MATHEMATICS CURRICULUM OF GRADES 11TH AND 12TH FROM THE PERSPECTIVE OF STAKEHOLDERS IN THE SULTANATE OF OMAN

By

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Thesis submitted in fulfillment of the requirements

for the degree of

Doctor of Philosophy

SCHOOL OF EDUCATIONAL STUDIES
UNIVERSITI SAINS MALAYSIA

APRIL 2010

ACKNOWLEDGMENTS

The completion of a doctorate degree is an enormous undertaking. I extend my appreciation to a number of people who enabled me to complete this dissertation.

I gratefully acknowledge the Ministry of Education in Oman, the Ministry of Higher Education, the Private Institutions, the experts and Professors of Public and Private Universities and Colleges, and the mathematics supervisors and teachers whose willing participation in this study was so crucial. My many thanks go to all people involved in this study for their time and effort they allocated.

I am also grateful to my supervisor, *Associate Prof. Fatimah Binti Saleh*, for the many hours she devoted supervising my research study. Her sound guidance, sincere interest and inspiring suggestions on the drafts of this work, and constant support and useful feedback, so readily provided throughout my research study have been invaluable. I would like also to express my thanks to *Dr. Ong Saw Lan* for her assistance and encouragement throughout different stage of my research. I would also like to thank *Professor Dr. Abd. Rashid Mohammed*, the Dean of School of Educational Studies and all staff in School of Educational Studies at USM.

I have been very fortunate to work with outstanding individuals who have encouraged and inspired me. I would like to thank all of my friends for their faithful companionship and great support during my study.

Finally, I wish to give a special thank-you to my family for their continuous support back home, throughout this research endeavor and their encouraging me to achieve that which I thought was unachievable without their support.

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GLOSSARY OF ABBREVIATIONS USED

Abbreviations used in this Study are listed below for Reference:

PDR	Means Participants of Dakhlyah Region
PADR	Means Participants of Al Dhahrah Region
PMR	Means Participants of Muscat Region
PBR	Means Participants of Batinah Region
PSHR	Means Participants of Sharqyiah Region
PHSBR	Means Higher Education' Participants of Batinah Region
PSBR	Means Private Sector' Participants of Batinah Region

KURIKULUM MATEMATIK GRED 11 DAN 12 DARIPADA PERSPEKTIF MASYARAKAT DI NEGARA OMAN

ABSTRAK

Tujuan kajian adalah untuk mengkaji pandangan pihak-pihak yang berkepentingan tentang Kurikulum Matematik Gred 11 dan Gred 12 di negara Kesultanan Oman. Kajian ini disertai para penyelia, guru, mahasiswa serta sektor swasta untuk mengkaji kandungan yang berkaitan dengan kurikulum matematik gred 11 dan gred 12. Selain itu kajian juga meninjau pandangan penyelia dan guru tentang kualiti strategi pengajaran dan amalan penilaian yang terdapat dalam panduan guru dan buku teks matematik gunaan peringkat sekolah menengah di Oman. Kajian ini menggunakan pendekatan triangulasi yang melibatkan dua soal selidik untuk mengutip data tentang kesesuaian kandungan, strategi pengajaran, dan amalan penilaian. Kaedah ini juga melibatkan temu bual dan analisis dokumen yang diberikan kepada para peserta kajian pada semester kedua tahun pengajian 2007/2008 di Oman. Soal selidik tentang kesesuaian kandungan meliputi gred 11 dan gred 12 mengandungi 12 bahagian utama, iaitu enam bahagian bagi setiap gred. Soal selidik mengenai strategi pengajaran pula terdiri daripada 18 soalan, manakala soal selidik tentang amalan penilaian mengandungi 11 soalan. Siri analisis berbentuk statistik perihalan seperti taburan frekuensi, skor min dan sisihan piawai dihitung untuk menentukan hasil penemuan data kuantitatif dengan menggunakan perisian *Statistical Package for the Social Sciences* (SPSS), versi 13.0. Transkrip temu bual telah dicatat dan dikategorikan bagi setiap gred seperti berikut: kandungan, strategi pengajaran, dan amalan penilaian. Hasil kajian kuantitatif menunjukkan bahawa setiap bahagian kandungan kurikulum bagi gred 11 dan gred 12 dianggap sesuai untuk pendidikan tinggi dan juga untuk sektor swasta. Secara keseluruhan peratusan

bagi gred 11 bernilai antara 67%- 91% bagi pendidikan tinggi, dan antara 57%- 84% bagi sektor swasta. Secara keseluruhan peratusan bagi gred 12 pula bernilai antara 66%- 92% bagi pendidikan tinggi, dan antara 57%- 85% bagi sektor swasta. Sebaliknya, kajian kualitatif menunjukkan kesemua enam bahagian gred 11 dan gred 12 sesuai untuk pendidikan tinggi, tetapi tiga bahagian gred 11 dan dua bahagian gred 12 tidak sesuai untuk sektor swasta. Hasil bagi strategi pengajaran menunjukkan bahawa 16 daripada 18 bahagian bagi gred 11 dianggap sebagai strategi yang berkualiti, dan skor min keseluruhannya antara 2.51-3.12 pada skala 4 mata, manakala 15 daripada 18 bahagian bagi gred 12 pula dianggap sebagai berkualiti, dengan skor min keseluruhannya antara 2.55-3.15 pada skala 4 mata. Dapatan bagi amalan penilaian menunjukkan bahawa kesebelasan bahagian gred 11 dan gred 12 diterima sebagai amalan yang berkualiti, dan skor min keseluruhan antara 2.53-3.24 pada skala 4 mata bagi gred 11, dan antara 2.50-3.22 pada skala 4 mata ini bagi gred 12. Berdasarkan dapatan ini, penyelidik ingin menyarankan beberapa cadangan untuk kejayaan pembangunan pendidikan, khususnya dari segi kurikulum matematik gunaan. Saranan utama ialah menyusun semula kandungan kurikulum matematik gunaan yang sedia ada kepada dua jenis kurikulum; Pertama, kurikulum matematik gunaan; kedua ialah kurikulum ekonomi dan sains pentadbiran yang merangkumi: Transaksi Pasaran Kewangan, Pengenalan Kepada Ekonomi, Keusahawanan (Perniagaan Kecil), Pengeluaran Dan Pemasaran Dalam Organisasi Perniagaan, Pilih Atur Dan Kombinasi, Bayaran Dan Insurans, Pengurusan Sumber Manusia, Perakaunan Dalam Organisasi Perniagaan, Kewangan Dalam Perniagaan, serta Pelancongan Dan Pelaburan.

MATHEMATICS CURRICULUM OF GRADE 11TH AND 12TH FROM THE PERSPECTIVE OF STAKEHOLDERS IN THE SULTANATE OF OMAN

ABSTRACT

The purpose of this study was to explore the stakeholders' views toward mathematics curriculum of grades 11 and 12 in the Sultanate of Oman. The study examined supervisors, teachers, undergraduate students of higher education level and of private sector toward the content relevant of mathematics curriculum in grades 11 and 12, and supervisors and teachers' views toward quality of instructional strategies and assessment practices suggested in teacher guide and textbooks of applied mathematics in secondary school in Oman. The study utilized triangulation approach using two questionnaires that were designed to data collect regarding content relevance, instructional strategies, and assessment practices. The techniques collection data involved interviews, and document analysis administered to participants during the second semester of the 2007/2008 academic year in Oman. The questionnaire about content relevance involved 12 main areas in grade 11 and 12 with six areas in each grade. Whereas the questionnaire for instructional strategies involved 18 items, and 11 items on assessment practices. A series of analyses of descriptive statistics, such as, frequency distributions, mean scores, and standard deviations were calculated on the quantitative data using the Statistical Package for the Social Sciences SPSS version 13.0. The interview transcripts were transcribed and categorized for each grade according to contents, instructional strategies, and assessment practices. The results of the quantitative data indicated that all areas of curriculum content for grade 11 and grade 12 were relevant for both higher education and private sector. Overall Percentage of grade 11 were between 67%- 91% for higher education, between 57% – 84% for private sector, and overall percentage for

grade 12 were between 66%- 92% for higher education, and between 57% – 85% for private sector. Whereas the qualitative data indicated that all areas for grades 11 and 12 were relevant to higher education, but three areas of grade 11, and two areas of grade 12 were not relevant to private sector. The result of instructional strategies indicated that 16 out of 18 items of grade 11 were considered good quality strategies, where the overall mean scores were between 2.51- 3.12 of 4 point scale, and 15 of 18 items for grade 12 were considered good quality, with the overall mean scores were between 2.55–3.15 on 4 point scale. The result for assessment practices indicated that all 11 items of grade 11 and 12 were considered as good quality practices, where the overall mean scores were between 2.53– 3.24 on 4 point scale for grade 11, and between 2.50– 3.22 on 4 point scale for grade 12. Based on the results, the researcher suggests some recommendations for the success of education development particularly in terms of applied mathematics curriculum. The main recommendation is to reorganize the content of current applied mathematics curriculum into two types of curriculum: First is the curriculum of applied mathematics, while the second is the curriculum of economics and administration sciences which include Transaction in Financial Markets, Introduction to Economics, Entrepreneurship (Small Business), Production and Marketing in Business Organization, Permutations and Combinations, Payments and Insurance, Human Resources Management, Accounting in Business Organization, Finance in Business, and Tourism and Investments.

Chapter One

INTRODUCTION

1.0 Introduction

With the dawn of the 21st. century, rapid technological evolution and massive explosion of knowledge have produced rapid changes in various aspects of life all around the world. A myriad of challenges have resulted from these changes and many sectors of society, especially the education sector, now require a strong system to face these challenges and keep abreast of the changes (Ministry of Education in Oman, 1998; Pod, 2004; Seaton, 2002; Noll and Wilkins, 2002, Braslavsky, 2001; Rassekh, 2001; Howson et al., 1982). As such, any educational system should be flexible so as to be viable in the light of any challenges, which require the comprehensive development of education systems in various fields such as, curriculum, assessment and supervision.

Braslavsky (2001, 2002) stated that there are at least seven main trends that pose fresh challenges to education. Most of them are related to rapid changes in the society, the need for a working environment and the manner in which inequality may turn into deprivation. Another major trend is for diversity which has come to be accepted as an asset. In addition, Rassekh (2001) stated three types of challenges to education and curriculum development that need to be closely scrutinized in the Arab Gulf countries (United Arab Emirates, Bahrain, Oman, Qatar, Kuwait, and Saudi Arabia); they are: (1) global challenges which are external to the world of education, (2) internal challenges of the education systems themselves, and (3) challenges specific to the Gulf Region.

The challenge that the Sultanate of Oman faces, as one of the Gulf countries, is to build a new educational system that will independently apply rapidly changing

technologies to Oman's education system with regard to the curriculum. Hopefully, the new educational system will be able to fully meet the new requirements of Omani students. (Ministry of Education in Oman, 1998; 2002).

1.1 Background of the Study

The curriculum is one of the most important elements in the educational system. It is a vital element that needs to be improved and modified by improving the methods of teaching in order to meet the requirements of contemporary life learners. It is essential that the curriculum be able to provide the learners with the necessary skills to pursue undergraduate and postgraduate courses and as well as the required skills needed to contribute and to function in society. The curricula play a vital role in the educational practice. They provide a crucial link between standards and accountability measures (Wu, 1996; QCA, 2004; UNESCO, 2005; Russell, 1998; Luitel, 2002).

However, the key outcome of mathematics education is the development of students' ability to apply certain essential skills in different areas such as communication, numeracy, information technology, problem-solving, sociability and co-operation. On the other hand, mathematics is a consistent and growing body of concepts which makes use of a specific language and skills to model, analyse, and interpret the world (Education Review Office, 1994, Confrey and Stohl, 2004).

The Mathematics curricula are being prioritized and must be developed and improved via teaching strategies and content restructuring that would eliminate content not directly related to the requirements of contemporary life. Ideally, the curriculum should strike a balance between theory and practice as well as content and teaching strategies. According to Wu (1996), a curriculum of mathematics should achieve a

balance between theory and applications and ultimately, a balance between the abstract and the concrete.

The National Council of Teachers of Mathematics (NCTM, 1995), the State Board of Education (2006); and the Curriculum Council (1998) indicated that most students learn basic mathematical facts and formulas, but many of them are unable to use this knowledge to solve everyday problems because the curriculum is more than a collection of activities. It must be coherent, focused on important aspects of mathematics, and well articulated across the grades. (Suydam,1990; Ministry of Education in New Zealand, 2006; White, 2004).

According to Scottish Executive (2004), the people want a school curriculum that will fully prepare today's children for adult life in the 21st century. Heidgerken (1950) indicated that educators often remark that theory in education is more advanced than practice. At the end of the twentieth century, we face dual challenges in mathematics education at all levels, specifically, we need to teach much more mathematics to many more people. Mathematics presented to students should be suitable for their life and must be relevant to their needs. It should also apply the integration of theory and applications in the curriculum.

It is very important for the curriculum to be developed because the curriculum is one of the pillars of the educational system that needs changes from time to time in order to respond to the demands of society. Kelly (1985) stated that it had become clear that in order to meet the demands of society, students must be highly skilled and qualified technologists. However, for the provision of greater educational opportunities for all, close attention must be given to the curriculum itself. Indeed, without curriculum changes or modifications, the structure of the system will be very weak. Dawn (2003)

stated that the development of curriculum becomes a value-laden process of determining what should be taught in schools.

This means that the mathematics curriculum should be reviewed and reformed or at least improved from time to time to make it applicable to the new challenges or changes. The reform raises a grave concern in different contexts. The economic and social wellbeing of our nations is critically dependent on the existence of what might be called a robust upper middle class in science, mathematics and technology. Above and beyond the presence of a high technology workforce, the nations of the world should insure a continuous supply of competent mathematicians, scientists and engineers in order to stay competitive in the global arena of the 21st century. Good mathematics skills for those school students gifted in mathematics provide the foundation on which this scientific technological class rests (Michigan Department of Education, 1998).

As the basis of the implementation of the new curriculum,, it needs the value judgment from various social groups, and the strategies of curriculum planning should be driven by developers with the longest-term perspective of stakeholders. When there is a decision to change or adapt the mathematics curriculum, various questions should be put forward, such as: (1) Does the curriculum meet the demands of the society? (2) Are there real reasons to change or develop a curriculum? (3) How will we measure the needs of the students? (4) What kind of curriculum can support the changes?

According to Russell (1998), it has become clear from the work of developing the curriculum in collaboration with stakeholders such as inspectors and teachers that the curriculum must have a dual focus. It must provide significant mathematical work for students and professional development for teachers.

The development of curriculum requires a relatively long time and a long term plan. Throughout the process of development, and the implementation of a variety of questions and problems, ideas arise. To cope with the multitude of issues, there is a need to conduct a number of procedures and studies (Lewy, 1977; McLeod, 1995; Roehrig and Kruse, 2005). However, for curriculum development, curriculum reform is a good way to improve the existing curriculum in order for it to be relevant and to match the current requirements, such as requirements of the higher education and business sector.

The essence of curriculum reform lies in the views of stakeholders towards its strengths and weaknesses and in evaluation of all elements of the existing curriculum. Taking into consideration the stakeholders' perspective and opinion is one of the most important methods to get a clear picture of the implemented curriculum before making any decision to reform the curriculum or to change some of its syllabuses. This is needed even if the curriculum is newly implemented or it had been implemented for a long time. It is a part of curriculum evaluation. Gregory (2002) states,

> "Once the new curriculum is in operation, additional evaluation procedures will be needed to enable the program to be monitored and its effects on learners and learning outcomes evaluated to ensure it stays on-track to achieving its stated goals and objectives "(p.23).

The implementation of curriculum evaluation needs to construct an evaluation mechanism or a technique with the characteristics of a dialogue. Instead of evaluation, exploring the stakeholders' views about the relevance of the implemented curriculum to achieve the goals is a suitable practice when the developer is thinking of curriculum reform. (Lewy, 1977; Xiaowei, 2004; Lightfoot, 1999; Aikenhead et al., 1993).

1.1.1 Education in the Sultanate of Oman

The challenges faced by the Sultanate of Oman, particularly require a high degree of adaptability and a key background in mathematics to independently apply rapidly changing technologies to Oman's needs (Ministry of Education, 1998; 2002). Hence, in 1998, the Ministry of Education in Oman has introduced a new education system for grades 1-10 (Ages 6-16) and Post-Basic education (secondary school) which includes two grades namely grade 11 and grade 12 (Ages 17-18).

This system has given more attention to the mathematics curriculum where the students require a good background in mathematics. Newly developed mathematics curricula are being designed to achieve foundation knowledge, skills and attitudes that Omanis need in order to learn and adapt to the very different future they are going to face. New methods of teaching using concrete materials, improved strategies for student assessment, modern technology in the classroom, economic and administration knowledge and skills have been designated to be implemented in the new curriculum (Al Belushi, Al Adawi and Al Ketani, 1999; Ministry of education in Oman, 2002).

The educational system in the sultanate has progressed through many different stages (Alyaqoubi, 1999). More details regarding the different stages of the educational system will be provided in Chapter 2. In this chapter, the implemented curriculum and previous reforms of the current mathematics curriculum is presented in order to give a general picture of the status of the mathematics curriculum in Oman.

1.1.2 Mathematics Education in the Sultanate of Oman

Initially, the educational system in the sultanate began with non-Omani curricula and textbooks. These were imported from other Arab countries, especially from the state

of Qatar, the state of Kuwait and the Republic of Lebanon. There was no national mathematics curriculum in Oman until 1978 when the first Omani mathematics curriculum was implemented by a Jordanian experts committee. The situation continued until the mid-eighties when the Ministry of Education in Oman cooperated with the Ministries of Education in the Gulf States through the Arab Educational Bureau of the Gulf States to adopt the same mathematics curricula for the Arab Gulf countries. The Sultanate participated through its mathematics experts in different stages of the project, including the preparation of the framework and curriculum guide, materials, and field testing as a member in the Arab Educational Bureau of the Gulf States which supervised the implementation of the project (Al Maskary, 2004; Ministry of education, 2002).

In 1986, the old national mathematics curriculum was abandoned and the unified developed curriculum of the Gulf States was adopted (see Table 1.1). The curriculum and textbooks of mathematics, which are being used in the public schools at present, were based on the Gulf States project for a unified and developed mathematics textbook.

Table 1.1: The Implementation of the Arab Gulf Mathematics Curriculum

No. of Stage	Year of implemented	Grade
1	1988/1989	1
2	1989/1990	2 and 3
3	1990/1991	4 and 7
4	1991/1992	5 and 8
5	1992/1993	6 and 9
6	1993/1994	10
7	1994/1995	11
8	1995/1996	12

It is clear from Table 1.1 that the implementation of the Arab Gulf mathematics curriculum of grades 11 and 12 started in 1994/1995 and 1995/1996 respectively as a continuation of grades 1-10.

At the primary phase, learning and teaching materials for mathematics consisted of a teacher's guide, the pupils' textbook and an activity textbook. At the secondary level, a teacher's guide and textbooks are used. As in many countries at that time, it was generally acknowledged that the old mathematics program was too content-laden, particularly in the theoretical part, much of which lacked relevance to the students or their immediate environment. This reliance on content has over-emphasized rote learning and the mechanical application of memorised algorithms (Al Maskary, 2004).

In the old mathematics curriculum of all grades in Oman, as in the Gulf countries, insufficient attention was paid to the basic understanding and reasoning processes. It was lacking in practical activities, connected ideas, economic skills, and any innovative thinking or creative skills. For most students, this approach led to an aversion to the mathematics subject and also led to the belief that it is a difficult subject (Arab Center of Educational Research, 2000, 2001; Al Maskary, 2004). From this perspective, most students believed that mathematics is a subject for creative students.

1.1.3 Mathematics Reform in Oman

The previous section showed that the Ministry of Education has adopted reform policy for mathematics curriculum for all grades in Oman.

In grades 11 and 12, the old curriculum (Arab Gulf Country Curriculum) has been changed to match with the requirements of the Sultanate's new policy on education. This reform started in the year 2000/2001. In 1999/2000 the ministry adopted a new

mathematics subject called 'the science of economy and administration' as part of a new mathematics curriculum for grades 11 and 12. This subject was introduced with the intention to bridge the gap in skills which was needed for the business sector and was not included in the existing curriculum of that time. This subject comprised of several knowledge and skills of production, accounting, marketing, economic principles, administration principles, and mathematics skills related to these areas. This subject was implemented within the mathematics curriculum for the Art Education Section in secondary schools. This subject remained in the Mathematics curriculum until 2002 when the ministry decided to change the educational system of general education from the old one which consisted of three cycles: elementary, preparatory, and secondary with two sections: Science and Art in grades 11 and 12 to a new system which consisted of twelve levels (grades 1-12) with no cycles nor science and art labeling for the secondary stage. In this new education system, the ministry rebuilt all the curricula of the secondary school stage (Ministry of Education, 2002, 2004).

1.1.4 Implementation of Current Mathematics Curriculum

In the year 2003, the Ministry of Education in Oman merged the three kinds of curriculum for grades 11 and 12, which were Mathematics for Science, Mathematics for Art, and economy and administration sciences and divided them into two categories: Pure Mathematics and Applied Mathematics. This was accomplished by modifying the old mathematics curriculum of the Arab Gulf countries (Math for science and Math for Arts) and the subject of Science of Economics and Administration. The new mathematics curriculum has addressed the essential needs of the curriculum in the new education system (Ministry of Education in Oman, 1998, 2005-2006).

As for the content, the new curriculum should represent the needs of the Omani society in this century and strike a balance between abstract and practical knowledge. It should also emphasize the relevance of the topics in the subject to the lives of the students and introduce the learning of computer skills to develop new skills in order to solve mathematical problems and provide the students with opportunities to experience new technologies such as using computers, graphic calculators, and other mathematical programs that emphasize the connections between mathematics and the local environment. This should be carried out with a focus on the important skills of economy to face the new requirement of economic development and challenges.

As for the instructional strategies, the new curriculum should develop a new teaching method which is suitable to the new changes in the whole education system, de-emphasize rote learning, and emphasize on learning through direct personal experience, cooperative learning, and achieving them through greater use of:

(1) students' performed activities, and the necessary manipulative,

(2) outdoor school activities such as field trips, visits, and interviews,

(3) independent students' activities, assignments, and projects,

(4) emphasis on the use of thinking and creative skills in problem solving,

(5) encouragement of self-learning rather than only learning through the medium of the teacher, and

(6) appropriate technologies such as graphic calculators and computers.

As for the assessment practices, the new curriculum should be designed with less stress on the simple memorization of content and less emphasis on final paper-and-pencil examinations. The new curriculum should be constructed with greater stress on the applications of the students' materials, and with greater efforts to include higher-

order thinking skills and problem solving in student assessment. Moreover, assignments should be meaningful to include the concepts taught in the class and methods of assessment must be continuous.

Mathematics courses of the current mathematics curriculum at schools in grades 11 and 12 involve Pure and Applied Mathematics in each grade (more details are presented in Chapter 2). The two types of mathematics are defined as follows:

The Pure Mathematics course introduces extended topics related to concepts taught at grades 11 and 12. The Ministry of Education in Oman (2003a) highlights it as follows:

> "*Topics of this course are selected carefully as they are considered the core of mathematics teaching and learning all over the world. They have a significant impact on the development of students' mental abilities in analyzing and interpreting situations, problem solving and relevance to a variety of daily life situations*."(p.36).

The Applied Mathematics courses are designed to connect curricula to real life by developing mathematical knowledge and skills that match trends in diversification of curricula and extension of content. It goes in line with the requirements of the labour market and the business sector (Ministry of Education of Oman, 2003).

The current mathematics curriculum in the sultanate has general parts, aims and goals, a teaching plan, teacher guides, textbooks, methodology and curriculum improvement and assessment procedures. The current mathematics curriculum and its materials are modified from the previous mathematics curriculum by Jordanian, Canadian consultants, and Omani curriculum experts and curriculum developers. These were then checked and approved by the Omani Committee of the Curricula and Educational Evaluation in the Ministry of Education. The main objectives of this curriculum is to bridge the gap between the previous curriculum and the Basic

Education curriculum in order to be a logical continuity of that in Basic Education.

According to the Ministry of Education in Oman (2003), the current applied curriculum of mathematics gives the opportunity for students to resolve problems that require them to work either individually or co-operatively with other students in class or with parents at home. It also allows them to use technology, to address relevant and interesting mathematical ideas, and to experience the power and usefulness of the topics related to various knowledge and skills such as mathematics, economics and administration. By the time the students reach undergraduate studies, they would have been equipped with many problem solving strategies and many other skills needed for both public and private sectors. All these will help them in their future jobs.

According to the Ministry of Education (1998; 2003) and Al Maskary (2004), students who are following the current Mathematics curriculum takes on a much larger role in the learning process. The students conduct activities using manipulative software, concrete models, and other resources and they also have opportunities to discuss the mathematical concepts with both the teacher and other students. So all Mathematics lessons of this curriculum courses should involve exercises connected to daily life experiences, motivation and a positive attitude towards Mathematics. Integration of real-life experiences particularly in the economics and administration field will help students develop a keen interest in Mathematics. Furthermore, the assessment should help to determine the degree to which all students are learning through the many oral presentations as well as numerous activities in the business field such as in banking, marketing, and insurance. Inquisitive questions are part of every lesson aimed at checking the students' understanding, and students are allowed to use graphic calculators and/or computer software such as Spread sheet, Mathemtica, and

Maple to work out or calculate operations that are lengthy or more complex than those covered by the paper exams and quizzes. When students use calculators and software to work out operations, they are expected to apply their skills in mental computation in predicting the outcome.

To achieve the general outcomes by the end of grade 12 (the last level of General Education), the current curriculum is developed with the following aims:

1. To communicate mathematically with others,
2. To connect mathematical ideas to everyday experiences,
3. To use various Mathematics skills such as estimation and mental mathematics.
4. To relate and apply new mathematical knowledge through problem solving,
5. To reason and justify their thinking, and
6. To select and use appropriate technologies such as computer software, and graphic calculators to solve problems. (Ministry of Education of Oman, 1998, 2003)

1.1.5 Improving the Mathematics Curriculum

The old Mathematics curriculum was traditionally teacher-centered. The teacher was the central part in the classroom and controlled the learning activity within the class. Students were expected to remain quiet in their seats and concentrate closely on what the teacher was presenting. The teacher used to allocate assignments from the follow up textbook by teaching those assignments in every page and in every unit. The teacher used to do that in a routine way, that is, he/she does not improve the teaching method. Improving the way Mathematics was being taught became one of the main goals of the Mathematics reform. The current curriculum, according to the Ministry of Education (2003), started to shift teaching Mathematics from a teacher-centered

approach towards a student-centered approach. It also provides more balance between theory and practice and connects Mathematics to daily experiences and economic skills.

Although the current Mathematics curriculum has been designed to meet the requirements of learners in both theoretical and practical skills and in both public and private sectors, it is hoped that the students would be able to link mathematics skills in the domain of Applied Economics and Management and Insurance in one hand and to continue his/her studies on to higher education or to get involved with work on the other hand. However, the follow-up action regarding the implementation of the current Mathematics curriculum accomplished through field visits by specialists to schools showed that the output of this approach still exhibited a shortage of many of the scientific and practical skills that are required in the business and higher education sectors. In addition, the students who entered studies at higher educational institutions still need to pay more attention to the knowledge and skills of Mathematics and its practices in their daily life (Ministry of Education, 2006).

Moreover, the results of the final exams in Grade 12 indicated that the students' performances in Applied Mathematics are still low. According to the Ministry of Education (2007a), the final examination results of the general examination of Grade 12 for the years 2001, 2003, 2005, and 2006/2007, showed that the average student mark in Mathematics in the scholastic year 2001/2002 was 43.91 for students taking Mathematics of Arts. In comparison, in the first semester of the scholastic year 2006/2007 the average mark for students taking Applied Mathematics was 32.4. The analysis of the final examination results in grade 12 as shown in Table 1.2 below indicated a decrease in the average examination score during the scholastic years 2003/

2004 to 2006/2007.

Table 1.2: The average of Student Marks in the Final Exams of Grade 12.

The year	Average of applied Mathematics
2001/2002	43,93
2002/2003	57.5
2003/2004	53.6
2004/2005	54.51
2006/2007	32.4

According to the previous discussion, exploring the stakeholders' views and opinions about the existing Applied Mathematics curriculum in the Sultanate was extremely important as it was a necessary step to determine the strengths and weaknesses of the curriculum topics and instructional strategies. Decisions could then be made regarding whether to reform the curriculum or not.

1.2 Problem Statement

With the advent of globalization and technological development, Mathematics skills has become a necessary in many areas such as business, science, and technology. To produce the excellence required for economic skills in the 21st century, students today require strong knowledge and skills in order to pursue a higher education and economic requirements so as to compete in the technology driven workforce.

In the Sultanate of Oman, the Mathematics curriculum is an essential programme, which equips students with the knowledge and skills to help them in their higher education studies in different colleges particularly in science and technology subjects. Both the government and business sectors need employees with good skills, especially in Mathematics as stated in the documentation of Oman Vision 2020 Conference (Ministry of Development, 1997). The conference recommended specific

policies concerning education in general and the Mathematics curriculum in particular. The conference report indicated that the challenges facing Oman, particularly the need for self-sufficiency, a diversified economy and in keeping pace with technological changes, require new educational goals to qualify the Omanis for the type of life and work of the modern global economy. These goals require a high degree of adaptability and a strong background in mathematics and science in order to independently apply the rapidly changing technologies to match the needs of Oman. (Al Belushi et al., 1999; Ministry of Education of Oman, 2005-2006).

The Ministry of Education has been reforming the system of education since 1998. The educational reform encompasses several aspects. For example, in the post-Basic education, the Ministry implemented several fundamental changes in relation to the Mathematics curriculum reforms which were implemented in several fields such as revising the general objectives of curricula, the content, teaching strategies, and assessment methods to meet the requirements of the new needs of Omani society.

The Ministry of Education held many seminars in the years 2002-2003; it also held the International Conference of Education in the Secondary School (December, 22-24, 2002). The outcomes of all seminars and the international conference recommended that the respective ministry should reform the curriculum, particularly the curriculum of Mathematics to match the educational development (Ministry of Education, 2002) and to meet the requirements of the economy and higher education in Oman. For example, the report of the International Conference of Education in the Secondary Schools concluded with the following statements:

- there is a growing irrelevance regarding the school curriculum to the students' own lives and future careers. Thus, this case contributes to negative student attitude towards school and some courses such as Science and Mathematics.

> "*It put forward recommendations for bridging the gaps between general education and further education; it is highlighted on the skills shortages for all students who applied for higher education or for business institutions which is considered the biggest challenge facing technical training. The new entrants lack competencies in various areas such as English, Mathematics and vocational skills*" (Ministry of Education of Oman, 2002, P.31-44)

Based on the results of the Conference, recommendations from the seminars, and the requirements of the business sector, the ministry implemented the curriculum of **Applied Mathematics** for grades 11 and 12 in the scholastic year 2003/2004. This curriculum, which was a mixture of Mathematics, Economics as well as administration knowledge and skills was intended to bridge the gap between the theoretical and practical dimensions in the Mathematics curriculum as well as to face the requirements of the new education system. It was also aimed at preparing the students who plan to pursue higher education as well as those who intend to join the economic sector with skills needed for business. The major shift in this Mathematics curriculum as explained in the curriculum documents (Ministry of Education, 2003) is to avoid the routine of traditional learning as it puts emphasis on encouraging the students to develop scientific and logical thinking, analytical skills and problem-solving. This curriculum should reflect the real needs of students of applied skills at this stage of education in Oman.

While following up the implementations of the Applied Mathematics skill, the experts wrote some reports throughout their visits to schools. These reports indicated

that there are still gaps with regards to the content of curriculum, teaching strategies, and assessment practices and the real needs of the students (Ministry of education, 2006).

Furthermore, the researcher in his visits to many schools which included grades 11 and 12 and his discussions with educators, teachers, parents and other people in different areas of the society found that the applied mathematics curriculum in grades 11 and 12 is not sufficient to meet the needs of higher education and business sectors at this stage and in future life, particularly in the economic development. There are also many gaps between the content of the curriculum and the actual needs of Omani society (Ministry of Education, 2004, Al-Lamki, 2006).

In fact, it is quite difficult to determine where the problems in the current curriculum content are, which is an important step to decide whether to reform or to change the curriculum without carrying out any assessment and evaluation to this curriculum. It is also quite difficult to identify the areas and topics that may need a reform or change and to determine whether the instructional strategies and assessment procedures which were suggested in curriculum guide are suitable to this curriculum or not. Methods of exploring the views and opinions of stakeholders about the relevance and quality of the content, teaching strategies, and assessment practices are important to identify where the problem is and what should be done after many years of curriculum implementation. This would help in identifying proposed steps to be taken to develop the Mathematics curriculum in the context presented earlier.

1.3 Objectives

The aim of this study is to explore the views of stakeholders towards the Grade 11 and Grade 12 Mathematics curriculum in the Sultanate of Oman. The main objectives are as follows:

1. to explore the views of stakeholders on the existing mathematics curriculum of grades 11 and 12 with regards to the content relevance to higher education studies and employment in the private sector in the Sultanate of Oman,
2. to explore the views of supervisors and teachers towards the quality of existing instructional strategies for the Mathematics curriculum for grades 11 and 12,
3. to explore the views of supervisors and teachers towards the quality of existing assessment practices for the Mathematics curriculum courses for grades 11 and 12, and
4. to determine the strengths and weaknesses of the existing Mathematics courses for grades 11 and 12 in Oman.

1.4 Research Questions

The questions of this study are given below.

1. What are the mathematics stakeholders' views on the existing Mathematics curriculum content of grades 11 and 12 in Oman with regards to its relevance to higher education studies and employment in the private sector?
2. What are the views and opinions of mathematics supervisors (inspectors) and teachers towards the quality of instructional strategies of the current Mathematics curriculum courses in grades 11 and 12 in Oman?

3. What are the views and opinions of mathematics supervisors (inspectors) and teachers towards the quality of assessment practices of the current Mathematics curriculum in grades 11 and 12 in Oman?

4. What are the strengths and weaknesses in the existing Mathematics curriculum courses for grades 11 and 12 in the Sultanate of Oman?

1.4.1 The Criteria

Questions in this research will be answered in the light of the following criteria:

a) The Content

- Is the content relevant to the requirements of the higher education and private sector?
- Are the areas of content consistent with the content of the Mathematics curriculum in Oman which were suggested in the curriculum document?

b) Teaching Strategies

- Are the teaching strategies used suitable for the students' level and does it take into account the individual differences among them?
- Do the teaching strategies used encourage the use of multiple strategies of learning such as collaborative, electronic, and discovery strategies among students?
- Do the teaching strategies used encourage creative thinking among students?

c) Assessment Practices

- Do the assessment methods used have appropriate practices to measure the achievement of the Mathematics objectives?
- Are the used assessment methods comprehensive in terms of the topics?

- Did the practices provided use a continuous assessment of student performance throughout the academic year?

1.5 Significance of the Study

In 2003, the Ministry of Education in Oman implemented the current Mathematics curriculum for grades 11 and 12. This curriculum ,which involves Pure and Applied Mathematics, was modified from the previous mathematics curriculum delivered in 2002 which, in turn, was modified from the previous one delivered in 1995 (Ministry of education, 2003). In addition, the respective ministry is going to implement a new system for the grades 11 and 12, which will need a comprehensive vision for all school curricula including Mathematics. The purpose is to develop a good curriculum to match the new challenges.

The current curriculum is in need of improvement or reform for many reasons explained earlier. On the other hand, the perspective of stakeholders of the Mathematics curriculum will help the respective ministry to have a clear, thorough, and consistent vision on this matter. The results from these views and opinions can also help the developers to enhance the existing curricula as well as develop the modern curricula for the sake of upholding good quality Mathematics education in the Omani schools. In addition, the significance of this study lies in the following points:

1. It is the first study in the Sultanate to explore the views of stakeholders about the current Mathematics curriculum in grades 11 and 12 in Oman in a bid to evaluate the current curriculum to satisfy the students' needs in both higher education and workplace and also to meet the requirements of the new economic era,

2. From the researcher's view, it will help the policymakers to make a decision regarding the reform of the current Mathematics curriculum for grades 11 and 12, and

3. It will give the Mathematics developers a clear picture of the reality of the skills contained in the current Mathematics curriculum for the target grades 11 and 12.

1.6 Limitations of the Study

1. This study will be limited to the current mathematics curriculum (**Applied Mathematics only**) in the grades 11 and 12 in the Sultanate of Oman, including content, instructional strategies and assessment procedures.
2. This study involves only Grades 11 and 12 in 11 educational regions in the Sultanate of Oman. It includes supervisors, Mathematics teachers, university lecturers, undergraduate students and a number of specialists from the respective institutions.

1.7 Theoretical Background

The idea of curriculum is not new, but the way we understand and theorize it has been altered over years, and there remains a considerable dispute over its meaning. Curriculum schemes exist in every system of education, but in most countries, especially in continental Europe, Latin America, and many parts of Asia, the word "curriculum" is unfamiliar; instead of the word "curriculum", they used the word "program" (Center for Science, 1999).

Curriculum, for example, may be defined as all experiences that occur at school. Curriculum is the range of formal studies and learning experience offered by a school (Akhtar, 2004). Oliva (1997) defines curriculum as comprising various aspects, among them the one that is taught in a school, a set of subjects, content, a program of studies, a

set of materials, a sequence of courses, a set of performance objectives, a course of study, everything that is planned by school personnel, and a series of experiences undergone by learners in a school that an individual learner experiences as a result of schooling. However, Wilson (1990) states that a curriculum is:

> "*Anything and everything that teaches a lesson, planned or otherwise. Humans are born learning, thus the learned curriculum actually encompasses a combination of all of the following; the hidden, null, written, political and societal; Since students learn all the time through exposure and modeled behaviors, this means that they learn important social and emotional lessons from everyone who inhabits a school from the janitorial staff, the secretary, the cafeteria workers, their peers, as well as from the deportment, conduct and attitudes expressed and modeled by their teachers. Many educators are unaware of the strong lessons imparted to youth by these everyday conta*cts"(p. 2).

In general, we can say that there are planned, formal, acknowledged curriculum and also an unplanned, informal, or hidden one. According to Doll (1992) "*The planned curriculum embraces content usually categorized within subjects and subject fields. The unplanned curriculum includes such varied experiences or engagements at testing learners or any people*" (p. 5).

In this research, the definition of curriculum is adopted as follows:

> "*All topics of contents, experience and guide learning experiences, teaching strategies, assessment practices, and intended outcomes, formulated through the systematic construction of knowledge and experience, which is included in the mathematics curriculum documents under the auspices of the ministry of education that go with the general philosophy of education in Oman*" (Ministry of Education, 1998).

The four basic principles of curriculum and instruction are: objectives, experiences, organization, and evaluation. According to Tyler (1949), to develop the curriculum, the following questions should be presented and tested:

1. What educational purposes should the school seek to attain?

2. What educational experiences can be provided that are likely to attain these purposes?

3. How can these educational experiences be effectively organized?

4. How can we determine whether these purposes are being attained?

The quality of a curriculum can be affected by various principles and a special attention to these principles should be given to help improve a curriculum. So various measures should be taken. These measures are:

1. Analyzing the curriculum to discover where the strengths and weaknesses are,
2. Evaluating the existing curriculum to decide if it needs to be changed,
3. Studying the experiences of other countries or institutions related to the current case to determine which of their experiences might be suitable to be included in the target curriculum or to function as a source of reference in efforts to improve the curriculum,
4. Making a comparison between many systems and studies related to those systems to summarize the effectiveness of these systems' reform.

According to UNESCO/ISESCO (1999) and Kelly (1985), a careful assessment of the existing curriculum is essential before any reform is undertaken, and it must take into account the country's education policy, economic, demographic, cultural, social and technological environment. Problems to be solved, needs to be satisfied, and priorities to be addressed, must be identified, and recommendations made for action. Additionally, Smith (1996; 2000) states that in planning of reform, it should offer:

> *"(1) Principles for the selection of content that is: What is to be learned and taught?,*
> *(2) Principles for the development of a teaching strategy that is: How it is to be learned and taught?,*
> *(3) Principles for the making of decisions about sequence, and*
> *(4) Principles on which to diagnose the strengths and weaknesses of individual students and differentiate the general principles 1, 2 and 3 above, to meet individual cases.*"(p.3).

Exploring the stakeholders' perspectives about the quality and relevance of the existing curriculum is an essential procedure to reform it on the basis of the evaluation results. Consequently, decisions can be made to change the elements of this curriculum or re-design it. This is the systematic collection and analysis of data needed to make decisions, i.e. a process in which most well-run programs engage from the outset. It is a cyclical process including preparation, assessment, and reflection, and it determines the quality of programs and their component processes (Stufflebeam, 1973; Doll, 1992; Muraskin, 1993; Chelimsky & Shadish, 1997).

To reform the target Mathematics curriculum, some critical questions should be asked. These questions are:

> "(1) *what is the nature of the mathematics program?*
> *(2) Where can we begin to make improvements?*
> *(3) How do we cultivate support 'both among our staff and from the community at large' for changes in our program?*
> *(4) How can we ensure that all students leave school mathematically proficient"* (Leinwand and Burrill, 2001, p. 35).

Exploratory study procedures should be implemented according to clear criteria. A set of criteria for the instruments of research will be developed in the best way, hence the data, which will then be collected, will be easier to analyze. The criteria vary from one area to another. Among these areas are:

(1) Scientific criteria, such as: internal validity, external validity, and reliability;

(2) Practical criteria, such as relevance, importance, credibility, timelines;

(3) Prudential criteria, such as: efficiency, (Lewy, 1977; Brady, 1995; Babbie, 2005).

Survey technique is a frequently used mode of observation in the social sciences, and it is used for descriptive, explanatory, and exploratory purposes (Lewy, 1977; Babbie, 2005). It is an important and a common quantitative method used in exploration