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

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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 and a quality of 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 and instructional strategies considered as good quality strategies. The main recommendation is to reorganize the content of current applied mathematics curriculum content.

Keywords: Relevant, Curriculum, Economic, Administration, Strategies.

1. INTRODUCTION

The world in this century is facing rapid changes in various aspects of life as a result of the massive explosion of knowledge and rapid technological evolution which requires a strong system to face these challenges and keep abreast of these changes, especially in the education (Ministry of Education in Oman, 1998; Pod, 2004; Seaton, 2002). So any educational system should be flexible to be viable in the light of any challenges.

The challenges face the Sultanate of Oman is to build a new educational system to independently apply rapidly changing technologies to Oman's with regard to the curriculum to face the new requirements of Omani students. (MOE, 1998).

2. BACKGROUND

The Ministry of Education in Oman has introduced a new education system for grades 1-10 (Ages 6-16) and for Post-Basic education which includes two grades 11, 12 (Ages 17-18). This system has given more attention to the curricula of Mathematics where the students require a high degree of adaptability and background in mathematics. Newly developed mathematics curricula are being designed to achieve and foundation knowledge, skills and attitudes that Omanis needed to learn and adapt to the future they are going to face.

In grades 11 and 12, the old curriculum has been changed to match with the requirements of new policy in education in the Sultanate. This reform started in the year 2000/2001. In 1999/2000 the ministry was adopted a new mathematics subject called 'the science of economy and administration' as a new one of

mathematics curriculum in grades 11 and 12 to bridge the gap of mathematics skills which are needed for the business sector and was not included in existing curriculum.

2.1 Applied Mathematics courses (which are the topic of this study) are designed to connect curricula to real life by developing knowledge and skills that match trends in diversification of curricula and extension of content. As the respective ministry stated, it goes in line with the requirements of labor market in careers and business sector (Ministry of Education of Oman, 2003). The current applied curriculum of mathematics should be given the opportunity to students to resolve problems that require them to work either individually or co-operatively with other students in class or with parents at home, 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, economic, administration.

3. PROBLEM STATEMENT

The reform of mathematics curriculum of grades 11 and 12 implement several fundamental changes in relation to the Mathematics 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 Omani society. In the academic year 2002, the ministry held the international conference of education in secondary school to give her new vision for new education system for Post-Basic education. The international conference report indicated,

"*It put forward recommendations for bridging the gaps between general education and further education; it is highlighted on the skills shortages for all students 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).

Furthermore, the researcher in his visits to many schools which included grades 11 and 12 and his discussions with educators, teachers, and parents found that the current curriculum is not sufficiently suitable to meet the needs of higher education and business sectors, particularly in the economic development.

In fact, it is quite difficult to determine where the problems in the current curriculum are in order to decide to change the curriculum without carrying out any assessment to this curriculum. It is also quite difficult to identify the areas and topics that may need a reform. Methods of exploring the views of stakeholders about the curriculum are important to identify where the problem is and what should be done.

4. OBJECTIVES

The aim of the study is to explore the views of stakeholders towards Mathematics curriculum of grade 11 and 12 in Oman. Its objectives are to:

4.1 explore the views and opinions of stakeholders on existing mathematics curriculum of Grades 11 and 12 in the Sultanate of Oman with regards to

(a) Content, (b) Instructional Strategies, and (c) Assessment Practices,

4.2 determine the relevance of existing Mathematics curriculum courses of grade 11 and 12 to the higher education and business sector in Oman, and to

4.3 determine the strengths and weaknesses of the existing Mathematics courses of grades 11 and 12 in Oman.

5. RESEARCH QUESTIONS

The questions of this study are:

5.1. 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 and business sector?

5.2. What are the views and opinions of mathematics supervisors (inspectors) and teachers towards the instructional strategies of the current mathematics curriculum courses in grades 11 and 12 in Oman?

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

5.4. What are the strengths and weaknesses in the existing mathematics curriculum courses for grade 11 and 12 in the Sultanate of Oman?

6. LIMITATIONS OF THE STUDY

This study will be limited to explore stakeholders' perspectives towards the current Applied Mathematics only in the grades 11 and 12 in the Sultanate of Oman,

7. THEORETICAL BACKGROUND

Curriculum, for example, may be defined as all experiences that occur at school. 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 adopted is 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 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).

8. METHODOLOGY

This study used triangulation approach included quantitative and qualitative method(Figure 1). The quantitative approach is based on a survey using questionnaires. The qualitative approach is based on documents analysis and interviews. The advantage of using triangulation approach is that the qualitative results can verify the quantitative results (Brannen, 1992; Niglas, 2000).

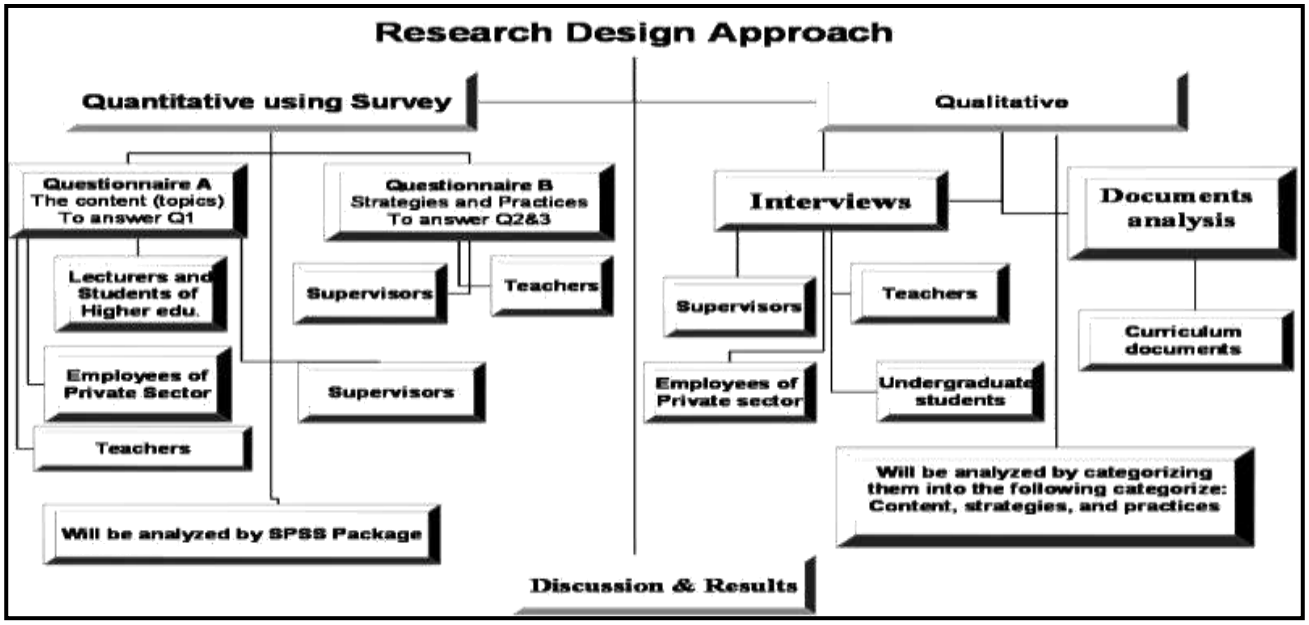

Figure 1: Triangulation approach of the study

8.1. Population and Sample

The population of this study was all lecturers, undergraduate student, supervisors, teachers, and people of private sector who are interests or concerns of this subject curriculum. The sample of this research was between 10-15% of the whole population included 588 respondents. The details of sample are in Table 1.

Table 1 Distribution of Study Sample according to kind of participants

Kind of participants	Population	Sample (10-15 % of population)	Percentage
Higher education participants	1100	150	25 %
Private sector participants	1000	135	23.5 %
Teachers and Supervisors	1820	303	51.5 %
Total	3920	588	100%

8.2. Quantitative Data Collection

Quantitative approach of this research based on a survey using questionnaires which were developed by determining the syllabus of mathematics curriculum of grades 11th and 12th for the topics of content, and determining the instructional strategies and assessment practices that are included in curriculum and assessment documents (Ministry of Education, 2002, 2006). There were two questionnaires; the first (Quest. A) was designed to collect data about the content' relevance. It has 64 items for both grades (Table 2).

Table 2: The main Topics of both Grade 11th and 12th

Section	Topics	No. of statements
A1 Content of Grade 11th	Exponents and Logarithms	6
	Inequalities and Linear Programming	4
	Transaction in financial Markets	7
	Introduction to Economic	5
	Sequences and Series	5
	Entrepreneurship (Small Business)	6
A2 Content of Grade 12th	Production and Marketing in Business Organization	7
	Permutations and Combinations	3
	Payments and Insurance	7
	Human Resources Management	4
	Statistical and Probabilities	6
	Accounting in Business Organization	4
Total		64

The second (Quest. B) was designed to collect data about the quality of instructional strategies and assessment practices. It has 29 items (Table 3).

Table 3 Questionnaire of Instructional and Assessment

Section	details	No. of Items
B1	Teaching Strategies	18
B2	Assessment Practices	11
Total		29

8.3. Qualitative Data Collection

For the Qualitative approach, this research utilized the techniques of documents analysis and interviews. The details of each are as follows: Curriculum documents of applied mathematics was analysed to gather data about the topics' relevance of current curriculum content to higher education and private sector according to

their requirements. A semi-structured interview guidelines (Appendix C) was developed to further probe the research questions. In the interviews, 8 specific questions were designed as a framework and guidance for the interviews to clarify and support the responses of the perceptions survey questionnaire. All of the interviews questions were open-ended, including descriptions of the existing mathematics curriculum in grades 11th and 12th. About 5% of whole sample was selected for interviews. They were conducted 30 participants.

8.4. Validity and Reliability

The validity of the questionnaires and interviews questions obtained from specialist and experts in the fields of mathematics education and educational research who evaluated the instruments. A pilot version was reviewed from 6 experts and lecturers of Sultan Qaboos University academic staff, 2 experts of mathematics curriculum in the Ministry of Education, and one expert of the International Conference of The Mathematics Education into the 21st Century. According to experts' comments, new version were developed. A pilot-testing was conducted by distributing 80 questionnaires of content, and 60 questionnaires of strategies to teachers, supervisors, and experts to determine the reliability of the questionnaire and to ensure as much as possible, an accurate survey measurement. A reliability test was performed after the pilot study data was collecting. The questionnaires had a Cronbach alpha score as shown in Table 4.

Table 4 Cronbach alpha score of grades 11th and 12th

Dimensions	Cronbach's Alpha			
	Grade 11		Grade 12	
	No. of items	Alpha	No. of items	Alpha
Content(Topics)	33	0.770	31	0.814
Teaching Strategies	18	0.926	18	0.910
Assessment Practices	11	0.812	11	0.870

Due to the Table 4, the instruments have high score which means that they were suitable for using to collect data for answer questions of this research.

8.5. Data Collection Procedures

Various steps were done administering instruments. Firstly; Permission was taking from the respective institutions. Secondly; A requested list of all schools and institutions in higher education and private sector was prepared. Thirdly; the researcher was coordinated with chief supervisors in each region to submit the questionnaires to the respondents. The interviews were conducted after all questionnaires have been received.

8.6. Data Analysis

The responded quantitative data were analyzed using the SPSS 13.0. Descriptive statistics, such as frequency distributions, means scores, standard deviations, were used to answer research questions.

Qualitative description was used to discuss the interviews questions that as follows: Interview transcripts were transcribed and categorized into the following categorizes for each grade: The content, Instructional strategies, and assessment practices. All the shorthand notes were transcribed and discussion.

9. THE FINDINGS

This is divided into the following sections: The finding of quantitative data, the finding of qualitative data, and the summary of the finding. Each section was augmented with tables and figures, when required. The total of respondents was 463 with the responding rate is 78.6 % for all as shown in Table 5.

Table 5 Total of respondents' responding

Group of Participants	Respondents		Sample	Responding Rate
	Frequency	%		
Higher Education	130	28	150	87 %
Private Sector	100	21.5	135	74 %
Supervisors and Teachers	233	50.5	303	77 %
Total	463	100	588	79 %

9.1. Stakeholders' views on curriculum content in Oman

Stakeholders' responses about the content' relevance were divided into 2 main parts: the first was about the relevant content of grade 11 and the second was about the relevant content of grade 12.

Respondents were asked to determine whether the content is relevant (Yes=1) or not relevant (No=0). To determine the relevance of content, the questionnaires were based on six areas for each grade. Descriptive statistics, such as, frequencies, mean scores, and standard deviations were used to analyze responses of respondents in all areas of grades 11 and 12. In this study, the topics, which have mean scores less than 0.50, were considered as irrelevant topics. The details are as follows:

9.1.1 Finding of Grade 11

Overall mean scores of all 33 items indicated that all topics of grade 11 were relevant to higher education (Means: 0.67- 0.91) and private sector (Means: 0.57 – 0.84). The highest mean score was in the "Currency markets for higher education (M=0.91)" whereas the lowest mean score was in "Promissory Note (M= 0.43)" which was not relevance to the private sector. The findings are as shown in Table 6.

Table 6 showed that the mean scores of main areas of higher education were 0.73- 0.84 which indicated that all areas of this grade are relevant whereas the mean scores of private sector were 0.64- 0.73, which also indicated that all areas of this grade are relevant to private sector.

Table 6: Mean Scores of Responses for Higher Education and Private Sector for grade 11

Order	Topics	H. Education		P. Sector	
		M	SD	M	SD
Average of means scores		**0.79**	**0.40**	**0.69**	**0.46**
1	Entrepreneurship (Small Business)	0.84	0.37	0.73	0.45
2	Introduction to Economics	0.84	0.37	0.72	0.45
3	Transaction in Financial Markets	0.83	0.36	0.69	0.45
4	Exponents and Logarithms	0.76	0.42	0.70	0.45
5	Sequences and Series	0.75	0.43	0.65	0.48
6	**Inequalities and Linear Programming**	**0.73**	**0.45**	**0.64**	**0.48**

The findings in terms of content relevance as shown in Table 6 indicated that both higher education and private sector have the same order on the areas of Entrepreneurship and Introduction to Economics whereas the order of the remaining 4 areas were different. The findings also showed that the mean score of higher education is higher than the mean score of private sector on all areas (See Figure 2).

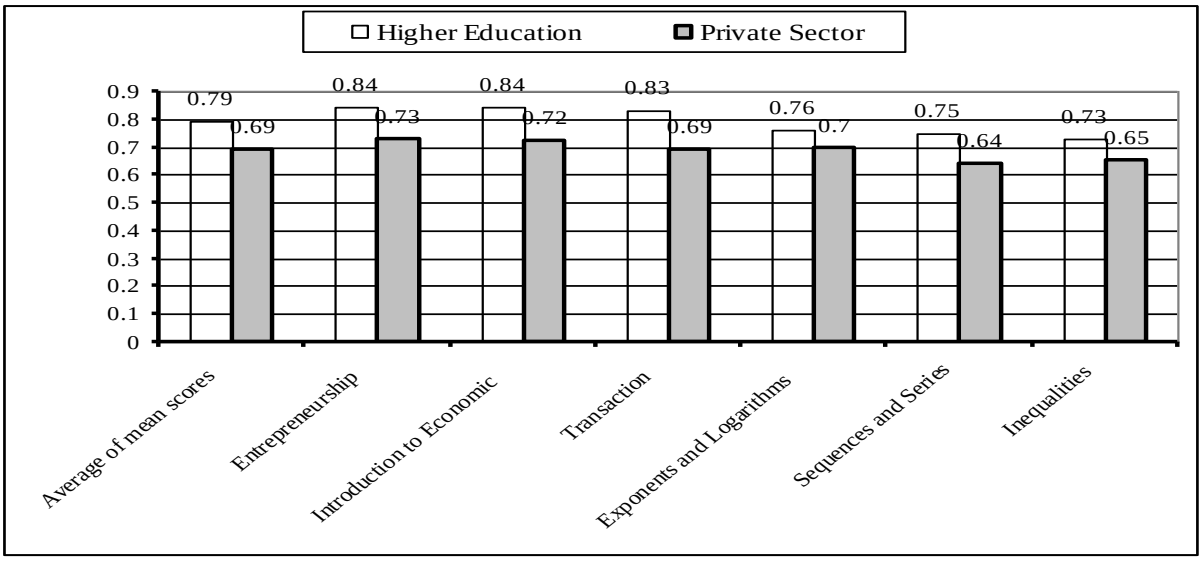

Figure 2: Order of Mean Scores of Responses on Main Areas of Grade 11.

9.1.2 Finding of Grade 12

Overall mean scores of all 31 items indicated that all topics of grade 12 as shown in Table 7 were relevant to the higher education (M: 0.66- 0.92) and private sector (M: 0.57 – 0.85). The highest mean score was the topic "Generally Accepted Accounting Principals (M=0.92)" for higher education and "Marketing and Its important role in Business Cooperation (M= 0.85)" for private sector.

Table 7: Mean Scores on the Main Areas for Higher Education and Private Sector

No.	**Areas**	**H. Education**		**P. Sector**	
		Means	SD	**Means**	**SD**
1	Production and Marketing in Business Organization	0.83	0.37	0.73	0.44
2	Permutations and Combinations	0.69	0.46	0.54	0.50
3	Payments and Insurance	0.85	0.36	0.73	0.45
4	Human Resources Management	0.83	0.38	0.73	0.45
5	Statistical and Probabilities	0.69	0.46	0.59	0.49
6	Accounting in Business Organization	0.90	0.30	0.80	0.40

The findings of Grade 12 in terms of content' relevance as shown in Tables 7 indicated that both higher education and private sector have the same order on all areas but the mean scores of higher education was higher than the mean scores of private sector on all areas which indicated that the content' relevance for higher education were higher than the private sector (See Figure 3).

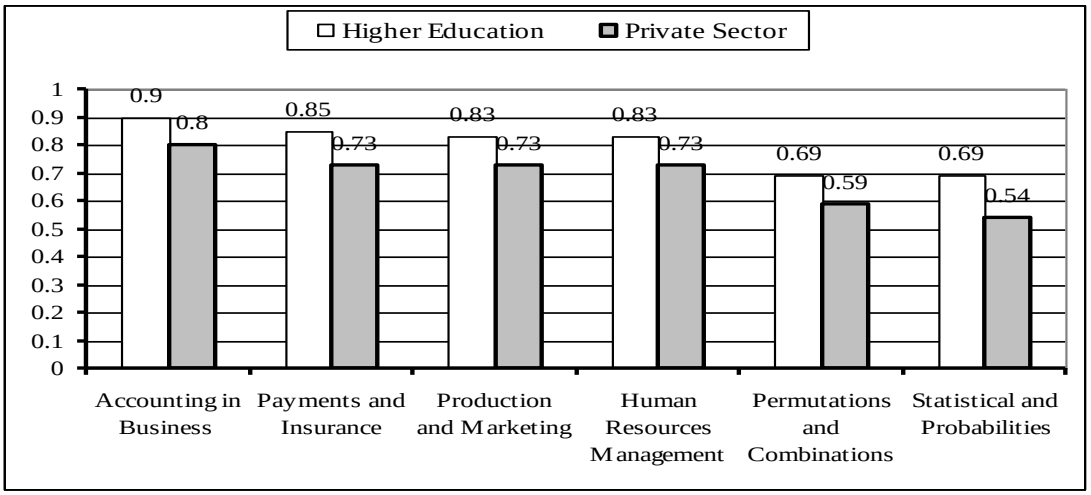

Figure 3: Mean Scores of Responses of Grade 12 for Higher Education and Private Sector

9.2. Views of Supervisors and Teachers towards the Instructional Strategies

Supervisors and teachers were asked to respond to 18 items. Each of them is of four points: (Strongly Agree=4, Agree=3, Disagree =2, and Strongly Disagree =1) dealing with the respondents' views about the quality of instructional strategies that suggested in the curriculum guide and textbooks of current curriculum.

The overall mean scores of respondents' views about instructional strategies were 2.32- 3.12 of 4 point for grade 11 and 2.39–3.15 for grade 12 (Table 8).

Table 8: Mean Scores of Responses on Instructional Strategies of Both Grade 11 &12

No.	**Items**	**Grade 11th**		**Grade 12th**	
The instructional strategies which are provided in the curriculum guide are:		**M**	**SD**	**M**	**SD**
1	In line with Mathematics theories and principles	3.09	0.72	3.06	0.69
2	Aim at developing the students' computational algorithms.	3.03	0.74	2.96	0.77
3	Take into consideration the individual differences among students.	2.85	0.83	2.77	0.85
4	Encourage students to use the self-learning method.	2.91	0.79	2.99	0.81
5	Encourage students to use the collaborative learning method.	2.94	0.79	3.01	0.76
6	**Encourage students to use the e-learning method.**	**2.32**	**0.83**	**2.39**	**0.89**
7	Encourage learning by activity among students.	2.93	0.78	2.91	0.75
8	Improve the students' creative thinking.	2.60	0.88	2.63	0.88
9	Encourage students to use the learning by discovery technique.	2.51	0.84	2.55	0.83
10	Suitable for teaching and / or learning the economic knowledge and skills.	3.12	0.68	3.15	0.67

11	Suitable for teaching and / or learning the administration knowledge and skills.	2.88	0.79	3.04	0.76
12	**Encourage students to search for relevant information through the internet.**	2.65	0.90	**2.48**	**0.97**
13	Encourage students to present oral reports about specific economic and administration skills which are related to the topics of the curriculum.	2.90	0.80	2.83	0.78
14	The practical activities, which are provided in curriculum guide for teaching and / or learning the topics, develop the critical thinking among students.	2.72	0.79	2.71	0.78
15	The level of mathematical proofs which are provided in textbook is suitable to the students' thinking level.	2.83	0.82	2.78	0.80
16	The practical activities, which are provided in curriculum guide for implementation in the business, such as banking, marketing, …etc can be implemented.	2.83	0.83	2.85	0.87
17	The examples which are provided in curriculum guide to explain the difficult concepts are sufficient.	2.61	0.86	2.58	0.90
18	**Curriculum guide suggest suitable computer programs for teaching and / or learning the concepts of Mathematics and Economics.**	**2.35**	**0.89**	**2.48**	**0.95**

Table 8 shows that the mean scores on 18 items are above midpoint (2.5) for 16 items of grade 11 and for 15 items of grade 12. For grade 11, the average of mean scores was 2.78, which indicated positive views about the instructional strategies. The highest mean scores was in item 10 (M=3.12). For grade 12, the average was 2.79, which indicated general positive views. The highest mean scores was in item 10 (M=3.15) (Figure 4).

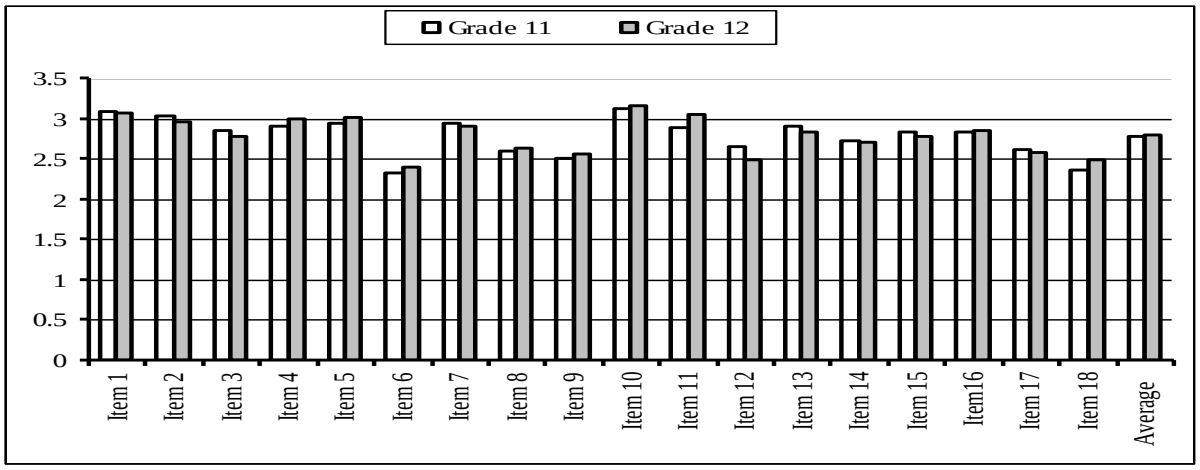

Figure 4: Mean Scores of Responses on Instructional Strategies of Grade 11 & 12

9.3. Views of Supervisors and Teachers towards the Assessment Practices

Supervisors and teachers were asked to respond to 11 items and responding scales of four points (Strongly Agree=4, Agree=3, Disagree =2, and Strongly Disagree =1) dealing with their views about the quality of assessment practices suggested in the current curriculum of current curriculum. The findings are as follows. Overall mean scores of supervisors and teachers' views as shown in Table 9 were 2.53– 3.24 for grade 11 and 2.50– 3.22 for grade 12**.**

Table 9: Mean Scores of Responses on Assessment Practices of Grade 11 & 12

No.	**Items**	**Grade 11th**		**Grade 12th**	
The assessment practices which are provided in the curriculum are:		**M**	**SD**	**M**	**SD**
1	**focusing on measuring the knowledge level**.	**3.24**	**0.68**	**3.22**	**0.73**
2	focusing on measuring the comprehension level.	3.16	0.64	3.05	0.68
3	focusing on measuring the application level.	3.02	0.73	3.01	0.75
4	taking into consideration the individual differences among students.	2.84	0.74	2.78	0.80
5	focusing on measuring the analysis level.	2.70	0.77	2.61	0.78
6	**focusing on measuring the synthesis level.**	**2.53**	**0.77**	**2.50**	**0.81**
7	assessing only the level of memorization (the routine way of teaching / learning process).	2.89	0.84	2.81	0.87
8	using continuous patterns to assess the students' performances throughout the academic year.	3.03	0.75	3.02	0.82
9	measuring the activities of the students through their presentations.	2.82	0.73	2.69	0.79
10	the practical exercises presented at the end of each topic in textbook are suitable for measuring the objectives of that topic.	3.01	0.78	2.93	0.82
11	including direct observations for student practical activities in the field of Economics and Administration.	2.87	0.79	2.81	0.76

Table 9 shows that the mean scores of respondents' views on 11 items are above midpoint (2.5) for all items of grade 11 and for 10 items of grade 12. For grade 11, the average mean scores was (M=2.92), indicated positive views about the assessment practices. The relatively high mean were on items (1, 2, 3, 8, and 10) which had mean scores above 3.0. The highest one was the item 1 (Figure 5).

For grade 12, the average was 2.86, indicated positive views. The relatively high mean were in items 1, 2, 3, and 8; the highest of them was the item 1 (M=3.22).

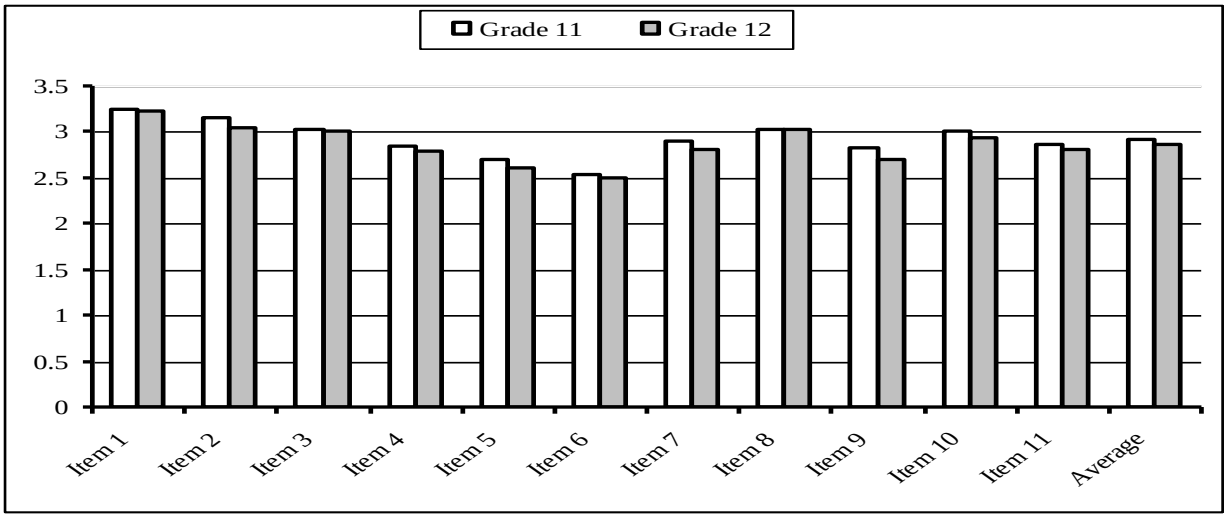

Figure 5: Mean Scores of Responses on Assessment Practices of Grade 11 & 12

10. RESULTS OF THE STUDY

Overall findings of the quantitative analysis indicated that all areas of content are relevance to both higher education and private sector whereas qualitative findings indicated to irrelevance of some areas to private sector.

The results indicated that relatively the high content' relevance was on areas of themes of economic and administrative whereas the low content' relevance were on areas of pure mathematics. But in most areas we could observe that the standard deviations were relatively high particularly in findings that related to private sector (Tables 6 & 7) which could be interpreted according to the different concerns of the respondents, because due to different philosophy of institutions. These institutions are of different concerns towards the graduate of these curriculum, however some institution concern on marketing or accounting or payments and insurance whereas others concern on human resources or small business or transaction in financial markets, moreover, some institutions may concern on more than one area.

Most instructional strategies and assessment practices that were suggested in the current curriculum guide and textbooks of both grades were considered as suitable strategies to learn/teach the current curriculum content and to assess the performance of students. The level of suitability of those strategies and practices was in different level ranged from low to relatively high.

As shown in above discussion, it could be concluded that the quantitative results of this study showed that the topics of this curriculum positively relevant to both higher education and private sector in general.

The qualitative results were in line with the quantitative results in most topics of areas of grades 11^{th} and 12^{th} which indicated that all areas of both grades were relevant to higher education, and most topics of areas were relevant to private sector.

11. CONCLUSION

The content and instructional strategies have been the most important elements in the curriculum system. In addition, assessment practices are considered as a control system of education; they are the vital element of educational system.

Whereas, the essence of curriculum reform lies in the views of stakeholders towards all elements of curriculum in terms of their strengths and weaknesses of the current topics, strategies, practices of teaching and assessment particularly when this curriculum content includes different areas and when its topics are of various aspects. Furthermore, when this kind of curriculum effects a wide base of people and institutions, then the evaluation of content and strategies becomes very important. According to Gregory (2002), once the new curriculum is in implementation, additional evaluation procedures will be needed to ensure it stays on-track to achieve its stated goals and objectives.

This study was to explore the stakeholders' perspective about the mathematics curriculum of grades 11 and 12. The results of quantitative data indicated that the current content of curriculum were considered relevant to the requirements of both higher education and private sector. However, the results of qualitative data indicated that there are some areas that were not relevant to the private sector; these areas were of pure mathematics topics. However, the areas of applied applications have been important to the society because the course of this curriculum is designed to connect curricula to real life needs by developing mathematical topics that match modern trends in diversification of curricula and extension of content (MOE, 2008, P.72-73).

The topics of economic and administration is connected to requirements of the labor market whereas the areas of pure mathematics are not directly connected to the requirements of the jobs in the private sector.

The courses of Entrepreneurship (Small Business), Introduction to Economics, Transaction in Financial Markets, Accounting in Businesses and Enterprises, Payments and Insurance, Production and Marketing in Business and Enterprises, and Human Resources Management included topics, and applications that are considered important issues to business organizations and institutions in Oman.

The content of this curriculum may need to be explore more and identified to be completely matching the requirements of both higher education and private sector.

Accordingly, this study was necessary to determine the extent of the content of the curriculum in response to the requirements of the various interest institutions that were prepared to meet the requirements of the study or work on them and to identify the appropriateness of the proposed teaching strategies to teach the current content.

According to the result of this study, the instructional strategies, which were used to teach/learn the topics of applied mathematics, focused on a low level of thinking such as memorization and understanding whereas it should focus on the development of independent learning skills including critical thinking, analysing, and decision-making through practical activities and projects related to the topics. These skills are valuable to students entering the job market in the areas of business and commerce (MOE, 2008, P. 73).

It is worth considering that the excellence of instructional strategies and assessment practices should be our first priority because technology and e-learning will not improve poor instructional strategies. Kearsley (1996) argued that "without excellent teachers, technology will not enhance learning to any degree".

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