initiators of policy, and then tracks the policy through its implementation at the lowest level" (Birkland, 2005, p. 182).

Figure 2.6: Alternative Models of Language Development

2. Educational Goal	3. Instructional Focus	1. Central Linguistic Assumption	
		1.1 Rely on Linguistic *Reinforcement*	1.2 Accommodate Linguistic *Interference*
2.1 *Monolingual* Common Culture	3.1 ***Academic*** ***Learning***	**Transitional Bilingual Education** A.	**Structured English Immersion** B.
	3.2 ***Language*** ***Development***	D. **Second language enrichment** (e.g., Latin study)	C. **English as a Second Language**
2.2 *Multilingual* Cosmopolitan Culture	3.1 ***Academic*** ***Learning***	**Dual Immersion** E.	**Foreign Language Requirements** (e.g., science study in a foreign language) F.
	3.2 ***Language*** ***Development***	H. **Foreign Language Study** (e.g., Study Abroad)	G. **Native Language for Native Speakers**

Source: Mitchell, et. al., 1999, p. 95

Language development programs such as MAG are chosen depending on the educational goal (see Figure 2.6 above). The instructional focus then depends on the central linguistic assumption. For example, the educational goal in the US is monolingual since it is anticipated that L2 learners become part of the common culture in the US. Students in US public schools are expected to achieve academically. India's educational goals, on the other hand, are more multilingual. The educational goal of the UAE is to be multi-lingual through academic learning; as a result, the MAG program was implemented relying on language reinforcement.

2.3.2.2 Policy Evaluation

The conceptual framework (Figure 2.5 above) shows three stages in the policy process. The last stage, *Outcomes*, is not only the implementation stage but also an evaluative stage. It is in this stage that a policy is evaluated against its goals (Birkland, 2005, p. 222). The feedback from this

stage informs the *Environmental Condition* stage or the *Governmental Processes, Belief System, Interactions and Actions* stage thereby setting the cycle in motion again.

There are four reasons policies are evaluated (Heck, 2004, pp. 11-12):

1. to identify choices, or courses of action, that lead to optimal decisions to resolve identified problems.
2. to examine the processes through which purposes and values in the public sector are translated into policy actions.
3. to identify the outcomes and impacts resulting from policy actions.
4. to produce evidence that helps to resolve policy debates over different courses of action.

Policies in education in the UAE are constantly being evaluated. An example of policy evaluation is at tertiary level where it was decided that too much is spent on the foundation years preparing students for degree programs where this could be done in school. The main focus in the foundation program is to bring English language skills to academic level. However, this will soon come to an end since there is pressure on schools to teach students the skills needed for college and university (*The National* 23 February 2010a). In this example, the problem was identified and it was decided that schools should teach these skills. In addition, evidence was produced to inform the course of action (e.g., news papers reported many of the evidences – the amount of spending every year on students' foundation year).

Chapter Three: Methodology

This study set out to investigate if there is a significant difference between the MOE and MAG schools in achievement on Math and English assessments. These subjects are assessed since their outcomes are frequently used in the evaluation of educational programs (Baker, 2006, p. 261). Further, the study compares the achievement of boys and girls in these subjects within and between the two programs. With these, an evaluation of the MAG program and its policy of using English as the medium of instruction is made.

3.1 Research Design

The research used a fixed design approach to collecting data. This approach allows the researcher to use quantitative methods in data collection (Robson, 2002, pp. 4-5). The fixed design is "pre-specified" since there is a set goal to the research and how it will be carried out (Robson, 2002, p. 4). This research used math and English tests to answer the research question. However, the design of this study is not a true experimental design rather a quasi-experiment which is the most common design in social research (Trochim, 2006). The difference between a true experimental design and a quasi-experimental design is the random assignment of subjects to the experimental and control groups which can cause some issues with internal validity (Heffner, 2004). In education, it is nearly impossible to truly randomize research groups since the groups are typically classes not individuals. However, an advantage of using this kind of design is the minimal threat to its external validity since they are considered natural experiments and allow for more generalizations about a population ("Quasi-experimental design," 2010, para. 3). For this reason quasi-experiment is better suited to educational research.

3.2 Participants

The UAE MOE introduced the MAG program as an experiment in English as the medium of instruction policy. For this study, the MAG program schools are the experimental group and the MOE schools are the control group since this program is the default program in the public schools. The population for this study is grade three students at state primary schools in the UAE. The state schools consist of the MOE schools, the MAG schools, and the Model schools. The focus of this study is on the MOE and MAG schools. MOE schools service all of the emirates through all the cycles for boys and girls while six of the seven emirates in the UAE (Dubai, Sharjah, Ajman, Ras Al Khaimah, Fujeirah and Um Al Qiwain) have two MAG schools

for each cycle, one for each gender in each cycle. Each system follows the same curriculum set by the Ministry of Education. However, the standards of the MAG program follow those of the ADEC and the curriculum is supplemented with additional more challenging curricula.

Four schools, two Cycle One MOE and two Cycle One MAG, were randomly selected in Dubai. This emirate is a model of how the MAG program should be implemented since all except one of the MAG schools in this emirate got good to acceptable ratings by DSIB in 2010. However, the program in Dubai faces many of the same challenges as the other emirates. Lessons in math and science in the MAG schools are given in English in addition to the daily English lesson. The regular MOE schools follow the same standards in all of the emirates. The curriculum in the MOE schools is delivered in Arabic except for the daily forty minute English lesson. All schools in the MOE system have UAE nationals in the administration of the schools. Many teachers in the schools are UAE nationals, with a few other nationalities, mostly Arab expats.

School 1 is a Cycle One public school for girls. It was designated as a MAG school by the MOE. It provides education for 331 students from grades one to five, age six to eleven years. Each class has on average twenty students with four sections of grade three. The teachers are mostly UAE nationals with others from various nationalities. The English and science teachers for grade three are bilingual non-nationals and the grade three math teacher is a native English speaker.

School 2 is a government MOE school for girls. It provides education for 580 students from grades one to five, age six to ten years. It follows the MOE curriculum delivered in Arabic in all subjects except the daily English lesson. Each class has an average twenty-two students with six sections of grade three. The grade three math teacher is a UAE national and the English teacher is a bilingual Arab expat.

School 3 is a Cycle One public school for boys. It was designated as a MAG school by the MOE. It provides education for 387 students from grades one to five, age six to eleven years. Each class has on average twenty students with four sections of grade three. The teachers are mostly UAE nationals with others from various nationalities. The grade three English and science

teachers are native English speaking non-nationals. There are two math teachers for grade three; one is a bilingual UAE national and the other is a bilingual Arab expat.

School 4 is a government MOE school for boys. It provides education for 305 students from grades one to five, age six to eleven years. It follows the MOE curriculum delivered in Arabic in all subjects except the daily English lesson. Each class has an average of eighteen students with four sections of grade three. There are two math teachers for grade three; one is a UAE national and the other is an Arab expat. The English teacher is a bilingual UAE national.

The student sample for this study was randomly selected grade three students from the MOE schools and from the MAG schools in Dubai, twelve students from each section of each grade. The average ages of the students are between eight and nine years. The students in the MOE schools had a minimum three years of English instruction and the MAG students had in addition to the three years English instruction, math and science instructed in English since first grade. In addition, the teaching practices at the MAG schools are known to be more learner-centered than at the MOE schools since one of the goals of this program is to increase the competence of teachers in the UAE in learner-centered teaching. All students in the sample are UAE nationals from various socio-economic backgrounds. The schools serve their area from grade one to five.

3.2 Instrumentation

Assessment is "any measure of the degree to which students have learned the objectives set out for them" (Slavin, 2009, p. 412) and usually come in the form of tests or quizzes (Slavin, 2009, p. 412). Tests showing student achievement are used in education for many reasons – to evaluate students' progress, to inform teaching, to evaluate curricula, and to evaluate learning programs (Wragg, 2001; Sowell, 2005; Ornstein and Hunkins, 2009). It is for the last purpose that tests were used in this study.

3.2.1 The Tests

Tests were used to measure students' achievement in math and English. Data on the achievement of students in math and English was collected using two tests, one for math (see Appendix 5 and Appendix 6) and one for English (see Appendix 4). The math test was used to assess the students' understanding of math concepts as well as their problem solving skills. This test totaled sixteen problems in three parts covering addition, subtraction, and multiplication.

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Each problem had between one and four items. The problems were a mixture of numerical calculations and word problems and totaled a possible forty points. This test covered areas which both groups would have covered since they are from the MOE curriculum. The English tests were used in this study to evaluate the participating students' English language skills. This test was in three parts for each of the language skills – writing, reading, and listening. The writing section had six test items related to writing and assessed vocabulary and grammar. Each item was assigned three to ten points. The reading section had four test items assessing comprehension of reading material through sentence completion, picture description, and answering questions. Each item was assigned four or six points. The listening section had two test items assessing students' receptive vocabulary knowledge through oral definitions and pictures. Each item was assigned five points. For this test, a total sixty points were possible. This test covered areas of grammar and vocabulary and writing and reading skills covered by the MOE curriculum for the test groups' level. The themes covered in the test are common to children of this age. The form of the tests is standard MOE format.

3.2.2. Reliability and Validity

Reliability and validity are critical aspects of the tools used for data collection. Reliability refers to "the extent to which a test … produces similar results under constant conditions on all occasions" (Bell, 2005, p. 117) while validity reveals "whether an … instrument measures … what it is supposed to measure … "(Bell, 2005, p. 117). The tests used for this study were taken from another public school in the MOE system that was not participating in the research. These tests were previously used as grade two year-end examinations and were prepared by teachers according to MOE specifications and standards[5]. Each math test was translated into English (see Appendix 5 and Appendix 6) and was administered to the MAG schools. MOE participants took the original math tests in Arabic. Since the tests were based on the existing MOE curriculum and prepared following MOE specifications it may be presumed that they are reasonably valid and measure what is included in the curriculum and presumably presented by the teachers. In terms of reliability since the tests have been previously used as year-end tests it is reasonable to infer some degree of reliability.

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[5] It must be noted that a request was made to use a standardized test for math and English from the US for this research, however getting authorization to use and translate the tests made their use unfeasible due to time constraints of the study.
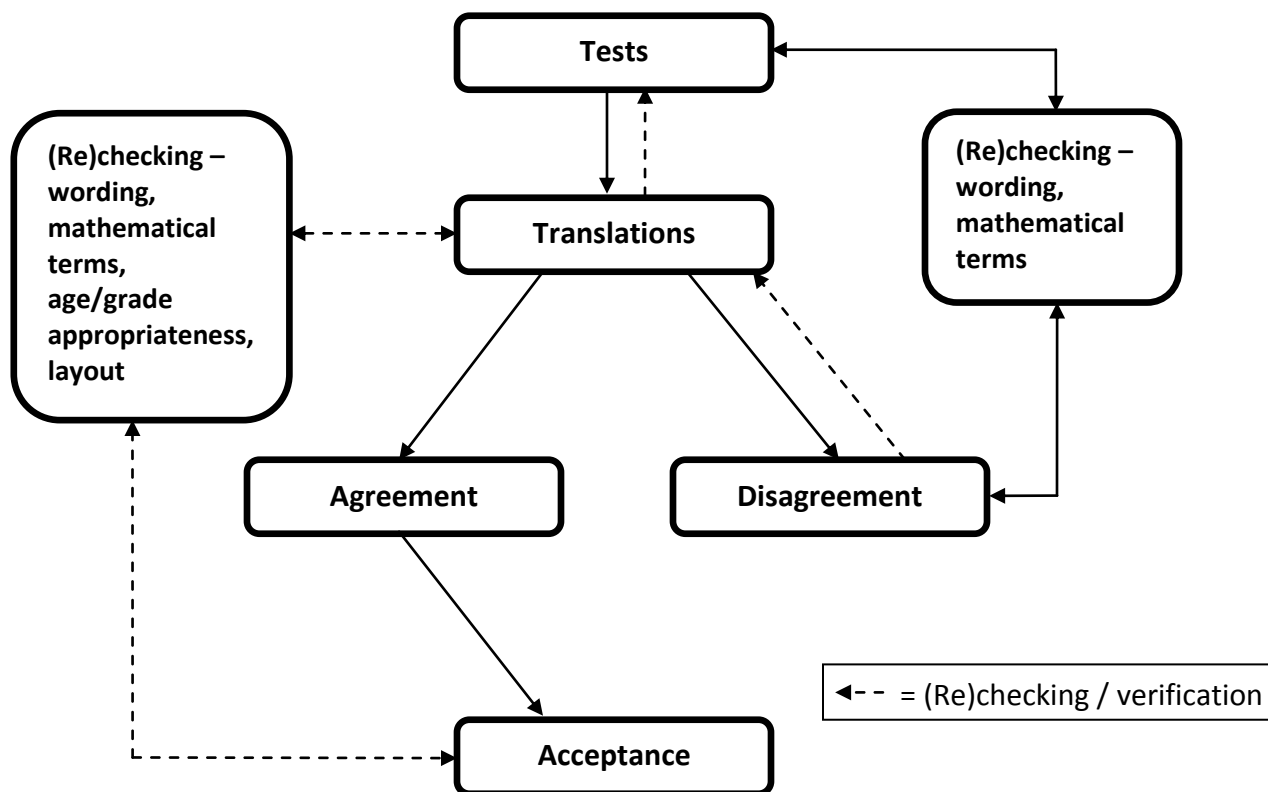
3.3 Pilot Study of the Test

Fixed design studies must be piloted in order to "sort out technical matters to do with methods of data collection … to ensure you are on the right lines conceptually … [and is] an opportunity to revise the design, to sharpen up the theoretical framework, develop research questions, [and] rethink the sampling strategy …" (Robson, 2002, p. 97). Since there was initial resistance from the principals of the schools towards the study for concern of the students' class time, in order to reduce the amount of time in the schools, expert math and English teachers outside of the study revised the tests. The feedback for the math test included rewording of questions, to make the test easier to understand; and layout to make the test easier to follow visually as well as incorporating place for the students to work out the problems. The feedback on the English tests was that the tests were a bit too thematic for the MAG schools (based on the course book of the MOE schools) but the themes were familiar to children of this grade level and the test items were a valid way to ascertain achievement in the designated skill areas.

3.4 Limitations of Translated Tests

Translating is normally used to help limited English proficiency students on achievement tests. The intention for translating the math test for this study was to keep consistency in curriculum. But, translation can limit the accuracy of the data in research. Preparing translated versions of tests so that they are conceptually and functionally suitable to the language of the persons taking the test is for the most part quite challenging, especially since translating can present measurement error (Solano-Flores, 2008, p. 195). This happens when there is considerable deviation between the scores of the translated test and the original as a result of the translation model (Solano-Flores, 2008, p. 196). One way to avoid measurement error is to back-translate the items translated to guarantee preservation of meaning between the languages (Solano-Flores, 2008, p. 196). Back-translation, or Brislin's (cited in Regmi, Naidoo, and Pilkington, 2010, p. 20) model of translation, is considered to be the best model for translation. This model (see Figure 3.1 below) involves at least two bilingual people, other than the researcher, who translate the text into the target language, then translate it back into the original language. Then, both texts are compared to make sure they are accurate. Any incongruities are then arbitrated and rectified.

Figure 3.1: Iterative Translation

```
                        ┌──────────────┐
                        │    Tests     │◄──────────────────────┐
                        └──────────────┘                       │
┌────────────────┐             │  ▲                    ┌────────────────┐
│ (Re)checking – │             ▼  ┊                    │ (Re)checking – │
│ wording,       │      ┌──────────────┐               │ wording,       │
│ mathematical   │◄┄┄┄►│ Translations │               │ mathematical   │
│ terms,         │      └──────────────┘               │ terms          │
│ age/grade      │         ╱        ╲ ▲                └────────────────┘
│ appropriateness│        ╱          ╲ ┊                        ▲
│ layout         │       ╱            ╲┊                        │
└────────────────┘  ┌──────────┐   ┌──────────────┐            │
      ▲             │Agreement │   │ Disagreement │◄───────────┘
      ┊             └──────────┘   └──────────────┘
      ┊                  │
      ┊                  ▼
      ┊             ┌──────────────┐   ┌─────────────────────────────────┐
      └┄┄┄┄┄┄┄┄┄┄┄►│  Acceptance  │   │ ◄┄┄ = (Re)checking / verification │
                    └──────────────┘   └─────────────────────────────────┘
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Adapted from: Regmi, Naidoo, and Pilkington, 2010

Translation and back-translation used to convert the math tests into Arabic was done by a legal documentation service. In order to make sure the translations used appropriate terms in English for the age and grade level of the students, the exam was given to expert math teachers for revision.

3.5 Data Collection Methods

Data was collected from four schools over a period of three weeks during school hours. An initial meeting of teachers and head teachers was arranged for each school in order to explain their role as participants as well as to answer any queries about the study. Times were arranged in advance with the administration of the schools to administer the tests so as not to disturb their regular study time. Twelve students were randomly selected from each class at each school as participants to the study. Participating students were taken to a quiet part of the school so they

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would not be disturbed while taking the test. Before giving out the tests, students were informed that this test would not affect their grades and that they could not have studied for it. Any part of the test students were not able to do was skipped and if they had questions at any time during the examination time they could ask.

3.6 Ethical Considerations

Ethics in research refers to "moral principles and rules of conduct" (Walliman and Buckler, 2008, p. 30). It guarantees that the researcher and the participants are protected (Walliman and Buckler, 2008, p. 31). Smith (cited in Mills, 2003) states that "[a]t a commonsense level, caring, fairness, openness, and truth seem to be important values undergirding the relationships and the activity of inquiry" (p. 91). Walliman and Buckler (2008) propose a framework with four aspects to be considered – proposal, potential, permission, and protection (pp. 31-32). The ethical issues which present themselves for this research "centre on access, consent and participants' protection" (Punch, 2006, p. 56), especially since children are required for this study (Bell, 2005, p. 16). Permission and protection mean that "all must be fully informed" (Bell, 2005, pp. 15-16) and that "participants are not wronged in the name of research" (Mills, 2003, p. 91). A central issue in research is informed consent, which is "the principle that seeks to ensure that all human subjects retain autonomy and the ability to judge for themselves what risks are worth taking for the purpose of furthering scientific knowledge" (Mills, 2003, p. 91). In this respect all those involved in this research were informed of the research, its purpose and what their role was. They were guaranteed full anonymity where names were not to be used in reference to the school and other participants.

The principals of each target school were approached at the end of the academic year 2009-2010, to request collaboration for this study for the following academic year. The principals were informed, orally and in writing (see Appendix 1), of the confidentiality of the study. Upon the principals' requests, permission was gained from the Knowledge and Human Development Authority (KHDA) in Dubai by sending a letter of request. This was sent in both Arabic (see Appendix 3) and English (see Appendix 2). After permission was granted to conduct the study, the researcher set about organizing the administration of the math and English tests at the middle of the second semester. Since many students showed concern about taking a test without

studying, they were assured that they could not have studied for this test and that it would have no affect on their grade. Students were asked to do their best on the test on their own but were able to ask questions if they felt they needed help. The tests were administered during extra-curricular activity periods or in place of an absent teacher so as not to interrupt their scheduled periods of studies during the school day. At the end of the data collection period, school principals were given a gift of thanks and gratitude.

3.7 Data Preparation
The process of data preparation includes the marking and recording of the students' scores, and the software used to analyze the data. All tests were organized by school and paired to each student such that each student had one English test and one math test. These were marked by marking assistants using an answer key and then rechecked by the researcher. The scores were then converted to a percentage score. All students were assigned a student number according to their school in order to keep student identities confidential and for recording purposes. The scores were entered into a table where the different test scores and schools were kept separate. These were then transferred to the data analysis software SPSS. The data was categorized into the variables gender, school, student identification number, system, math scores, and English scores. These were then entered into the analysis program to be analyzed.

3.8 Procedures for Testing Hypotheses
A fixed design method was used for this study in order to measure the results of math and English tests and compare them against the predetermined categorical variables school type (MOE and MAG) and gender (boys and girls) using measurements of central tendency and measurements of variation in addition to *t*-test and Chi-squared. Central tendency is measured as mean, median, and mode (Robson, 2002, p. 408). For this study, the measurement of mean in central tendency was used to compare boys' and girls' achievement in math and English between the two programs. Variation can be measured as range, variance, and standard deviation (Robson, 2002, p. 408). Standard deviation was used to measure variation in order to test how much the data deviated from the mean. *T*-tests compare the means of two groups in two ways; either as a dependant samples *t*-test or as an independent samples *t*-test (Robson, 2002, p. 439). This study used the independent samples *t*-test between the MAG and MOE programs since the scores are not paired. A further *t*-test was used with the variable gender to compare the means of

the two groups, boys and girls. The analyses were conducted using sophisticated statistical software such as SPSS. Figure 3.2 shows how it was decided which tests were to be used to analyze each research question.
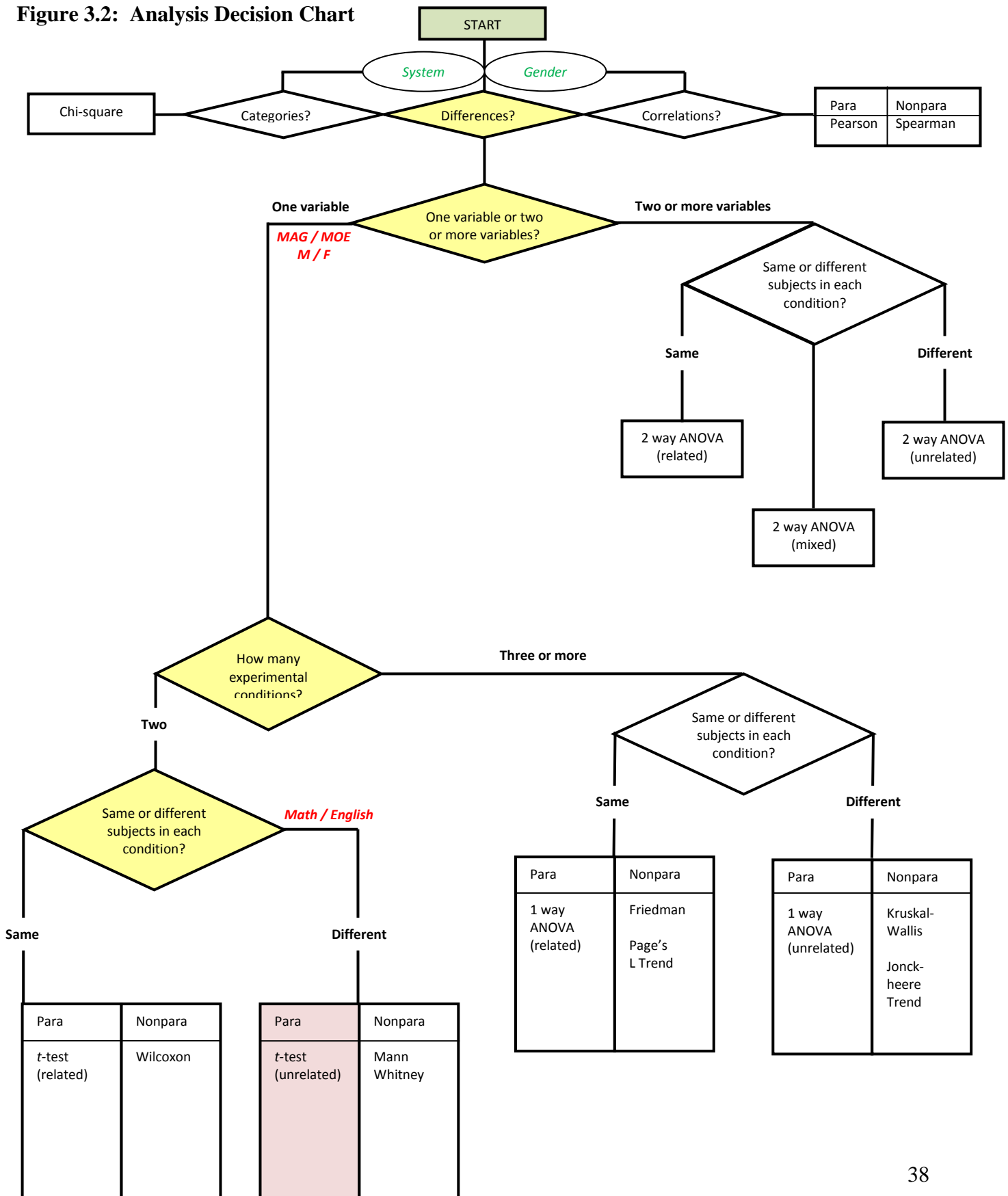
Table 3.1: Analysis of Math and English tests

t-test, measure of central tendency (mean), measure of variation (st. dev.)		Independent Variables			
		MOE		MAG	
		Boys	Girls	Boys	Girls
Dependant Variables	Math				
	English				

Independent *t*-tests were used to analyze and interpret the data between the school programs (see Table 3.1). This *t*-test was used to test for a significant difference in means between the school programs MAG and MOE in the variable 'school program system' for the total achievement on the math and English tests, i.e., if there a significant difference in the achievement of grade three students in MAG compared to their counterparts in MOE schools on math and English tests.

The independent *t*-test was used additionally to test if there is a significant difference in the achievement of boys as compared to girls in English and mathematics in both systems.

Figure 3.2: Analysis Decision Chart

START

System Gender

Chi-square ◄— Categories? — **Differences?** — Correlations? —► Para Pearson | Nonpara Spearman

One variable
MAG / MOE
M / F

One variable or two or more variables?

Two or more variables

Same or different subjects in each condition?

Same
2 way ANOVA (related)

2 way ANOVA (mixed)

Different
2 way ANOVA (unrelated)

How many experimental conditions?

Three or more

Same or different subjects in each condition?

Two

Same or different subjects in each condition?
Math / English

Same

Para	Nonpara
1 way ANOVA (related)	Friedman Page's L Trend

Different

Para	Nonpara
1 way ANOVA (unrelated)	Kruskal-Wallis Jonck-heere Trend

Same

Para	Nonpara
t-test (related)	Wilcoxon

Different

Para	Nonpara
t-test (unrelated)	Mann Whitney

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Adapted from: Greene and D'Oliveira, 2003

The results of these processes offered an abundant body of data from which conclusions can be drawn about the MAG program and the learning it offers in a language other than the mother tongue. In addition it presents a view into the achievement of boys and girls in the different programs so that issues concerning their learning in these programs can be addressed, not only for the MAG program, but also for bilingual learning in schools in general.

3.9 Operation Definitions

For the purposes of the discussion, the following definitions will be used for these terms:

MAG – (*Madares Al Ghad – Schools of the Future*) a program of instruction in the UAE where the MOE curriculum in science and math is delivered in English

MOE – (Ministry of Education) this refers to the government body in the UAE which oversees education in all the schools in the Emirates. It has its own curriculum for all subjects, including the core subjects, science and math.

Student achievement – students' scores achieved in the research tests

Bilingual – the ability to at least communicate and possibly think and reason in another language other than the mother tongue.

Bilingual Programs – any program which offers a learner the opportunity to learn another language.

Chapter Four: Findings

The purpose of this research was to evaluate the MAG program and its medium of instruction policy by investigating if there is any significant difference between the MOE and MAG school students' achievement on math and English tests. Additional comparative analyses were made between the boys and girls to find any significant difference between these. Finally, by reviewing the outcomes of the two tests and the literature on the topic, an evaluation of the program and its policy is made since effectiveness can be measured through outcomes in these subjects (Baker, 2006, p. 261).

Four schools, two MAG and two MOE, participated in this study, a total of two hundred fifty-four students (254). Of these one hundred nineteen (119) were from the MAG system and one hundred thirty-five (135) were from the MOE system. Of the two systems, one school for each gender participated, a total of ninety-six (96) boys and one hundred fifty-eight (158) girls (see Table 4.1).

Table 4.1: Distribution of Systems and Genders

	Boys	Girls	System total
MAG	Sch. 3: 53	Sch. 1: 66	119
MOE	Sch. 2: 92	Sch. 4: 43	135
Gender Total	145	109	254

Two assessments were used, math and English to measure student achievement. These were from a non-participating MOE school. The scores of these tests were converted to a percentage score and then analyzed using independent *t*-test.

4.1 Overall Findings

The data was analyzed according to the research questions. The reason the school systems were analyzed was to evaluate the MAG program and its English as the medium of instruction policy in terms of student outcomes. The rationale for investigating gender in this study is to keep the learning of math impartial to gender (Goodell and Parker, 2001) so that boys and girls each have equal opportunity to get a good education.

4.1.2 Results of Findings for Research Question 1

To find if there a significant difference in the achievement of MAG students after three years of implementation of the program compared to MOE students in math and English, the first analysis was of the students of the school types (MOE and MAG) in their total achievement on the math and English tests. *T*-test analyses were administered to find any significant difference between their scores.

The results of the analysis between the school systems (see Table 4.2) on the English test show that the MAG schools scored significantly higher with a mean of 16.53 (st. d. = 11.804) out of hundred (the highest score attainable for each test) than their MOE counterparts who scored with a mean of 12.09 out of hundred (st. d. = 5.151). The mean difference among the schools on the English test was -6.911 and -1.967 and the 0.05 confidence interval. The effect size was medium ($d = 0.5236$). The independent *t*-test showed that the difference between the two school systems was significant (t= -3.541, df = 200, $p = 0.000$). Overall, both school systems which follow the MOE curriculum, scored poorly on the assessment. The poor quality of English education in MOE schools is mentioned in the DSIB 2009 report. Further findings will be discussed in detail below.

Table 4.2: Independent Samples Test – between school systems (MOE & MAG)

		Levene's Test for Equality of Variances		t-test for Equality of Means						95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
English Test	Equal variances assumed	33.130	.000	-3.541	200	.000	-4.439	1.254	-6.911	-1.967
	Equal variances not assumed			-3.377	123.438	.001	-4.439	1.314	-7.041	-1.837
Math Test	Equal variances assumed	2.627	.107	5.975	189	.000	12.604	2.109	8.443	16.764
	Equal variances not assumed			6.021	188.149	.000	12.604	2.093	8.474	16.733

The results of the analysis between the school systems on the math test show that the MOE schools scored significantly higher with a mean of 29.23 (st. d. = 15.628) out of hundred than their MAG counterparts who scored with a mean of 16.63 out of hundred (st. d. = 13.285). The

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mean difference involving the schools on the math test was between 8.443 and 16.764 and the 0.05 confidence interval. The effect size was notably large ($d = 0.8714$). The independent t-test showed that the difference between the two school systems was significant ($t= 5.975$, df = 189, $p = 0.000$). This will be further discussed in detail below.

The overall scores on the math test from both school types are low, evident in the mean score, which is well below the MOE passing score of fifty per cent. The TIMSS (Trends in International Mathematics and Science Study) report (KHDA, 2007, p. 13) showed Dubai scored below the international average on math. Of the MOE students who participated in the TIMSS test, forty-five percent didn't reach the low benchmark.

4.1.2 Results of Findings for Research Question 2
To determine if there a significant difference in the achievement of boys and girls, the second analysis was of gender (boys and girls) in their total achievement on the math and English tests. Independent t-tests were administered to find any significant difference between the scores of boys and girls.

The results of the analysis between the genders (see Table 4.3) on the assessments show that there is a significant difference between boys' and girls' results on the math and English test. On the English test, the results of the analysis show girls scored significantly higher with a mean 17.06 (st. d. = 10.405) out of hundred (the highest score attainable for each test) than boys who scored with a mean of 10.47 (st. d. = 5.328) out of hundred. The mean difference involving girls and boys on the English test was between 4.200 and 8.980 and the 0.05 confidence interval. The effect size was notably large ($d = 0.8374$). The independent t-test showed that the difference between the genders was significant ($t= 5.438$, df = 200, $p = 0.000$). These results are similar to those from the US and UK which show that girls score better on national exams in language skills (Slavin, 2009, p. 113). Gellert, Jablonka, and Keitel (2001, p. 83) state that the reason girls do better is that they approach mathematical calculation more carefully and accurately than boys.

Table 4.3: Independent Samples Test – between Gender (Boys & Girls)

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | 95% Confidence Interval of the Difference | |
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
English Test	Equal variances assumed	15.919	.000	5.438	200	.000	6.590	1.212	4.200	8.980
	Equal variances not assumed			5.831	174.385	.000	6.590	1.130	4.360	8.820
Math Test	Equal variances assumed	9.101	.003	.524	189	.601	1.211	2.310	-3.345	5.767
	Equal variances not assumed			.508	151.585	.612	1.211	2.384	-3.498	5.920

The results of the analysis between the genders on the math test show that the girls scored significantly higher with a mean of 23.76 (st. d. = 13.634) out of hundred (the highest score attainable for each test) than the boys who scored with a mean of 22.55out of hundred (st. d. = 18.271). This is what the trend is worldwide with girls in math (Slavin, 2009, p. 113; Pressley and McCormick, 1995, p. 441) and the same results were reported on the TIMSS test for the year four exam participants (KHDA, 2007, p. 28). However, on the math test for this study, the boys' score is less divergent from the mean than the girls. The mean difference involving gender on the math test was between -3.345 and 5.767 and the 0.05 confidence interval. The effect size was notably small (d = 0.0759). The independent t-test showed that the difference between the genders was not significant (t = 0.524, df = 189, p = 0.3005). Graphs will show the details of these results which will be further discussed below.

Further t-test analysis tables with regards to the assessments and school type and gender can be found in the appendix (see Appendix 7).

4.2 Further Findings

Graphs are a useful way to present information and reveal findings not represented in charts (Brace, Kemp, and Snelgar, 2006, p. 75). The above results reveal further findings in terms of school type and gender in the math and English evaluation in the graphs below.

4.2.1 English Scores

The above outcomes for MAG in the English assessment show that MAG scored higher than MOE. However, Graph 4.1 shows that even though MAG averaged higher than MOE, they still attained lower than the MOE passing score of 50. A total of six students out of one hundred and nineteen (119) scored above the mean of which two students scored slightly above the MOE passing score. The MOE students scored consistently below the passing score with three students scoring slightly above the mean. Even the highest was well below the passing mark.
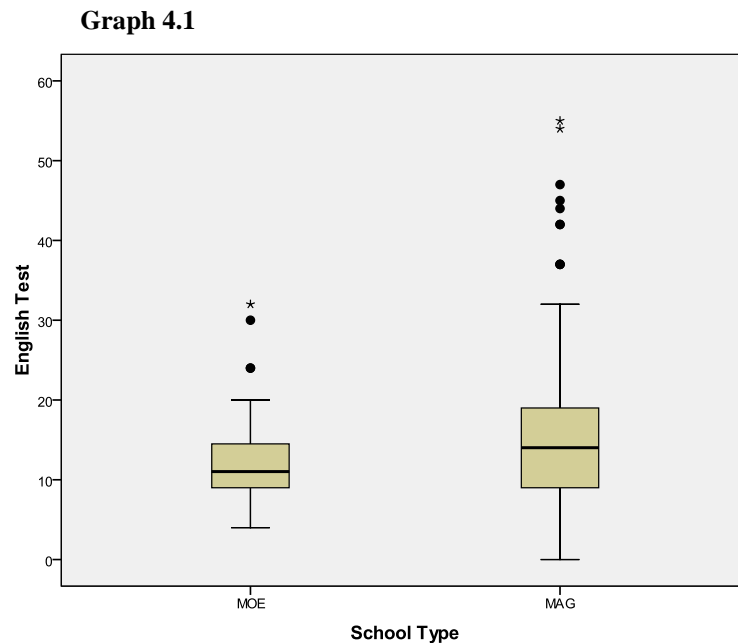
Graph 4.1

In Graph 4.2 (below), the results between gender on the English test show that the girls scored significantly higher than the boys which is similar to the results from the US and UK which show that girls score better on national exams in language skills (Slavin, 2009, p. 113). However, when the genders are compared between MOE and MAG, the MAG girls average far above even their male counterparts in MAG. Even the MOE boys do better than the MAG boys in this case. The MOE girls achieve better than the MOE and MAG boys but not as well as MAG girls.

Graph 4.2
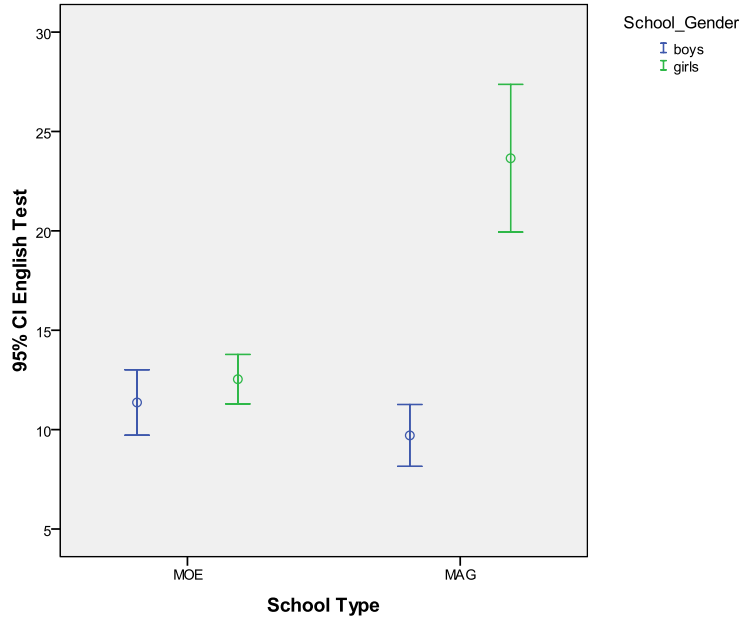
From these results it evident that the MAG program does well in terms of outcomes in English, particularly the girls. See Appendix 7 for additional tables (tables 4A, 4B, 4C) and Appendix 8 for the corresponding graphs (graphs 4A, 4B, 4C).

4.2.2 Math Scores

The above overall outcomes for the math assessment show that MOE students scored significantly higher than MAG. Graph 4.3 shows that MOE students attained well above the MOE passing score of 50 with one student achieving eighty percent while MAG students, on average, attained just above the passing grade with one student out of one hundred and nineteen (119) achieving a score of sixty percent.

Graph 4.3
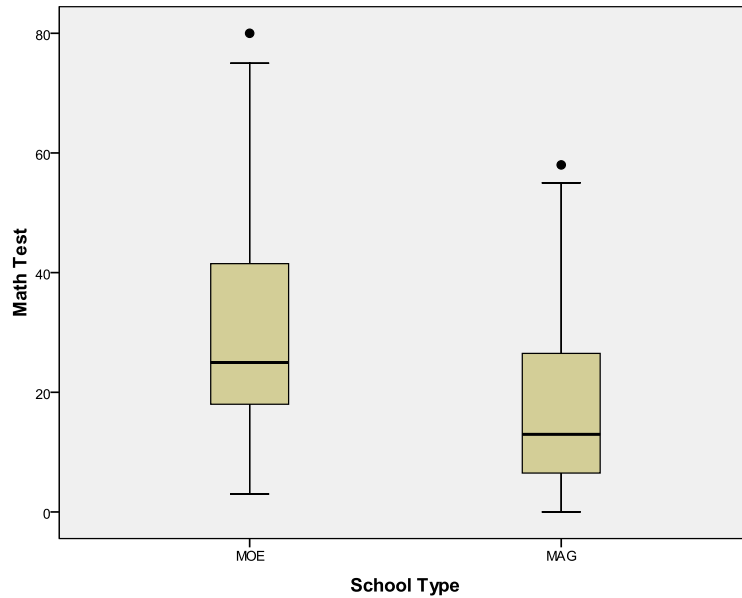
The overall outcomes for gender reveal that girls attained significantly higher than boys. Graph 4.4 shows the results between genders on the math test in relation to their school systems. The highest outcomes are from MOE schools, boys followed by girls. The MAG schools differ, showing that girls' results are better than the boys'. Further tables and graphs can be viewed in the appendices (see Appendix 7 and Appendix 8).

Graph 4.4
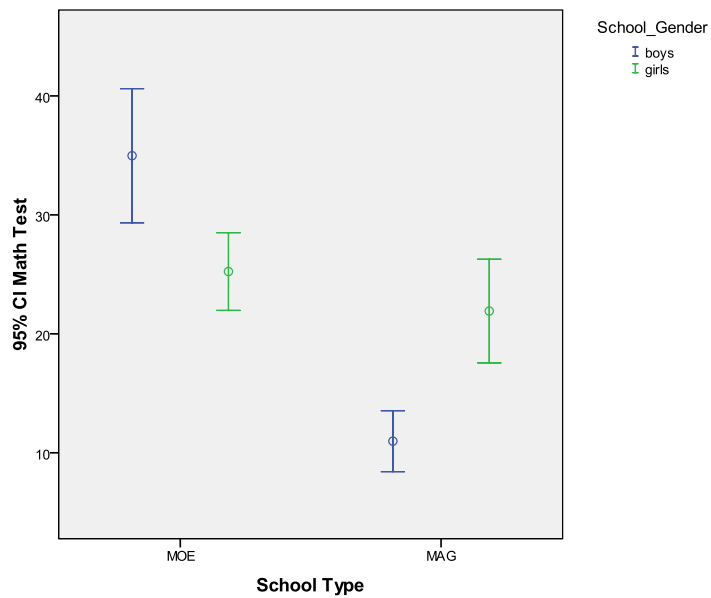
The evidence provided by the graphs shows that the MOE policy of teaching subjects such as math in L1 helps students achieve better. Research in cognitive development of bilinguals by Skutnabb-Kangas and Toukomaa (cited in Cummins, 1979, p. 235) supports this, particularly for subjects such as math.

4.3 Evaluation of the MAG Program and its Medium of Instruction Policy
A program can be evaluated in terms of results on assessments in subjects such as math and English (Baker, 2006, p. 261). For this study, the MAG program will be evaluated using what has been revealed in research about bilingual education and the findings of the participating students' achievement on math and English assessments.

The MAG program was identified as a form of immersion program since it is similar to the private schools' bilingual program where the content and teaching strategies are specially designed "to build students' vocabularies, simplify instructions and help … students succeed in the content" (Slavin, 2009, p. 108). These kinds of programs are considered to be subtractive since it "aims to move children on to a second language as a language of instruction" (UNESCO, 2003, p. 18). Studies from the US show that students in immersion programs tend to drop out later in their schooling. This kind of education is not in line with the UAE government's goals to prepare students to be proficient bilinguals while developing their Arabic and Islamic identities. Evidence from the UAE that this bilingual program model is subtractive is in the private schools where the DSIB (2009) reported weak progress in Arabic and Islamic studies. In addition, immersion programs, such as that of MAG are against the UNESCO position on bilingual education which states that "… instruction in the mother tongue is beneficial to language competencies in the first language, achievement in other subject areas, and second language learning" (UNESCO, 2003, p. 15). Bilingual programs which support the development of L1 help students achieve better in school as well as build on their cognitive abilities (Skutnabb-Kangas and Toukomaa cited in Cummins, 1979).

In addition, the MAG system as a bilingual program does not support bilingual education theories such as the Threshold Theory and the Developmental Interdependence Hypothesis and what is now understood about BICS and CLAP. The Threshold Theory asserts that a bilingual learner must attain a level of competence in L2 before L2 can be used to succeed academically

while the Developmental Interdependence Hypothesis maintains that whatever a bilingual student learns in L1 is transferable to the second language. This not only applies to the cognition of content study, but also to the cognition of second and additional languages. By starting children in immersion education from grade one, does not give them enough time to develop their mother tongue and their second language to the degree needed to succeed academically.

This study, in the schools where it took place, revealed through student outcomes on math and English assessments that after three years of implementation the MAG approach as a form of immersion program has not benefited the students since their English scores are below average. Studies in time to attain BICS proficiency show that it takes at least two years to reach oral proficiency in a second language Hakuta, Goto Butler, and Witt (2000). In the context of the UAE, where students only use English at school, the longer time of five years is needed. As a bilingual program in effect for three years, the MAG system has not benefited the learners since their math scores are also below average. In this area, it takes much more time, from five to ten years to acquire the L2 needed to benefit cognitively and succeed in school (Collier, cited in Cummins, 1999, p. 2). The three years proposed by the MAG program to reach proficiency level is insufficient for students to develop oral competence much less academic competence in English, especially in context of the students who attend public schools.

Chapter Five: Conclusion

Thirty years of research in second and foreign language learning has brought awareness about the importance of the first language in cognitive development while learning in L2. This is evident in the topics of theoretical papers written at that time which discuss issues which are being debated today in education such as the importance of L1 maintenance in L2 learning and academic achievement in L2 learners. It was not until recently that educationalists in the bilingual field acknowledged the importance of maintaining L1 while acquiring L2 in order o succeed academically. Interestingly though, "[w]hile linguistics and psychology have developed at roughly the same pace, teaching methods run as much as twenty years behind the changes in the more theoretical fields" (Orr Easthouse, 2003, p. 2). However, progress is being made. The effectiveness of the various language programs (see Figure 5.1 below) from around the world have been evaluated and the results of these studies have consistently shown the importance of a sound foundation in the first language and a carefully planned cross over to the second language is "an important factor in … language learners' success in education" (Malone, 2003, p. 3). Besides, Collier (1989) states that "it does not really matter for overall long-term academic achievement when one is initially exposed to (or first receives instruction in) the second language, as long as the L1 cognitive development is continued through age 12 (the age by which first language acquisition is largely completed)" (p. 517). Her suggestion of a specific age of completion for first language acquisition is very important. Krashen, Long and Scarcella (1979) formed generalizations about age, rate and eventual attainment of L2 using previous research. The generalization about younger versus older learners is that younger learners reach higher levels of proficiency, e.g., children will have better pronunciation than older learners. However, older learners, ages eleven to fifteen, are better than younger learners and adults in syntax and morphology. Skills in syntax and morphology are very important in language used in school, especially after elementary school since it is language which represents abstract concepts and is used in the higher order learning processes. This means that older students learn the language needed for academic success faster than younger students, particularly those who have 'completed' their L1 acquisition. Coincidentally, the ages presented by Krashen, Long and Scarcella (1979) and Collier (1989) are the same.

Figure 5.1

PATTERNS OF K-12 ENGLISH LEARNERS'
LONG-TERM ACHIEVEMENT IN NCEs
ON STANDARDIZED TESTS IN ENGLISH READING
COMPARED ACROSS SIX PROGRAM MODELS

(Results aggregated from a series of 4-8 year longitudinal studies
from well-implemented, mature programs in five school districts)

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Program 1: Two-way developmental bilingual education (BE)
Program 2: One-way developmental BE, including ESL taught through academic content
Program 3: Transitional BE, including ESL taught through academic content
Program 4: Transitional BE, including ESL, both taught traditionally
Program 5: ESL taught through academic content using current approaches
Program 6: ESL pullout--taught traditionally
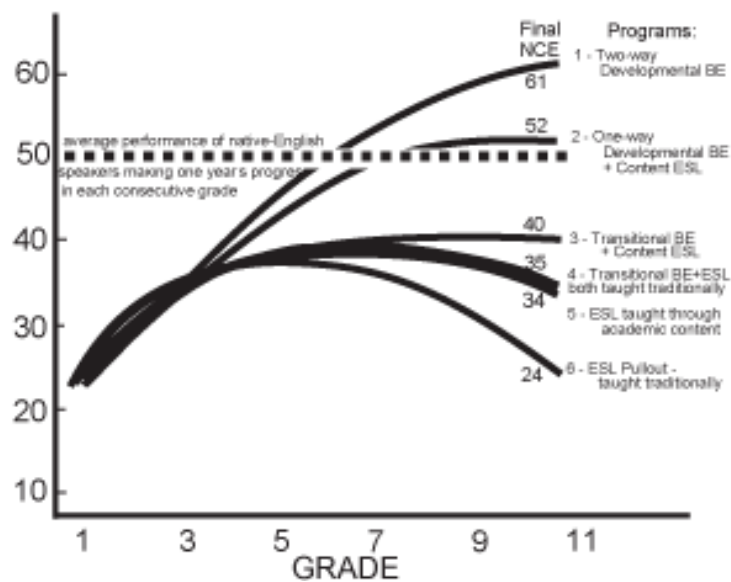
Source: Malone, 2003, p. 12

5.1 Reflections

New models of bilingual programs are being put into practice, which are founded on the Threshold Theory and the Developmental Interdependence Hypothesis. Malone (2003) presents one such model (see Figure 5.2 below) which has students pass through stages in the process of learning L2 while developing L1. These stages represent the Threshold Theory and are in congruence with the Developmental Interdependence Hypothesis. The stages in this program

support the Threshold Theory and allow learners to reach their thresholds in L1 and L2 without negative effects. Additionally, it allows them to benefit from their abilities as they continue through the stages particularly in language since "the importance of language ability increases as children move up through school" (Clarkson, 1992, p. 418). Together with these theories and what is known about the time it takes to reach fluency in L2, when applied to the stages, the first threshold would be stages one and two. These would take at least seven years since that is what is said is needed to reach proficiency in a language to succeed academically. A learner moving to the next threshold (or to stage three) would be at least grade six. In the present UAE MAG curriculum, there are no stages which would allow learners to develop their L1.

Figure 5.2: Stages of Multilingual Education

Stage 1	Stage 2	Stage 3	Stage 4
Build fluency & comprehension in oral L1 (for children)	Build fluency & comprehension in oral and written L1	Continue L1 literacy Build fluency & comprehension in oral L2	Use both/all languages in continuing education
	Begin learning oral L2	*Bridge to literacy in L2*	**Non-Formal system** * Reading clubs * Distance education * Community learning centers * Vocational training
Begin literacy in L1	Continue using L1 as MOI	Use both languages as MOI	
Use L1 as MOI		Begin adding additional languages, as desired	**Formal system** * Primary * Secondary * Tertiary

Source: Malone, 2003, p. 5

This study reveals important features of education in the UAE which need attention. First, the study shows how the language programs used in the UAE are more subtractive in nature since they do not adequately allow learners to attend to the development of their mother tongue in the core subjects. This is particularly evident in private schools where the core subjects are learned in English and is mirrored in the MAG program. Students graduating from these kinds of language programs are not able to discuss topics in science or math in their mother tongue. There is evidence of this from Sweden where professionals speak Swedish in daily conversations

but switch to English when it concerns their work. In Sweden, to turn this trend, educational policies which protect the national language have been put into effect in order to have professionals who can speak about their work in their mother tongue (Fouché, 2008). By incorporating a program such as that modeled above, student outcomes would more than likely improve.

Second, the study reveals that many of the issues concerning gender in education, specifically math, are the same as in other parts of the world. However, the UAE is fortunate in that these issues can be dealt with at school level where the genders are educated separately. In this area of research, there are mixed results (Becker, 2001; Forgasz and Leder, 2001). Indeed, lessons can be learnt from these studies specifically in how each gender approaches learning math and how teachers can be trained in approaches and techniques specific to each in order to get better outcomes (Becker, 2001; Forgasz and Leder, 2001; Gellert, Jablonka, and Keitel, 2001; Goodell and Parker, 2001).

Third, the study informs policy making with empirical evidence, and support from theories. Evaluations of bilingual programs ensure national and program goals are aligned. The MAG initiative, as a bilingual program, is not in line with UAE policy goals to prepare students to be proficient bilinguals while developing their Arabic and Islamic identities since it has been shown to be subtractive as a form of immersion program. Additionally, the outcomes on both the math and English test do not meet the MAG goals after three years of implementation. The official and unofficial participants in the policy process should convene to address these issues with the evidence to decide the next steps.

5.2 Limitations of the Study

The limitations of this study were time and the tests. Time restraints of the study made it impossible to employ a pre/post-test study which would have revealed the areas of effectiveness of each program. Such a study takes at least a year where this study had only five months. The tests were another limitation to this study. Tests which are used internationally to assess language and math skills would have been more reliable. Unfortunately, getting permission to translate and use these tests takes more time than was available. Another issue concerning the tests, other than translation (see the discussion of translation limitations in the methodology

chapter) is bias. However valid and reliable the tests used in this study may be (see the discussion of validity and reliability in the methodology chapter), since the tests were written by teachers from a non-participating MOE school and not a MAG school could raise the issue of test bias even though the researcher made every attempt to make the test conditions as fair as possible.

5.3 Recommendations for Further Study

Further research into the types of bilingual education available in the UAE and their impact on student achievement will help inform stakeholders, particularly parents as to which kind of education best suits their children's needs; educationalists so they can better adjust public education to the needs of the society; and policy makers so they have relevant research based on up to date theories to back their decisions. At present, it is difficult to label language programs in the UAE since the context of the country, in particular Dubai, is very different from other countries. The situation in Dubai in terms of language status is different from the US or Canada where research on the many different types of bilingual programs have been made to establish their effectiveness. In the UAE, Arabic is the majority language since it is the official and national language and English has high status in many sectors of the workforce, whether government or private.

In terms of research of the MAG as a program for bilingual education, studies into student outcomes in Arabic and Islamic to find out if their mother tongue is developing to such a degree as to support academic success would help program administrators adjust the program to meet the educational goals of the UAE government. A year-long pre-post experiment is urgently indicated in order to see if the results of this study are replicated.

It is hoped that the language policies in the UAE will bring about an additive bilingual society "where different languages have different functions" (Baker, 2006, p. 74) and where "the addition of a second language and culture is unlikely to replace or displace the first language and culture" (Lambert, cited in Baker, 2006, p. 74). The challenge is to implement language learning programs to support this. This could be met by defining and implementing an additive program in selected MOE schools as another research project whose results could be studied and compared to the results from the MAG study suggested in the previous paragraph.

References

Abedi, J., Lord, C. & Plummer, J. R. (1997). *Final report of language background as a variable in NAEP mathematics performance*, report to the National Center for Research on Evaluation, Standards, and Student Testing, Graduate School of Education and Information Studies, UCLA [online]. [Accessed on 21 Mar 2009]. Available at http://www.cse.ucla.edu/products/reports.asp

Ahmed, A. (2009). 50 per cent of Emiratis opt for private education. *The National* [online] 21 October [Accessed 17 July 2010]. Available at http://www.khaleejtimes.com/DisplayArticleNew.asp?section=theuae&xfile=data/theuae/2009/october/theuae_october495.xml

Al Najami, S. (2008a). Plans to Revamp Public School System. *Gulf News,* 20 June.

Al Najami, S. (2008b). Study finds male pupils floundering [online]. *Gulf News*, 08 November. [Accessed 24 November 2010]. Available at http://www.khda.gov.ae/en/news/khdanews.aspx?ID=13783

Anderson, L. W. & Krathwohl, D. R. (eds.) (2001). *A taxonomy for learning, teaching and assessing: a revision of Bloom's taxonomy of educational objectives*. New York: Addison Wesley Longman, Inc.

Baker, C. (2006). *Foundations of bilingual education and bilingualism.* 4th ed. Clevedon, UK: Multilingual Matters Ltd.

Becker, J. R. (2001). 'Single-gender schooling in the public sector in California: promise and practice', in Atweh, B., Forgasz, H. & Nebres, B. (eds). *Sociocultural research on mathematics education: an international perspective.* Mahwah: Lawrence Erlbaum Associates, Inc.

Bell, J. (2005). *Doing your research project: a guide for first-time researchers in education, health, and social science*. 4th ed. Berkshire, UK: Open University Press.

Bialystok, E. & Hakuta, K. (1999). 'Confounded age: Linguistic and cognitive factors in age differences for second language acquisition,' in D. Birdsong (ed). *Second language acquisition and the critical period hypothesis*. Mahwah, NJ: Lawrence Erlbaum Associates. pp. 161-181[online]. [Accessed 10 March 2010] Available at http://www.stanford.edu/~hakuta/www/research/publications/(1999)%20-%20CONFOUNDED%20AGE%20LINGUISTIC%20AND%20COGNITIVE%20FACTORS%20IN%20.pdf

Birkland, T. A. (2005). *An introduction to the policy process: theories, concepts, and models of public policy making.* 2nd ed*.* Armonk, NY: M. E. Sharpe, Inc.

Brace, N., Kemp, R. & Snelgar, R. (2006). *SPSS for psychologists: a guide to data analysis using SPSS for Windows*. 3rd ed. Palgrave Macmillan, Hampshire, UK.

Brisk, M. E. (2006). *Bilingual education: from compensatory to quality schooling.* 2nd ed. Mahwah: Lawrence Erlbaum Associates, Inc.

Bose, E. (2005). *What are tests?* [online]. [Accessed 14 December 2010]. Available at http://www.libraryvideo.com/guides/K6718.pdf

Clarkson, P. C. (1992). Language and mathematics: a comparison of bilingual and monolingual students of mathematics, in *Educational Studies in Mathematics* [online]. vol. 23 (4), pp. 417-429 [Accessed 30 March 2009]. Available at http://www.jstor.org/stable/3482992

Collier, V. P. (1989). How Long? A Synthesis of Research on Academic Achievement in a Second Language. *TESOL Quarterly,* vol. 23 (3), pp. 509-531.

Crystal, D. (2003). *English as a global language,* 2nd ed. Cambridge: Cambridge University Press.

Cummins, J. (1979). Interdependence and the Educational Development of Bilingual Children, in *Review of Educational Research* [online]. vol. 49 (2), pp. 222-251 [Accessed 11 April 2009]. Available at http://www.jstor.org/stable/1169960

Cummins, J. (1999). *BICS and CALP: clarifying the distinction*. (online ERIC). [Accessed 24 November 2010]. Available at http://eric.ed.gov/ERICWebPortal/search/detailmini.jsp?_nfpb=true&_&ERICExtSearch_SearchValue_0=ED438551&ERICExtSearch_SearchType_0=no&accno=ED438551

Dubai School Inspections Bureau (DSIB). (2009). *Dubai Schools Inspection Bureau Annual Report 2009* [online]. Dubai: Dubai School Inspections Bureau. [Accessed 20 October 2010]. Available at http://www.khda.gov.ae/en/Reports/Reports.aspx

Dubai School Inspections Bureau (DSIB). (2010). *Dubai Schools Inspection Bureau Annual Report 2010* [online]. Dubai: Dubai School Inspections Bureau. [Accessed 20 October 2010]. Available at http://www.khda.gov.ae/en/Reports/Reports.aspx

Dubai Statistics Center. (2010). *Students by education type and nationality - Emirate of Dubai* [online]. Dubai: Government of Dubai. [Accessed 23 October 2010]. Available at http://www.dsc.gov.ae/Reports/DSC_SYB_2009_04_01.pdf

El Shamma, D. (2008). New Measures Imposed to Improve Academic Standards at Schools. *Gulf News,* 20 June.

El Shamma, D. (2010). 25% of Emiratis drop out of school after second year [online]. *Gulf News*, 06 October. [Accessed 20 November 2010]. Available at http://www.khda.gov.ae/en/news/khdanews.aspx?ID=19365

Forgasz, H. & Leder, G. (2001). '"A+ for girls, B for boys": changing perspectives on gender equity and mathematics', in Atweh, B., Forgasz, H. & Nebres, B. (eds). *Sociocultural research on mathematics education: an international perspective.* Mahwah: Lawrence Erlbaum Associates, Inc.

Fouché, G. (2008). First Languages Fear Second Place. *The Guardian Weekly*, May 23-29.

Gellert, U., Jablonka, E., & Keitel (2001). 'Mathematical literacy and common sense in mathematics education', in Atweh, B., Forgasz, H. & Nebres, B. (eds). *Sociocultural research on mathematics education: an international perspective.* Mahwah: Lawrence Erlbaum Associates, Inc.

Goodell, J. E., & Parker, L. H. (2001). 'Creating a connected, equitable mathematics classroom: facilitating gender equity', in Atweh, B., Forgasz, H. & Nebres, B. (eds). *Sociocultural research on mathematics education: an international perspective.* Mahwah: Lawrence Erlbaum Associates, Inc.

Graddol, D. (1997). *The future of English?* London: British Council.

Graham, M. (2006). *How Islam created the modern world.* Maryland: Amana Publications.

Greene, J., & D'Oliveira, M. (2003). *Learning to use statistical tests in Psychology.* 3rd ed. Great Britain: Open University Press.

Gulf News. (2006). 'Move to improve curriculums with focus on Arab identity', 17 February, p. 1/5.

Gulf News. (2008). 'Call for reforms in school system', 22 June, p. 4.

Hakuta, K. (2001). 'A Critical Period for Second Language Acquisition?', in D. Bailey, J. Bruer, F. Symons & J. Lichtman (eds). *Critical Thinking about Critical Periods*. Baltimore: Paul Brookes Publishing Co. pp. 193-205. [Accessed 10 March 2010] Available at http://www.stanford.edu/~hakuta/www/research/publications/(2001)%20-%20A%20CRITICAL%20PERIOD%20FOR%20SECOND%20LANGUAGE%20ACQUISITION.pdf

Hakuta, K., Goto Butler, Y., & Witt, D. (2000). How long does it take English language learners to attain proficiency? *University of California Linguistic Minority Research Institute Policy Report 2000-1* [online]. [Accessed 10 March 2010]. Available at http://www.stanford.edu/~hakuta/www/research/publications/(2000)%20-%20HOW%20LONG%20DOES%20IT%20TAKE%20ENGLISH%20LEARNERS%20TO%20ATTAIN%20PR.pdf

Hamers, J. F. & Blanc, H. A. (2000). *Bilinguality and bilingualism.* 2nd ed. Cambridge: Cambridge University Press.

Heck, R. H. (2004). *Studying educational and social policy: theoretical concepts and research methods.* Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Heffner, C. L. (2004). *Research methods* [online]. [Accessed 30 October 2010]. Available at http://allpsych.com/researchmethods/researchcontents.html

Hiyama, H. (2002). Japan Tries to Defend Language Against English Invasion. *Agence France Press* [online]. [Accessed 27 October 2010] Available at http://www.globalpolicy.org/component/content/article/162/27577.html

Issa, W. (2006). 'Experts Discuss Problems in the Teaching of English' *Gulf News*, 5 May, p. 5.

Khaleej Times. (2008a). 'Arabic curricula to be upgraded in schools', 6 May, p. 16.

Khaleej Times. (2008b). 'Call for reforms in school system', 22 June, p. 4.

Khaleej Times. (2010a). Why more Emirati boys quit schools? [online]. 18 May. [Accessed 20 November 2010]. Available at http://www.khda.gov.ae/en/news/khdanews.aspx?ID=18458

Khaleej Times. (2010b). Schooling compulsory till age 18 for nationals [online]. 19 July [Accessed 20 November 2010]. Available at http://www.khda.gov.ae/en/news/khdanews.aspx?ID=18908

Kirkpatrick, A. (2009). Extra Language Risks Losing the Children. *The Guardian Weekly*, 27 March.

Knowledge and Human Development Authority (KHDA). (2007). *TIMSS Educators Report: Dubai 2007 Trends in International Mathematics and Science Study* [online]. Dubai: Dubai School Inspections Bureau. [Accessed 20 October 2010]. Available at http://www.khda.gov.ae/en/Reports/Reports.aspx

Knowledge and Human Development Authority (KHDA). (2009). *The role of international assessments and school inspections in the reform of education in Dubai* [online]. [Accessed 20 October 2010]. Available at http://www.khda.gov.ae/CMS/WebParts/TextEditor/Documents/UK_%20brochure25-10-09_EN.pdf

Knowledge and Human Development Authority (KHDA). (2011). *About KHDA* [online]. Dubai: KHDA. [Accessed 20 October 2010]. Available at http://www.khda.gov.ae/En/AboutUs/AboutKHDA.aspx

Krashen, S. D. (2000). What Does it Take to Acquire Language? *ESL Magazine* [online]. vol. 3 (3) [Accessed 21 October 2009]. Available at http://www.sdkrashen.com/articles/what_does_it_take/index.html

Krashen, S. D., Long, M. A., & Scarella, R. C. (1979). Age, Rate, and Eventual Attainment in Second Language Acquisition. *TESOL Quarterly* [online]. vol. 13 (4), pp. 573-582 [Accessed 29 March 2009]. Available at http://www.jstor.org/stable/3586451

Leder, G. C. (1992). 'Mathematics and gender: changing perspectives', in Grouws, D.A. (ed). *Handbook of research on mathematics teaching and learning.* Reston, VA: National Council of Teachers of Mathematics.

Lewis, K. (2009). Emiratis turning to private schools. *The National* [online] 15 August [Accessed 17 July 2010]. Available at http://www.thenational.ae/apps/pbcs.dll/article?AID=/20090815/NATIONAL/708149820/0/NATIONAL

Lightbown, P. M. & Spada, N. (1999). *How languages are learned.* Oxford: Oxford University Press.

Litosseliti, L. (2006). *Gender & language: theory and practice.* London: Hodder Education.

Lloyd, P. (1995). *Psychology: Cognitive and language development.* Leicester, UK: The British Psychological Society.

Ma, X. (2001). 'Longitudinal Evaluation of Mathematics Participation in American Middle and High Schools', in Atweh, B., Forgasz, H. & Nebres, B. (eds). *Sociocultural research on mathematics education: an international perspective.* Mahwah: Lawrence Erlbaum Associates, Inc.

Malone, S. (2003). *Education for multilingualism and multi-literacy in ethnic minority communities: the situation in Asia* [online]. [Accessed 26 November 2010]. Available at http://www.sil.org/asia/ldc/plenary_papers/susan_malone.pdf

Mills, G. E. (2003). *Action research: a guide for the teacher researcher.* 2nd ed. New Jersey, USA: Pearson Education, Inc.

Mitchell, D. E., Destino, T., Karam, R. T., & Colon-Muniz, A., (1999). The Politics of Bilingual Education, in *Educational Policy* [online]. vol. 13 [Accessed 10 October 2009]. Available at http://epx.sagepub.com/cgi/content/abstract/13/1/86

Mohammed bin Rashid Al Maktoum Foundation. (2009). *Arab Knowledge Report 2009: Towards Productive Intercommunication for Knowledge.* Dubai: Al Ghurair Printing & Publishing House L.L.C.

Morgan, M. H. (2007). *Lost history: the enduring legacy of Muslim scientists, thinkers, and artists.* Washington, D.C.: National Geographic Society.

Moussly, R. (2010). Foundation programmes to be eliminated. *Gulf News* [online] 26 September [Accessed 17 July 2010]. Available at http://gulfnews.com/news/gulf/uae/education/foundation-programmes-to-be-eliminated-1.687288

Newman, D. (2002). 'The European influence on Arabic during the Nahda: lexical borrowings from European languages (ta'rib) in 19th-century literature'. *Arabic language and literature* [online]. vol. 5 (2) [Accessed February 2009]. Available at http://dro.dur.ac.uk/707/1/35761.pdf

Nikolov, M. & Djigunović, J. M. (2006). Recent research on age, second language acquisition, and early foreign language learning. *Annual Review of Applied Linguistics*, vol. 26, pp. 234-260.

Ornstein, A. C. & Hunkins, F. P. (2009). *Curriculum: foundations, principles, and issues.* 5th ed. Boston: Pearson Education, Inc.

Orr Easthouse, L. (2003). *Becoming bilingual is a way of life* [online]. [Accessed 22 November 2010]. Available at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.128.9601&rep=rep1&type=pdf.

Pound, L. (2006). *Supporting mathematical development in the early years*. 2nd ed. Berkshire, UK: Open University Press.

Pressley, M. & McCormick, C.B. (1995). *Advanced educational psychology for educators, researchers, and policymakers*. New York: HarperCollins College Publishers.

Punch, K. F. (2006). *Developing effective research proposals*. 2nd ed. London: Sage Publications.

Quasi-experimental design. (2010). *Wikipedia, The Free Encyclopedia* [online]. [Accessed 1 November 2010]. Available at http://en.wikipedia.org/w/index.php?title=Quasi-experimental_design&oldid=392154405

Regmi, K., Naidoo, J., & Pilkington, P. (2010). Understanding the processes of translation and transliteration in qualitative research. *International Journal of Qualitative Methods* [online]. vol. 9 (1) [Accessed 19 November 2010]. Available at http://ejournals.library.ualberta.ca/index.php/IJQM/article/viewFile/6829/6473

Richards, J. C. & Rodgers, T. S. (2001). *Approaches and methods in language teaching.* 2nd ed. Cambridge, UK: Cambridge University Press.

Robson, C. (2002). *Real world research: a resource for social scientists and practitioner-Researchers*. 2nd ed. Malden, MA: Blackwell Publishing.

Salama, S. (2009). Education must be revamped to foster cultural identity, FNC says. *Gulf News* [online] 28October [Accessed 17 July 2010]. Available at http://gulfnews.com/news/gulf/uae/education-must-be-revamped-to-foster-cultural-identity-fnc-says-1.519969

Secada, W. G. (1992). 'Race, ethnicity, social class, language and achievement in mathematics', in Grouws, D.A. (ed). *Handbook of research on mathematics teaching and learning.* Reston, VA: National Council of Teachers of Mathematics.

Slavin, R. E. (2008). Perspectives on evidence-based research in education: What works? Issues in synthesizing educational program evaluations. *Educational Researcher*, vol. 37 (1), pp. 5-14.

Slavin, R. E. (2009). *Educational psychology: theory and practice*. 9th ed. Upper Saddle River, NJ: Pearson Education, Inc.

Solano-Flores, G. (2008). Who Is Given Tests in What Language by Whom, When, and Where? The Need for Probabilistic Views of Language in the Testing of English Language Learners, in *Educational Researcher* [online]. vol. 37 (4), pp. 189-199 [Accessed 12 October 2010]. Available at http://edr.sagepub.com/content/37/4/189

Sowell, E. J. (2005). *Curriculum: an integrative introduction*. 3rd ed. Upper Saddle River: Pearson Education, Inc.

The Emirates Center for Strategic Studies and Research. (1999). *Education and the Arab world: challenges of the next millennium.* Abu Dhabi: The Emirates Center for Strategic Studies and Research.

The European Commission, (n. d.). 'Europa: Languages and Europe' (online). [Accessed 27 October 2010]. Available at http://europa.eu/languages/en/home

The National. (2010). Alarm over school dropout rate [online]. 20 June. [Accessed 20 November 2010]. Available at http://www.khda.gov.ae/en/news/khdanews.aspx?ID=18734

The National. (2010). University remedial English to end [online]. 23 February. [Accessed 20 November 2010]. Available at http://www.khda.gov.ae/en/news/khdanews.aspx?ID=17849

Trochim, William M. (2006). The Research Methods Knowledge Base, 2nd ed. (online). [Accessed 1 November 2010]. Available at http://www.socialresearchmethods.net/kb/

Troudi, S. (2007). 'The Effects of English as a Medium of Instruction', in Jendli, A., Troudi, S., and Coombe, C. (eds). *The power of language: perspectives from Arabia*. Dubai: TESOL Arabia. pp. 3-19.

UNESCO, (2003). *Education in a multilingual world: UNESCO education position paper* [online]. Paris: United Nations Educational, Scientific and Cultural Organization [Accessed 17 July 2010]. Available at http://unesdoc.unesco.org/images/0012/001297/129728e.pdf

Vine, P. (ed.). (2009). *United Arab Emirates yearbook 2009.* London: Trident Press, Ltd. Viewed 4 December 2010. http://www.uaeinteract.com/uaeint_misc/pdf_2009/index.html?page=21

Vine, P. (ed.). (2010). *UAE 2010: United Arab Emirates.* London: Trident Press, Ltd. Viewed 4 December 2010. http://www.uaeinteract.com/uaeint_misc/pdf_2010/Yearbook2010_EN/#0

Walliman, N. & Buckler, S. (2008). *Your dissertation in education.* London: SAGE Publications, Ltd.

Wragg, E. C. (2001). *Assessment and learning in the primary school.* London: RoutledgeFalmer.

Yelland, N. (2001). 'Girls, Mathematics, and Technology', in Atweh, B., Forgasz, H. & Nebres, B. (eds). *Sociocultural research on mathematics education: an international perspective.* Mahwah: Lawrence Erlbaum Associates, Inc.

APPENDICES

Appendix 1

Helen Layman
P. O. Box 67061
Mizher 2, Dubai
United Arab Emirates
050/458-0540
hlayman@emirates.net.ae

August 16, 2009

To the Principal of ███████████████████

Dear Ms. ████████████,

I am a Masters of Education student at the British University in Dubai. I am specifically interested in investigating the correlation between English proficiency and math achievement in Arabic speaking grade three students and am proposing to conduct research in this area for my dissertation. As I am sure you are aware, teaching the core subjects in English is an area of debate.

Through my research I am hoping to investigate if grade three native Arabic speaking students understand higher order math concepts in English when applied to practical situations and the correlation between English proficiency and math achievement in Arabic speaking students attending elementary grade three. This would entail administering proficiency tests in English and mathematics in the first and second semesters as well as observing teaching techniques in the classroom. Since many mathematics teachers are concerned about teaching their subject in English and with their students' achievement in the subject taught in the second language, I would be happy to share my findings with you and your staff at a later stage.

This research is unlikely to put anyone at risk, as I would be conducting the research within the school timings, hopefully during a time when they would be having mathematics classes. It is unlikely as well that the tests will ask about unfamiliar skills and concepts of the students' grade and level. Furthermore, this research will adhere to the ethical guidelines of the university.

The data I gather will ensure anonymity of the participants and the school but will be used in the completion of my dissertation. Confidentiality will be ensured at all times. I am sure you have questions relating to my proposed research and as such I would welcome the opportunity to discuss this further. I will visit your school on September 13, 2009 at 10:00 am to discuss my proposed research and whether you would allow me to conduct my research at your school.

Yours sincerely,

Helen Layman

3.6
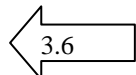
Appendix 2

Helen Layman
P. O. Box 67061
Mizher 2, Dubai
United Arab Emirates
050/458-0540
hlayman@emirates.net.ae

August 16, 2009

Dear Ms. Fatima Al Marri

I am a Masters of Education student at the British University in Dubai. I am specifically interested in investigating the correlation between English proficiency and math achievement in Arabic speaking grade three students and am proposing to conduct research in this area for my dissertation. As I am sure you are aware, teaching the core subjects in English is an area of debate.

Through my research I am hoping to investigate if grade three native Arabic speaking students understand higher order math concepts in English when applied to practical situations and the correlation between English proficiency and math achievement in Arabic speaking students attending elementary grade three. This would entail administering proficiency tests in English and mathematics in the first and second semesters as well as observing teaching techniques in the classroom. Since many mathematics teachers are concerned about teaching their subject in English and with their students' achievement in the subject taught in the second language, I would be happy to share my findings with you and the mathematics teaching staff of the schools at a later stage.

This research is unlikely to put anyone at risk, as I would be conducting the research within the school timings, hopefully during a time when they would be having mathematics classes. It is unlikely as well that the tests will ask about unfamiliar skills and concepts of the grade and level. Furthermore, this research will adhere to the ethical guidelines of the university.

The data I gather will ensure anonymity of the participants and the school but will be used in the completion of my dissertation. Confidentiality will be ensured at all times. The principals of the following Cycle 1 schools have requested a letter which would give your consent from the Knowledge and Human Development Authority that I conduct my research in their schools:

School Name	Place	Principal	Contact
Al Khulafa Al Rashideen School, Boys	Deira, Al Qusais	Ms. Tooba Al Redha	04/261-4419
Al Saada Primary School, Girls	Deira, Abu Hail	Ms. Hind Lootah	04/266-8227
Ghurnata Primary School, Girls	Deira, Al Mezher	Ms. Zainab Baqer Mohammed Baqer	04/287-8167
Sultan Al Owais Primary School, Boys	Deira, Al Hamriya	Ms. Mariam Ahmed Ali Al Kytoub	04/296-6068

Thank you for your cooperation.

Yours sincerely,

Helen Layman

3.6
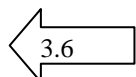
Appendix 3

هيلين لايمان
ص.ب67061
المزهر2دبي ،
الإمارات العربية المتحدة
050/458-0540
hlayman@emirates.net.ae

16 أغسطس، 2009

عزيزتي السيدة/ فاطمة المري

أفيد بهذا بأنني طالبة أدرس بالجامعة البريطانية في دبي للحصول على درجة الماجستير في مجال التعليم. ولديَّ اهتمام خاص بالتحقق من العلاقة ما بين الكفاءة في اللغة الإنجليزية والتحصيل العلمي في مادة الرياضيات لدى طلاب الصف الثالث ممن يتحدثون اللغة العربية، ومن هذا المنطلق فإنني سأقوم بإجراء بحث في هذا المجال من أجل أطروحتي. وأنا واثقة من أنك على دراية كاملة بأن تدريس المواد الأساسية باللغة الإنجليزية هو أحد الموضوعات التي تشهد جدلاً ومناقشات.

ويحدوني الأمل، من خلال البحث الخاص بي، في أن أتحقق مما إذا كان طلاب الصف الثالث الذين يتحدثون اللغة العربية يستوعبون المفاهيم الرياضية ذات المستوى الأعلى باللغة الإنجليزية عند تطبيقها على مواقف عملية، وكذلك دراسة العلاقة ما بين الكفاءة في اللغة الإنجليزية والتحصيل العلمي في مادة الرياضيات لدى طلاب الصف الثالث الابتدائي الذين يتحدثون اللغة العربية. وهو ما يستتبع بدوره إجراء اختبارات للكفاءة في اللغة الإنجليزية والرياضيات خلال الفصلين الدراسيين الأول والثاني، ومن ثم رصد أساليب التدريس داخل الفصول الدراسية. ونظراً لأن العديد من مدرسي الرياضيات يهتمون بتدريس مادتهم باللغة الإنجليزية مثلما يهتمون بالتحصيل العلمي لطلابهم في المادة التي يتم تدريسها باللغة الإنجليزية، فإنه يسعدني في مرحلة لاحقة أن أتقاسم نتائجي معكم ومع هيئة تدريس مادة الرياضيات بالمدرسة.

مع العلم بأن هذا البحث لن يعرض أي شخص للمخاطر، إذ إنني أعتزم إجراءه ضمن أوقات المدرسة، وتحديداً خلال حصص مادة الرياضيات. ولن تتضمن الاختبارات أسئلة حول المهارات والمفاهيم غير المألوفة للصف الدراسي والمستوى. وعلاوة على ذلك، فسيلتزم هذا البحث بالمعايير الأخلاقية للجامعة.

وتضمن البيانات التي سأقوم بجمعها إخفاء هوية المشاركين وكذا هوية المدرسة، إلا أنها سيتم استخدامها فقط في إتمام أطروحتي. كما أنني أضمن الحفاظ على السرية بصفة دائمة. وقد طلب مني مدراء المجموعة الأولى من المدارس التالية خطاب موافقة من هيئة المعرفة والتنمية البشرية لإجراء البحث الخاص بي داخل مدارسهم:

هاتف	المدير	المكان	اسم المدرسة
04/261-4419	السيدة/ طوبى الرضا	ديرة، القصيص	مدرسة الخلفاء الراشدين للبنين
04/266-8227	السيدة/ هند لوتاه	ديرة، أبو هيل	مدرسة السعادة الابتدائية للبنات
04/287-8167	السيدة/ زينب باقر محمد باقر	ديرة، المزهر	مدرسة غرناطة الابتدائية للبنات
04/296-6068	السيدة/ مريم أحمد علي الكيتوب	ديرة، الحمرية	مدرسة سلطان العويس الابتدائية للبنين

وفي النهاية، أشكرك على حسن تعاونك ودعمك لي.

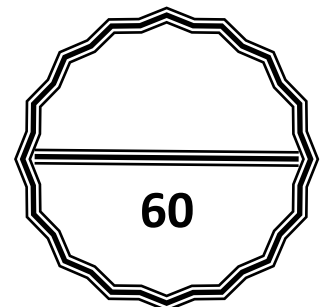وتفضلي بقبول فائق الاحترام والتقدير،،،

هيلين لايمان

3.6

Appendix 4
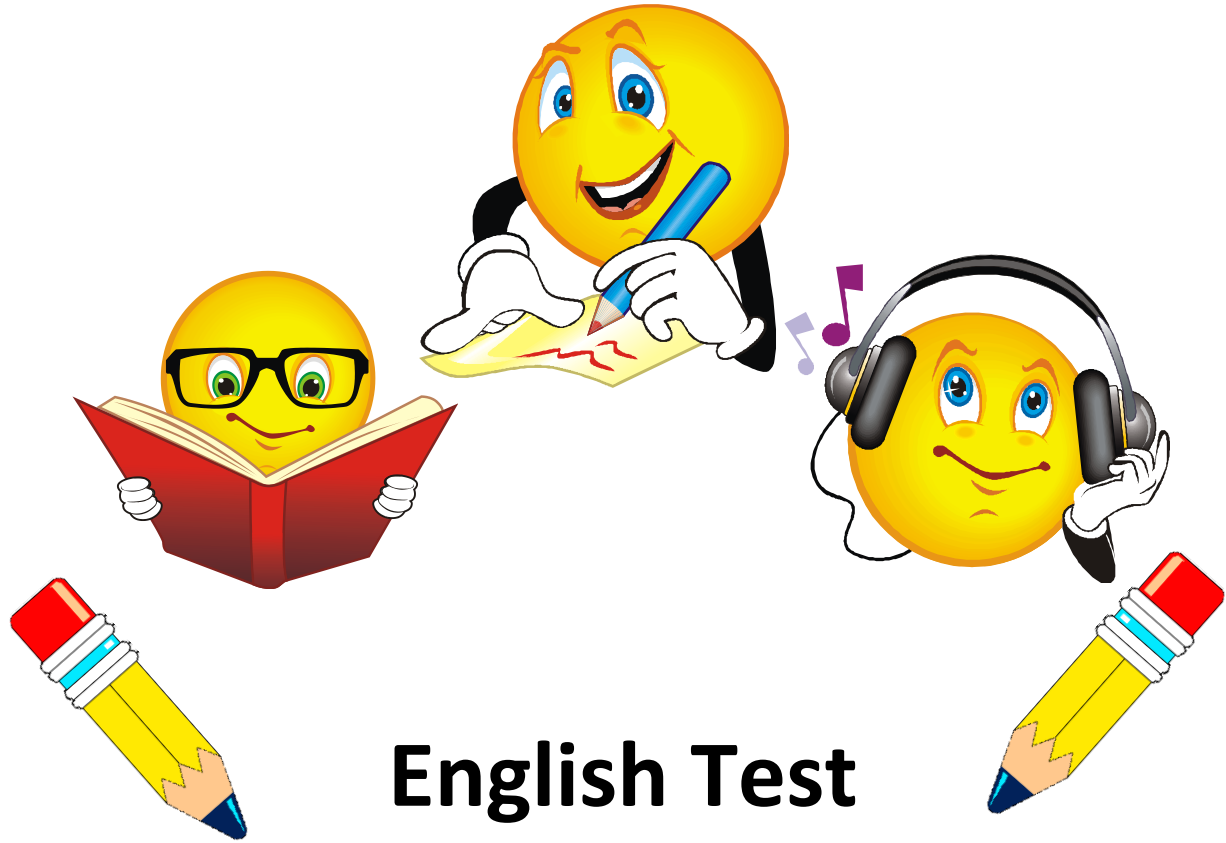
English Test

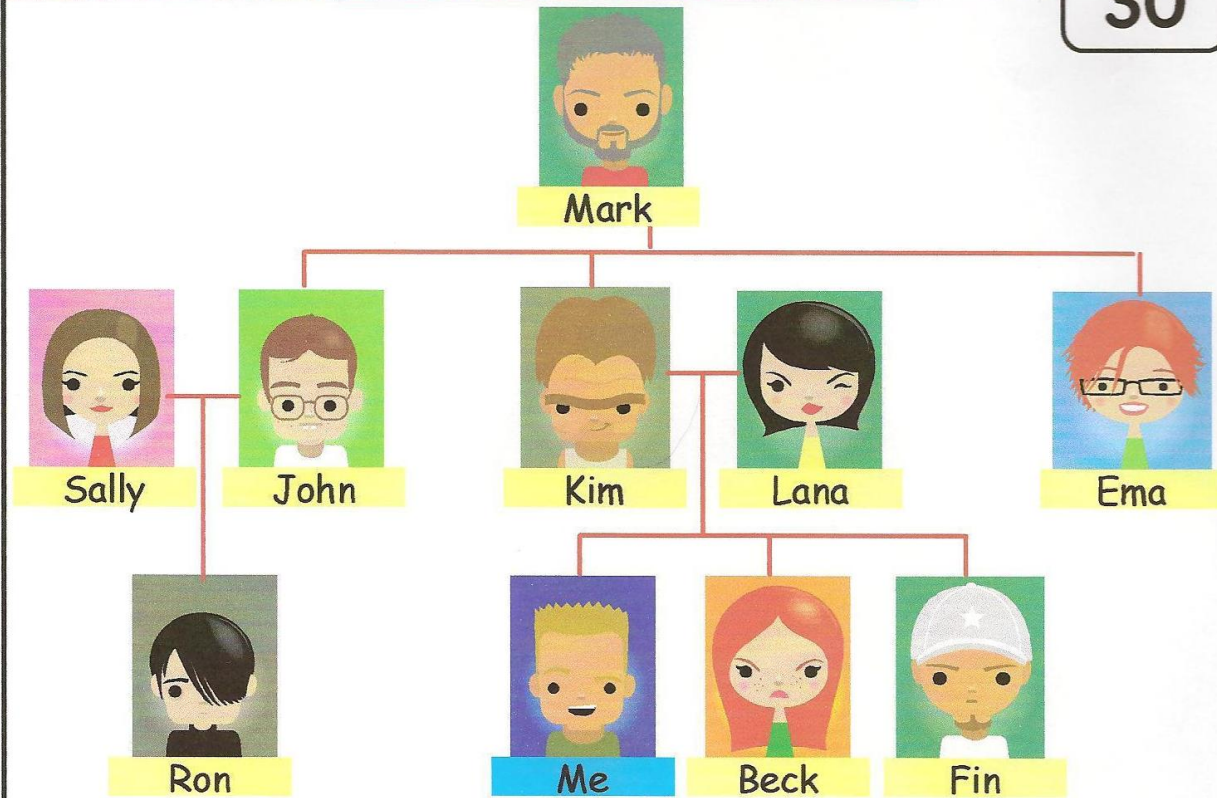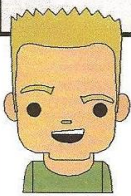**Name of School:** _____

Grade: _____

Date: _____

60

1. Look at the family tree, then finish the sentences: [10 marks]

Mark

Sally | **John** | **Kim** | **Lana** | **Ema**

Ron | **Me** | **Beck** | **Fin**

father - mother - sister - brother - uncle - aunt - cousin - grandfather
firefighter - officer - hairdresser - barber - nurse - pilot - waitress
fixes - serves - cuts - flies - drives - sports - math - school

Hello! I'm Jake, and this is my family.

1. Kim is my _____ . He is a _____. He fights fires.

2. John is my _____ . He is a dentist. He _____ teeth.

3. My cousin _____ is a student. He goes to _____ .

4. Ema is my _____ . She helps sick people. She is a _____ .

5. Lana is my _____. She _____ planes. She is a _____.

6. Mark is my _____ . He is a police _____ .

7. My brother _____ is a coach. He teaches _____.

8. My aunt Sally is a _____ . She _____ hair.

9. My sister _____ is a _____ . She _____ food.

2. What does Jake do with his family on Fridays? Write a paragraph:
[4 marks]
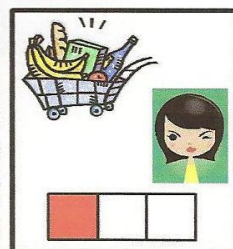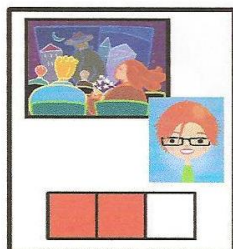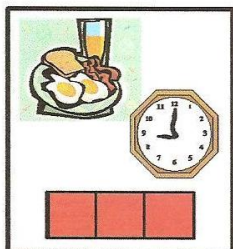
On Fridays, Jake _____

_____

_____

_____

_____

3. Complete the sentences about chores using has to or have to: [3 marks]

1. We _____ iron the clothes.

2. Samira _____ fold the clothes.

3. They _____ wash the dishes.

4. He _____ do his homework.

5. My father _____ go to the supermarket.

6. My sister and I _____ look after our brother.

4. What do you have to do after school today?
[3 marks]

_____

_____

_____

5. Find the mistakes in the sentences and correct them: [4 marks]

1. She haves to water the plants.

2. We have to do paint the fence.

3. I have a fish, a bird, a cat, a duck.

4. There are many shopping mall in the city.

5. There is a horse and and a cow in the field.

6. Hamda has wash the clothes.

7. I usually do homework at 4:00.

8. My cousin live on a farm.

6. Write about the city and the country: [6 marks]

In the city, _____

_____

_____

_____

_____

_____

In the country, _____

_____

_____

_____

_____

_____

Good Luck

1. Finish the sentences to describe the pictures: [4 marks]

20

1.

City Mouse goes to the country
....
....
....

2.

City Mouse is not happy because
....
....
....

3.

They are happy because
....
....
....

4.

Country Mouse doesn't like the city because
....
....
....

2. Check ✔ or ✗ and correct the mistakes: [6 marks]

1. Country Mouse lives on a farm. ☐

2. City Mouse is not happy in the barn. ☐

3. Country Mouse goes to the city with his cousin. ☐

4. They see a restaurant, a museum and a skating rink in the country ☐

5. City Mouse lives in a house. ☐

6. It is warm and there is a lot of food in the barn. ☐

7. On the table, they find cheese and milk. ☐

8. A big cat lives in the apartment. ☐

9. Country Mouse is still hungry. ☐

10. The cat hides behind a refrigerator. ☐

11. Country Mouse does not like the city. ☐

12. City Mouse goes back to the farm. ☐

3. Read the story and answer the questions: [4 marks]

THE LION AND THE MOUSE
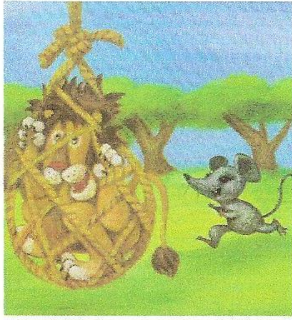
One day, a lion is walking along. Suddenly, he walks into a net.

"Help!" he yells. "I can't get out."

A little mouse comes running. She says, "I'll help you."

"How can you help?" asks the lion. "You're too little."

The mouse begins biting the net into small bits.

The lion gets out and smiles. He says, "You may be a little mouse, but you're a big help."

1. Why does the lion need help?
....
_____

2. Who comes to help him?
....
_____

3. Why does the lion think the mouse can't help him?
....
_____

4. How does the mouse help the lion?
....
_____

4. Choose the correct answers to complete the sentences: [6 marks]

1. The two brothers don't want to be:

| shepherds | doctors | firefighters |
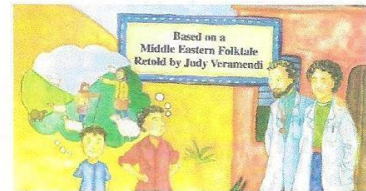
2. They want to be shepherds because:

| they like sheep | they like the mountains | they like swimming |

3. The two brothers are bad shepherds because:

| they eat lunch | they feel scared | they go to sleep |

4. The shepherd in the mountains:

| gives them food | gives them sheep | teaches them |

5. The two brothers feel scared because:

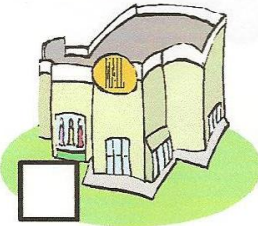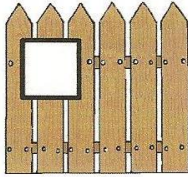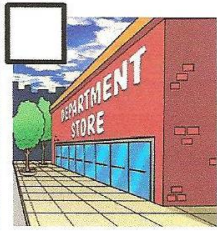| they see a monster | they jump into a river | horns poke them |

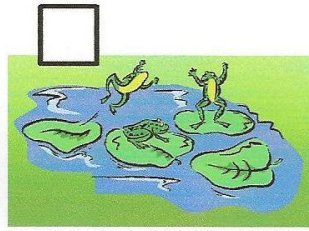6. They think that what pokes them is:

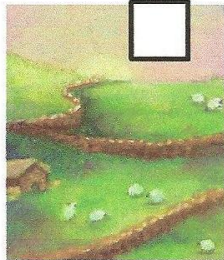| a sheep | a dream | a monster |

1. Listen and number the pictures: [5 marks]
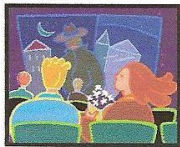
10
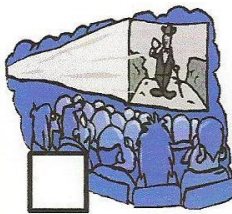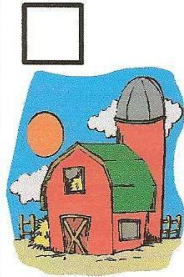
2. Listen and circle the correct picture: [5 marks]

1.

2.

3.

4.

5.

1] 1. A place you go to watch a movie. 2. A big shop that sells many kinds of things. 3. A home in a building. 4. A place you go to see old things. 5. Something to put around a farm to keep animals in. 6. A place you go to skate on ice. 7. A place where farm animals sleep. 8. A building with many shops. 9. A small body of water. 10. A place where animals can eat grass.

2] 1. Something you can do in the country. 2. Something you can do in the city. 3. An animal that is a pet. 4. Someone who is doing chores. 5. You have to paint the barn.
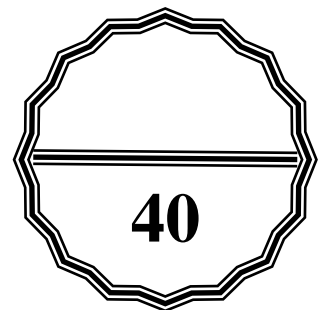
Appendix 5

Math Test

Name of School: _____

Grade: _____

Date: _____

40
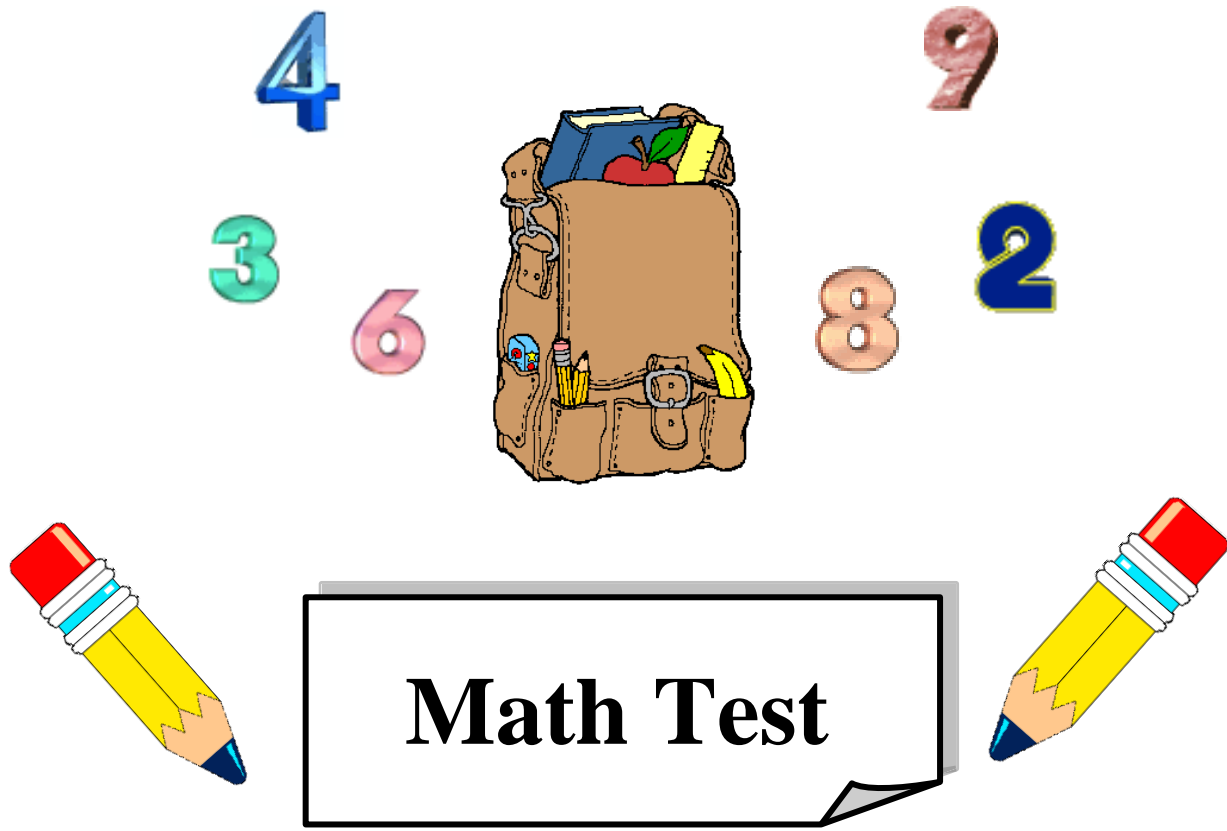
<u>**Addition:**</u>

1) Fill in the missing values:

    a. 700 + 400 = _____   **b. 500 + _____ = 1300**

    c. 8 hundreds + 3 hundreds = _____ _____

2) Fill in the missing values of the following:

    a. 40 + 32 = 40 + _____ + 2 = _____

    b. 20 + 15 = _____ + 20 = _____

    c. _____ + 17 = 23

3) Find the value of the following. Show your work.

    a. 38 + 61 = _____

b. $+\begin{array}{r}6518\\3081\end{array}$

c. $+\begin{array}{r}637\\334\end{array}$

d. $+\begin{array}{r}391\\27\\28\end{array}$

4) Find the value of the following. Estimate to verify.

316 and 897

a. **316 + 897 = _____**

b. **_____ + _____ = _____**

5) Word problems. Show your work where possible.

In a girls' school, Grade III students donated 500 Dirhams and Grade IV students donated 800 Dirhams.

a. **What is the total donation of both Grades?**

_____

b. **How much more did the Grade IV students donate than Grade III students?**

_____

Subtraction:

1) **Find the difference between the following numbers. Show your work.**

   2681 and 5528

2) **Find the difference between the following numbers. Show your work.**

   a. $\begin{array}{r} 679 \\ -\ 548 \\ \hline \end{array}$ b. $\begin{array}{r} 688 \\ -\ 139 \\ \hline \end{array}$ c. $\begin{array}{r} 4708 \\ -\ 136 \\ \hline \end{array}$

3) Word problems. Show your work where possible.

Talal bought a book for 105 Dirhams and some tape for 67 Dirhams.

a. How much more is the book's price than the tape's price?

_____

b. What is the value of the <u>1</u> in 105?

_____

4) Fill in the missing values in the blank:

a. 32 – _____ = 16

b. 28 – _____ = 20

c. 5 tens – _____   _____ = 3 tens

5) Will you have to perform addition to find the difference between 115 – 46?
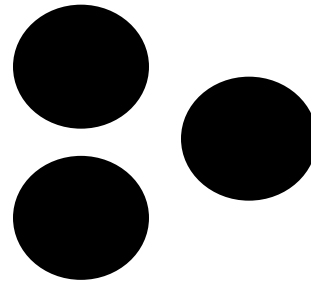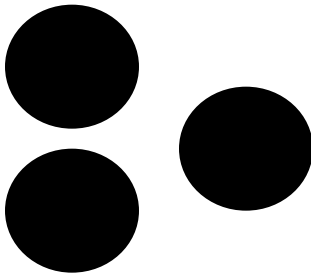
Yes   No

Multiplication:

1) **Below are two sets of dots. Use the sets to find the value of each number sentence.**

   a. _____ + _____ = _____

   b. _____ × _____ = _____

2) **Draw a picture to show how 4 times 2 is 8.**

3) How can you rewrite the problem using multiplication to find the value of 5 + 3 + 5?

_____

4) Which is larger 5 × 4 or 5 × 3?

_____

5) Find the missing values. Show your work where possible.

    a. 7 × 5 = _____

    b. 2 × 5 = _____

    c. 0 × 2 = _____

    d. 3 × 2 = _____

    e. Three twos = _____

    f. Four fives = _____

    g. Six twos = _____

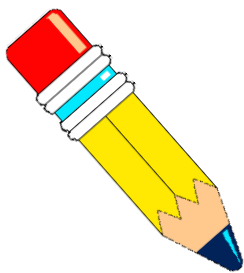**6) Multiples of 5 will end with the following numbers:**

    _____   _____

Go back and check your work.

3.2.1

3.2.2

7

Appendix 6

Math Test

Name of School: _____

Grade: _____

Date: _____

40
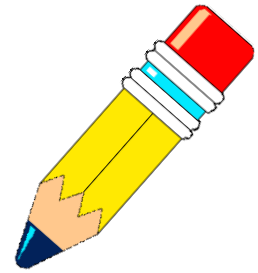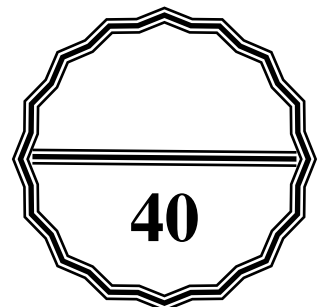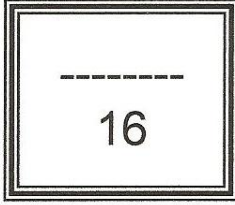
السؤال الأول : (الجمع)

1 -انسخي واكملي الجمل العددية التالية : -

500 + ------ = 1300   400 + 700 = -------

4 مئات + 7 مئات = ------------

2 – أكملي الجمل العددية التالية بايجاد العدد المناسب في الفراغ :-

40 + 32   =   40 + ---- + 2   = --------

20 + 15   = ------ + 20 = ----

------ + 17   = 23

10 مئات   =   --------------

2 – أوجدي كلاً من المجاميع التالية (أوضحي عملية اعادة التجميع عند الحاجة :

38 + 15   = ---------

$$
\begin{array}{r}
3\ 9\ 1 \\
2\ 7 \\
+\quad 2\ 8 \\
\hline
\end{array}
$$

$$
\begin{array}{r}
6\ 3\ 7 \\
+3\ 3\ 4 \\
\hline
\end{array}
\qquad
\begin{array}{r}
6\ 5\ 2\ 8 \\
+3\ 0\ 8\ 1 \\
\hline
\end{array}
$$

2

3 – اجمعي ----- قدري لتتحققي :

316 و 897

897 + 316 = ----------

قدري

--------------- + --------- = ------------

4 – المسائل اللفظية : -

في مدرسة اناث تبرعت تلميذات الصف الثالث ب 500 درهماً وتبرعت طالبات الصف الخامس ب800 درهماً .

1 – ما الحقيقة الأساسية التي تساعدك على ايجاد المجموع . --------------

2 – ما مجموع ما تبرعت به الطالبات في الصفين . -------------------

3 – بكم يزيد ما تبرعت به طالبات الصف الخامس عن طالبات الصف الثالث .

السؤال الثاني : - (الطرح)

10

1 - أوجدي الفرق بين العددين :

2681 و 5528

5528 - 2681 = --------

2 – أوجدي حاصل طرح ما يلي (أوضحي عملية اعادة التجميع عند الحاجة :

$$\begin{array}{r} 678 \\ -599 \\ \hline \end{array}$$

$$\begin{array}{r} 4708 \\ -136 \\ \hline \end{array}$$

$$\begin{array}{r} 678 \\ -599 \\ \hline \end{array}$$

3

3 – المسائل اللفظية : -

اشترى طلال كتاباً ثمنه 105 درهماً ، واشترى شريط دفع ثمنه 67 درهماً :

1 - بكم يزيد ثمن الكتاب عن ثمن شريط التسجيل - ------------------------- .

2 – قيمة الرقم 1 في العدد   - 105 -   -------------------- -   .

4 – أكملي الجمل العددية التالية بايجاد العدد المناسب في الفراغ :-

28 - ------   = 20   32   - -----   = 16

5 عشرات - ---------- = 3 عشرات

5 – هل عليك اعادة التجميع لايجاد الفرق بين

115 –   46 = -------

لا   نعم
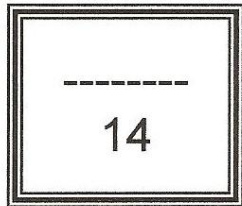
السؤال الثالث : - (الضرب)

14

1 – أكملي الجملة العددية التالية :

----------- + ------- = -------------

------- × ---------- = ------

4

2 – ارسمي صورة تبين

4×2   = ----------

3 – هل تستطيعي أن تستخدمي الضرب لايجاد 5 + 3+5   وضحي ذلك

----

4 – اي منهما أكبر 5 × 4   أو   5 × 3

----

5 – مضاعفات العدد   5   تنتهي بأحد الأرقام التالية :

----------   --------

7 – أوجدي حاصل ضرب ما يلي :

2 ×5 = --------

7 ×5 = --------

3 ×2 = --------

0 ×2 = --------

ثلاث اثنينات   = --------------------

-------------------- = أربعة خمسات

ست اثنينات   = --------------------

Appendix 7

Tables

Table 4X: Group Statistics (*t*-test) – MAG and MOE

	School Type	N	Mean	Std. Deviation	Std. Error Mean
English Test (ET)	MOE	108	12.09	5.151	.496
	MAG	94	16.53	11.804	1.217
Math Test (MT)	MOE	100	29.23	15.628	1.563
	MAG	91	16.63	13.285	1.393

Table 4Y: Group Statistics (*t*-test) – Boys and Girls

	Gender	N	Mean	Std. Deviation	Std. Error Mean
English Test	Girls	113	17.06	10.405	.979
	Boys	89	10.47	5.328	.565
Math Test	Girls	106	23.76	13.634	1.324
	Boys	85	22.55	18.271	1.982

Table 4A: Report – Means

Gender	School_Type		English Test	Math Test
Girls	MOE	N	67	59
		Mean	12.54	25.24
		Std. Deviation	5.100	12.541
		Minimum	5	5
		Maximum	32	55
	MAG	N	46	47
		Mean	23.65	21.91
		Std. Deviation	12.508	14.823
		Minimum	7	0
		Maximum	55	58
	Total	N	113	106
		Mean	17.06	23.76
		Std. Deviation	10.405	13.634
		Minimum	5	0
		Maximum	55	58

Table 4B: Report – Means

Gender	School_Type		English Test	Math Test
Boys	MOE	N	41	41
		Mean	11.37	34.98
		Std. Deviation	5.214	17.863
		Minimum	4	3
		Maximum	24	80
	MAG	N	48	44
		Mean	9.71	10.98
		Std. Deviation	5.359	8.432
		Minimum	0	0
		Maximum	19	35
	Total	N	89	85
		Mean	10.47	22.55
		Std. Deviation	5.328	18.271
		Minimum	0	0
		Maximum	24	80

Table 4C: Report – Means

Gender	School_Type		English Test	Math Test
Total	MOE	N	108	100
		Mean	12.09	29.23
		Std. Deviation	5.151	15.628
		Minimum	4	3
		Maximum	32	80
	MAG	N	94	91
		Mean	16.53	16.63
		Std. Deviation	11.804	13.285
		Minimum	0	0
		Maximum	55	58
	Total	N	202	191
		Mean	14.16	23.23
		Std. Deviation	9.139	15.833
		Minimum	0	0
		Maximum	55	80

Table 4-1: Explore Case Processing Summary – MAG/MOE English Test

| | School_Type | Cases | | | | | |
| | | Valid | | Missing | | Total | |
		N	Percent	N	Percent	N	Percent
English Test	MOE	108	80.0%	27	20.0%	135	100.0%
	MAG	94	79.0%	25	21.0%	119	100.0%

Table 4-2: Explore Case Processing Summary – MAG/MOE Math Test

| | School_Type | Cases | | | | | |
| | | Valid | | Missing | | Total | |
		N	Percent	N	Percent	N	Percent
Math Test	MOE	100	74.1%	35	25.9%	135	100.0%
	MAG	91	76.5%	28	23.5%	119	100.0%

4.2

4.2.2

Appendix 8

Graphs

Graph 4A

Graph 4B