The Efficiency of the New Mathematics Curriculum towards Saudi Mathematics Educators' Attitudes of Using Computers in Secondary Schools

By

Mana MohammadManaAlamry

\A dissertation submitted for the degree of MA in Mathematics Education in the Schoolof Education and Life Long Learning, University of East Anglia

ABSTRACT:

This researchaimed to explore the efficiency of the new mathematics curriculum towards Saudi mathematics educators' attitudes of utilising computers in Secondary Schools. Twenty-three male teachers from the Namas Provence took part in the research. A questionnaire with 24 statements (20 statements using a Likert scale + 4 open-ended questions) was used to assess the mathematics educators' attitudes towards the new curriculum, the role of the Ministry of Education,their experience and attitude towards computers,and the use of computers in the classroom.Results revealed that the teachers had positive attitudes towards using computers in the classroom. The teachers felt confident in using computers; however, they would like more training on how to use technology in the classroom. In addition, the educators believed that the students would benefit from training in using computers. Finally, the educators answered that more computers in the classroom were needed. The research concludes that the Ministry of Education need to provide the educators with training to ensure that the new curriculum is successfully implemented into the mathematics classroom. This research involved only male teachers working in male secondary schools and it is necessary to conduct a follow-up research with female educators to gain a full picture of the attitudes towards the new curriculum. Furthermore, to gain a more complete picture of the use of technology in the classroom, measurements of the number of times per week that educators use computers need to be provided.

Keywords*:*New Mathematics Curriculum, attitudes, using computer.

ملخص البحث:

هدف البحث الحالي إلى استقصاء أثر منهج الرياضيات الجديد على اتجاهات معلمي الرياضيات نحو استخدام الكمبيوتر في المدارس الثانوية. ولقد تكونت عينة البحث من ٢٣ معلماً من الذكور من مدينة النماص، كما اعتمد البحث على استبانة مكونة من ٢٤ عبارة (٢٠ عبارة بطريقة مقياس ليكرت، وأربع عبارات مفتوحة) من أجل تقييم اتجاهات المعلمين نحو منهج الرياضيات الجديد، والدور الذي تقوم به وزارة التربية والتعليم، وخبرات المعلمين واتجاهاتهم نحو الكمبيوتر، واستخدام الكمبيوتر داخل الفصل الدراسي. ولقد أظهرت نتائج البحث أن المعلمين يحملون اتجاهات إيجابية نحو استخدام الكمبيوتر داخل البيئة الصفية، بالإضافة إلى أن المعلمين لديهم ثقة في ذواتهم بشأن استخدام الكمبيوتر، ولكن على الرغم من ذلك، فالمعلين بحاجة لمزيد من التدريب بما يمكنهم من توظيف التكنولوجيا داخل البيئة الصفية. علاوة على ذلك، فيعتقد المعلمون أن الطلاب قد ينتفعون من التدريب بشأن استخدام الكمبيوتر. وفي النهاية، أكد المعلمون أن الفصول الدراسية لابد من تدعيمها بالعديد من أجهزة الكمبيوتر. ولقد انتهى البحث إلى أن وزارة التربية والتعليم لابد وأن تقدم تدريب للمعلمين لضمان أن المحتوى الجديد قد تم تطبيقه داخل البيئة الصفية. ولقد اعتمد البحث فقط على المعلمين من الذكور ومن الضروري إجراء دراسات مماثلة على الإناث من أجل بناء صورة متكاملة لاتجاهات المعلمين نحو المنهج الجديد. علاوة على ذلك، فلابد من تحديد عدد مرات استخدام الكمبيوتر داخل البيئة الصفية من أجل تكوين صورة متكاملة لاستخدام التكنولوجيا داخل البيئة الصفية.

الكلمات المفتاحية: منهج الرياضيات الجديد، الاتجاهات، استخدام الكمبيوتر.

Introduction:

Society has changed in the way in which computers and technology are used to educate children and this trend has led to information communication technology (ICT) being regarded as an essential component in teaching and learning mathematics (Lim and Khine, 2006). Although the idea that regular users of computers feel more confident in using computers may not be surprising, research has found that regular users also regard computers as a valuable teaching tool that can be used to make lessons diverse, fun and interesting (Cox, et al., 1999).

In the secondary school classroom, the introduction and use of technology are regarded as a necessary way to gain skill that are vital for success in the modern day global workforce (Schrum and Levin, 2009). The use of computers in the mathematics classroom could enhance students' learning and it can be used to challenge and extend students' learning and understanding (Edwards and Wright, 2005). Teachers are described as the "change agents in schools" and a teacher needs awareness, motivation and skills to explore different ways that technology can support the teaching in the mathematics classroom(Teo, 2008,p.421).

In the past five years, the Saudi Arabian Ministry of Education has implemented a new mathematics curriculum that has attempted to use computers have been adopted from developed nations such as the United Kingdom and the United States (Jurdak, 2009). As a mathematics supervisor within the Kingdom of Saudi Arabia, I have experienced a new trend in which the new curriculum advocates the use of technology in the mathematics classroom, as well as the adoption of Western teaching styles. I have witnessed a number of problems for mathematics teachers, especially those that were trained and focused on traditional methods of teaching without the aid of technology.

1.2 Research aim and Questions:

The aim with this research is to examine the impact that changes in the mathematics curriculum in Saudi Arabia has had on the teachers' attitude towards using computers in the secondary male schools. The research asks questions such as:

1. Is there a gap between the theoretical application of computers in the mathematics curriculum and its practical use due to teacher attitudes and lack of technological skills?

2. How do teachers feel about the implementation of the mathematics curriculum? What are their attitudes towards the use of technology in the classroom?

1.3 Significance of the Research

1.3.1 generally: This researchis important since it aims to explore empirical evidence that examines the impact curriculum development can have on teachers and their attitudes. Also, this research can have an effect on the way mathematics is taught in Saudi Arabia.Another implication of this research is the effect it could have on the level of training and support for teachers in Saudi Arabia. The research could increase understanding and knowledge regarding teachers' attitudes towards using technology in the classroom, which could benefit educators on a national as well as internal level.

1.3.2 Personally: As a supervisor of mathematics, the researcher has witnessed problems related to teachers' attitude and motivation to embrace the use of technology and it is necessary to examine how mathematics teachers view the implementation of the new curriculum to ensure that they are utilising technology to their fullest potential. for example, determining what to include in professional development is not easy and it is possible that teachers who have been teaching for a number of years will require a focus on other aspects as compared to teachers with little teaching experiences.

Literature Review

2.1 Mathematics and Computer Technology

Throughout history, the field of mathematics has used and benefitted from technology to promote a higher-level of thinking (Kersaint, 2007). Today, a range of technology that is applicable to teaching mathematics is available and teachers can choose from a multitude of hardware, software, and online sites to support and challenge students' learning. The abacus, rod calculus and slide rule are part of a development of tools that have led to computers. There are several benefits from using computers since students can focus on decision-making and problem solving, but there may be several obstacles to the integration of technologies. In Saudi Arabia, a problem may be the teachers' lack of ICT skills and there may be a resistance to change traditional teaching methods (Bingimlas, 2009). Integrating technology into the curriculum is a process that is not without problems and teachers may fear that it will eliminate opportunities for students to practise their computational skills.

Goldenberg (2000) says that the biggest issue in education is how to use technology efficiently in education, and teachers need to be aware of the different roles that technology can play in teaching mathematics. A survey of 820 Chinese primary school teachers showed two distinctive types of ICT uses; teachers used ICT for preparations of activities, student administration, and ICT was used to support and enhance learning (Sang, et al., 2011). Computers have made some topics and problems more accessible to students, and as a result, new ways to display and work with concepts have emerged. Goldenberg (2000, p.1) says, "With computers, as with pencils, some problems are great and some are a waste of time", and argues that the use of technology can hinder and prevent a student from seeing patterns and an aware teacher helps and supports students to ensure that they can reach different learning goals. Problems that require that the student to manipulate or explore visual representation such as geometric figures, moving images and graphs are suitable for using computers where interactive virtual manipulations can be performed. Pierce and Ball (2009) argue that teachers need to change their teaching strategies to adopt technology to support the teaching and learning. However, there is no universal view of when to use technology in the classroom.

Finally, using computers increases not only a person's computer skills but may also increase their understanding of computers, which may lead to a more positive attitude. Experience and successful use of computers may promote the development of positive feelings towards technology (Huang and Liaw, 2005). Creating positive experience of teachers is crucial to ensure that they will later use technology in the classroom. According to Lim and Khine (2006), periods with unsuccessful use of computers can act as a barrier to further usage of computers.

2.2Mathematics Teachers and Computer Experiences:

The focus in mathematics education when computer technology is used is often on higher-order cognitive skills (Wiest, 2001). During training, teachers may develop skills on how to use technology, and training can be used to enhance teachers' effectiveness in using technology. However, the experiences of teachers who have taught mathematics in the classroom for a number of years may be different. Their own teaching experiences may influence the way they feel about using computers in the classroom. Changing perceptions are difficult and research suggests that teachers who have practical experience of using particular mathematical concepts are more likely to be seeing the possible benefits of using a particular technology in the classroom (Garofalo, et al., 2000).

The teacher's role in a classroom where ICT is used could be described as a facilitator of knowledge (Heid, et al., 1990). This role may cause a problem for teachers who are used to instructing students. Teachers' confidence in their own knowledge and understanding of the how to utilise technology in the classroom is another factor that may influence the choices that a teacher makes (Doerr and Zangor, 2000). Laborde (2001) argues that the way a task is designed is the most import part of teaching, and teachers need to learn when to use technology and when to rely on traditional methods. The goal is to move away from using computers to being a simple provider of data to being a tool that helps provide meaning to the task. Learning how to use technology in this way takes time and teachers need to learn to design different tasks and understand how to design open-ended tasks that may require more "time for exploration and generalisation" (Laborde, 2001, p.311).

Teo (2008) conducted a study in Singapore and the results suggest that an initiative by the Singapore's Ministry of Education to enhance the use of computer in the classroom had led to teachers purchasing computer that they used at home. The teachers were also more prone to use related technologies such as the Internet. Overall, the initiative to enhance the use of computers in schools resulted in more teachers using computers in their home environment. The teachers had a more positive attitude towards computers. Thus, the initiative in Saudi Arabia to enhance the use of computers in schools may change teachers' attitudes towards computers. It may also lead to more teachers using the Internet and purchasing their own computers.

2.3Teachers' Perceptions on the Use of Technology in Secondary Mathematics Classes

A positive attitude means that teachers feel more at ease to use technology in the classroom (Kersaint, et al., 2003). The concept teachers' attitudes consist of a range of dimensions, for example, computer confidence and perceived usefulness (Rovai and Childress, 2002) and knowledge about computers (Yuen and Ma, 2002). Hardy (1998) identified the following factors as obstacles for integration of technology into the classroom: funding, lack of time, knowledge, and equipment. Hope (1997) suggests that teachers have to deal with two aspects when they are facing technology adaptation: the psychological effect of being involved in change and the challenge of learning to use the new technology.

Zhao, et al. (2001) found support for the idea that the teachers' attitudes towards technology are directly linked to the use of computers in the classroom. Teachers who regard computers as tools to manage their

students and to communicate with people are less likely to regard computers as effective teaching tools that can enhance students' mathematical skills.

The result related to the importance of age and gender is mixed, where many studies have found gender differences in attitude (Markauskaite, 2006), while Teo (2008) did not find any difference. Overall, research on gender and attitude towards computer suggest that males often have more experience of using computers (Brosnan and Lee, 1998). Gender differences have also been found regarding anxiety related to using computers, and female users have been found to experience higher level of negative attitudes towards computers and being more prone to computer anxiety (McIlroy, et al., 2001). Attitudes towards computers are changing and computers are becoming more prevalent, and this means that there may be changing attitudes among teachers towards computers. These changes may explain some of the results received related to gender, where studies conducted a couple of years ago may have received results indicating greater gender differences. Initiatives aimed to change female perceptions of computers may have led to changes in their attitudes (Teo, 2008).

2.4Institutional Influence on Teachers' Use of Computers in Teaching Mathematics

Teachers' thinking and attitudes are not only shaped by their own ideas and beliefs; the wider context needs to be taken into account when discussing influences on a person. According to Windschitl and Sahl (2002), the social context and the institutional setting may influence and change teachers' perceptions. The availability to staff development and access to technology are often treated as independent factors to influence a teachers' behaviour. However, teachers are part of larger groups and school are an institutional setting where certain attitudes and ideas are prevalent and different schools promote certain activities and believe that these are beneficial for their students. Andrews (1999) argues that a teacher's positive attitude and willingness to use computer in the classroom are linked to the school having a capable and enthusiastic IT coordinator.

Windschitl and Sahl (2002) suggest that an environment that encourages teachers to experiment helps to support teachers' learning and innovation. Teachers can learn from experts in the school, who have already mastered a new method. Albirini (2006) found that Syrian ESL teachers' attitudes to using computers were linked to their computer competence as well as to cultural perceptions. Thus, the conditions in the

schools helped shape the teachers' views upon using technology. Moreover,

Problems related to the implementation of technologies may differ from country to country and in Europe, the largest barrier was lack of computers and resources (Empirica, 2006). Al-Alwani (2005) found that a problem in schools in Saudi Arabia was lack of access to the Internet during the day. In Saudi Arabia, teachers have a limited number of hours to integrate ICT into the classroom and many teachers work from 7:00 a.m. to 2:00 p.m. Thus, lack of time to plan lessons may be an important factor that prevents teachers from using computers in the classroom. Albirini (2006) suggests that teachers should be provided with time to use and test new methods and approaches to use computers and technology in the classroom. Additional planning time should be provided and this could be achieved by reducing the teaching load.

2.5Evaluation of Using Technology in the Mathematics Classroom:

What impact does the use of technology have on the students? Students' learning of mathematics should improve when they are using technology, however, it may not be appropriate to use traditional methods to access student learning after students have been taught a specific content using technology. Russell and Haney (1997) found that the way a test was administered had an effect on the results, and students wrote significantly higher cognitive-level answers on computers as compared to by using pen and pencil. Thus, the Saudi Arabian Ministry of Education can support their implementation of technology into the mathematics classroom by providing teachers with tools to evaluate the effect on using mathematical tools. These results may motivate and further support teachers to introducing ICT skills into the classroom.

2.6Conclusion:

Overall, this literature review suggests that teachers have a positive attitude to using technology, but they may be reluctant to use computers in the mathematics classroom. Previous learning and experiences may also influence a teacher's attitude and motivation to use technology in the classroom.

A successful implementation of technology into the classroom may require teachers to change their teaching strategies (Pierce and Ball, 2009). Professional development programmes designed to help teachers become knowledgeable about the technology while challenging them to integrate technology into their teaching should be based upon the teachers' experiences (Grove, et al., 2007).

3.1 Methods and Methodology:

The aim of this research is to explore the impact of the new mathematics curriculum in Saudi Arabia, focusing on secondary teachers' attitude towards using computers and technology in the mathematics classroom.

The following objectives have been identified:

1. A thorough review of the existing literature related to the use of ICT in the classroom will be conducted, regional studies as well as international literature will be analysed.

2. The research methodology will be designed in such a way that it attempts to allow generalising the findings to the larger population.

3. Collection of data and data analyses will be carried out in an objective way. This will ensure that the validity as well as reliability of the research is not questionable.

The following assumptions were made:

1. Participants answered the survey honestly and truthfully.
2. All data collected were compiled from all participants in the same manner.

A quantitative analysis of questionnaire responses were used to discover how teachers think about the changes in the changes in the curriculum and how do they believe about integration ICT into mathematics curriculum. According to Swanson (2005), the research paradigm is related to examining the understanding of member's meaning.

A survey and an attitudinal questionnaire were used in this research. There are several advantages with using a survey, for example, participants are likely to participate since it does not take long time to finish a questionnaire. In addition, participants in a survey can remain anonymous and this may result in honest and sincere answers. A sincere and honest opinion is necessary to examine the educators' attitude towards the new curriculum and the role technology plays, consequently, other methods of qualitative approach such as interviews and observations were regarded as not suitable options. Considering that the researcher is a supervisor of mathematics education in Saudi Arabia the priority was to ensure that the teachers felt confident to provide honest opinions. The interview process, for instance, may contain answers where the teachers who have low levels of technological skill try to show themselves in a better light.

Today, the use of surveys to study teachers' attitudes towards technology in education is a well-used technique in educational research. A

study by Hardy (1998) highlighted that this type of study was rare in the field, but this was an old study, conducted over the fifteen years and since there have been a number of studies that have used surveys to assess teachers' attitudes. Teo (2008) assessed teachers' attitudes towards computers in Singapore using a Likert-style questionnaire, and thisresearch followed a similar pattern. In addition, four open-ended questions were used to provide the participants with an opportunity to express their own ideas and describe their feelings. Likert-style questionnaires are popular in educational research and this was another reason for using this method (Lowry and Turner, 2007). The questionnaire, the consent letter and the information sheet were translated into Arabic and then back into English, this procedure is to ensure that they are suitable for the participants.

Secondary schools in the Namas Provence in Saudi Arabia were selected for this researchbecause they are easier for me to get access. The data gathered from 23 mathematics teachers working at 14 different schools can be described as almost numerical. According to Cohen, et al. (2007), quantitative data allows a researcher to generalise about the findings. A conclusion that can be drawn from my position as a supervisor is that the majority of teachers have a historical lack of experience of using technology in the classroom. In addition, they have been trained locally. Thus, whenever similar conditions can be assumed in other parts of Saudi Arabia the results of this research can be used to reflect the attitudes of the secondary mathematics teachers in that region.

The findings of the literature review will provide context upon which the results of the questionnaire will be analysed. This technique will help with understanding and interpretation of the results to uncover the teachers' attitudes towards the use of technology in the mathematics classroom. Ideas and suggestions for improvements of the way the curriculum was implemented can be used by the Ministry of Education. The practice of constant feedback on changes to the curriculum is a positive step towards ensuring that changes to curriculum are based on observations and ideas collected from mathematics teachers. This may help the Ministry of Education to find ways to continue to improve the curriculum and the teaching process in Saudi Arabia.

3.2 The Context of the Research and the Participants:

Knowledge and understanding about technology is regarded as necessary components to prepare students for the future. However, despite these changes the education system is rooted in Islamic faith and tradition (Oliver, 1987). Thus, when implementing a new curriculum it is necessary to consider technology and progress within this framework.

The Ministry of Education in Saudi Arabia was established in 1953 and is responsible for all of aspects of education (Ministry of Education, 1986). In principle, there are general education and higher education in Saudi Arabia. The secondary educators participating in this study work in the fourth and last stage of the general education. Students are between fifteen to eighteen years old. There are three grades in secondary education, which prepare the students for higher education (Ministry of Education, 2006). In grade one, students study general education: a mixture of arts and science. In the last two grades, students choose which branch they want to specialise in and the students choose either arts or science. A certificate of general secondary education is provided after a student has passed the general examination.

Recently, Obeikan Education has worked in partnership with "McGraw Hill Education" company to provide the Ministry of Education in the Kingdom of Saudi Arabia with support to develop the new curriculum (Obeikan Education, 2013a).

A number of approaches have been used by the Ministry of Education to ensure that the materials provided consider the context of Islamic communities, for example, the design of educational material as developed by Obeikan Education, which use Islamic values as the foundation for the development of the learning material (Obeikan Education, 2013d).

A new approach to teaching mathematics by using computers and technology has been applied to all areas of the new secondary mathematics curriculum Obeikan Education (2013b). To keep pace with global developments in this area, these curriculums have been provided a full range of diverse educational materials. In addition, there is educational software and websites to provide the opportunity to employ new technologies and communication based on practice.

According to the new mathematics curriculum that have adapted by Obeikan Education, various areas such as Reasoning and Proof, Parallel and Perpendicular Lines, and Trigonometric Identities and Equations, are being taught to Grade One to Three at secondary schools (Obeikan Education, 2013c). To my best knowledge, which is supported by observations during my job as supervisor of mathematics, teachers need to use computer and visit websites to find out details about many conceptions that are taught and discussed in the mathematics classroom.

3.3 Pilot Study:

I did a small pilot study by sending the questionnaire to my supervisor initially who advised me to add open ended questions. Additionally, I sent it to two respondents and slight amendments were made when it was noticed that there was an ambiguous of translating one question. Pilot study is commonly neglected in researches but it 'is an especially useful form of anticipation' (Locke, 1993,p.73).

3.4Data collection:

The data was collected during a month in the Namas Provence in Saudi Arabia. Male teachers from 14 different secondary male schools took part in the research.

Consent from the Ministry of Education was collected before conducting the survey. Furthermore, consent for my research was obtained from the Ethics approval committee at the university. Finally, no consent from participants themselves was collected. The reason behind this decision was the belief that answering the questionnaire was not an obligatory task and the consent from the heads of schools were regarded as enough. Also, anonymity of participants might have been influenced if consent to participate was collected. Thus, the lack of collection of consent was regarded as a way to protect the identity of the participating teachers. On each school, there was one or a couple of teachers who took part and by using this method, the anonymity of the teachers that choose to take part was guaranteed. This means that my work as a supervisor at the schools may not be influenced by the research that I conducted. The teachers can feel reassured that I have no idea who actually took part in the research.

The questionnaires were distributed and delivered in person to the Heads of Schools at the same time the consent from the head of school was collected. All the selected Heads of Schools gave permission for their teachers to take part in the research. The questionnaire/s with a return envelope/s, without any name upon it, were given to the heads of schools who were asked to distribute them to all the secondary mathematics teachers in the school.

Two days before the deadline, the Heads of Schools was asked via phone to remind the teachers to complete the questionnaires. The questionnaires were collected in an enclosed box from the Heads of Schools. The box was not opened until all the questionnaires had been collected from the 14 participating schools. The aim with this procedure was to keep the anonymity of the participants and to preserve confidentiality. Considering my position as a supervisor of mathematics, I

did not want the participants to feel that I could identify their answers and this procedure was explained to reassure the teachers.

When the box was opened, all the envelopes were mixed and then opened one by one, each questionnaire was provided with a name (P1, P2,.....P23).

The following schedule was used when distributing and collecting the questionnaires. Data was collected during March and April 2013.

- First week - distribution of questionnaires to five schools.
- Second week - distribution of questionnaires to other five schools and collection of distributed questionnaire from the first week.
- Third week - distribution of questionnaires to four schools and collection of questionnaires that had been distributed in the second week.
- Fourth week - collection of what had been distributed in the third week. In addition, I finished some important official documents from the Department of Education in Namas Provence.

3.5 Data Analysis:

The questionnaire consisted of three different parts. Part1 consisted of four questions where the aim was to gain general information related to the participants. The frequencies of the responses on these questions were calculated. A graphical representation of the distribution of the data was presented by using histograms. Part2 consisted of 20 questions related to the Mathematics curriculum, using computers and the implementation of a new curriculum in Saudi Arabia. Frequencies, mode, and chi-square tests were used to analyse the results in this section. The participants were asked to indicate their answers on Likert scales; a five-graded Likert scale was used. Measuring attitudes, personality traits, and character is difficult and the Likert scale was constructed to deal with this dilemma. The original Likert scale used a series of questions with five response alternatives: strongly agree (1), agree (2), natural (3), disagree (4), and strongly disagree (5); however, there are other variations including the deletion of the neutral response, and a seven-point Likert scale (Ary, et al., 2010). However, the five-point scale was used since a neutral option was regarded as vital to ensure that the educators had an option where they did not have to choose side. In addition, a seven-point scale can be confusing with its many options.

Because of a low number of responses was consistently received on some values, the option to conduct analyses where answers were added

together were considered, that was, strongly agree/agree and strongly disagree/disagree answers were analysed together. Numbers on a Likert scale indicate "greater than" relationship yet how much greater was not indicated. Frequencies are a recommended way of analysing the data since it is on ordinal level. Chi-square testes was also carried out to further examine the relationships (Ary, et al., 2010).

Finally, Part 3 consisted of four open-ended questions, which were analysed by using a qualitative method. Thematic analysis was chosen since it is a flexible and diverse approach to analyse answers (Braun and Clarke, 2006). This type of analysis is not tied to any theoretical framework and rich descriptions of the data could be achieved by using this method. An open-ended questionswas usedto make the participants provide the response categories instead of being forced to choose from preselected categories selected by the researcher. Thus, insight into the participants' own perceptions about the problemis possible by using open-ended questions and the perceptions on the subjects are not closely tied to the researcher's own perceptions.

However, analysing open-ended questions is not a straightforward process and thematic analysis was used to classify the answers into different themes. No attempt was made to discover underlying assumptions and perceptions of the answers: the analysis is semantic. Due to time limits, the classifications into different themes was carried out by the researcher. Thus, the themes that are used may not be reliable or consistent, and another observer may classify an answer into another theme (Phelan and Wren, 2006). To minimise this risk, great care was taken when classifying the answers and a search for pattern in the answers was conducted if regarded as necessary. Thus, if a participant seems to provide conflicting answers, extra care was taken when classifying the answers into different themes.

3.6Ethical Considerations:

When discussing how the research can ensure that the responses gained are truthful and reflect the genuine attitude of the teachers used in this research, it is important to underline that each participant will be provided with complete anonymity and confidentiality. Often participants in studies such as this research may feel that in providing certain responses, they will face recrimination from their organisation (Babbie, 2010). Therefore, it is crucial that each participant realise that his response is anonymous and that participation is voluntary at all times. Confidentiality and anonymity will be guaranteed, with codes used to protect the identity

of schools and teachers. Data will be kept securely and will be destroyed following the completion of the research.

Before doing my research, I have reviewed the UEA code of ethics in order to support me in this practice .While doing the research, the researcher was remaining ethically aware. This has enabled me to committed to best practices relating to ethical development. In the interest of the institution, myself and those whose research I am reviewing, where appropriate it must comply with the legislations and adhere to all relevant policies and statutes of good practices.

To ensure that I practice in anti-discriminatory manner, serious consideration has been given to the following areas: carrying out research in a ethically responsible manner, taking the necessary consents, not disadvantaging anyone by the research, respecting others' viewpoints and rights, not misusing the information and respecting other opinions and rights. As with any research, there may be issues of conflict and bias and I need to fully explore this in my research.

Data Analysis:

In this section, the results from the questionnaire will be presented. The results will be shown in three sections, corresponding to the three different parts in the questionnaire.

4.1 Part 1:

The questionnaire was given to 23 participants from 14 different secondary male schools in Saudi Arabia and all of them responded about it. All the participants were male and everyone had a bachelor's degree. Thus, none of the participants had a master's degree or PhD. The majority of the teachers were Saudi nationals, 17 were Saudi and 6 were non-Saudi nationals.

All the teachers had one year of teaching experience or more. The majority of the teachers had eleven years or more of teaching experience, 13 out of 23 teachers. Ten out of the 23 teachers had over 15 years' experience of teaching. All the non-Saudi nationals (6 participants) had over 15 years of teaching experience.

The majority of the teachers had attended a professional training programme in using computers, 15 out of 23 teachers had attended training programmes (see Fig. 2). Half the teachers who had not attended any professional teaching training programme had between one to five years of teaching experience (4 participants). The other four participants who had not attended any training consisted of three participants who were non-

Saudi nationals with more than 15 years of teaching experience and a Saudi national with over 15 years of teaching experience.

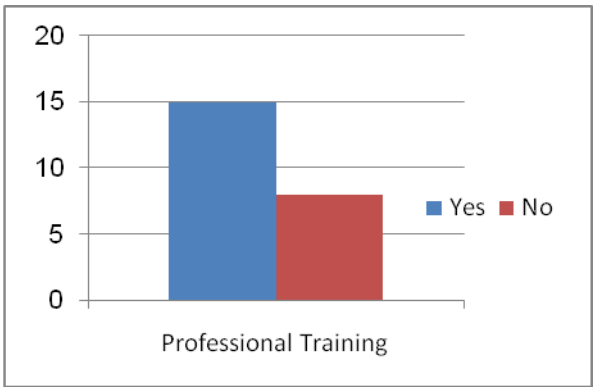

Fig. 2. Number of teachers attending professional training in using computers.

Eleven out of fifteen teachers had received training that was less than one month (see Fig. 3). Six out of the eleven teachers who had received training that was less than one month had been trained how to use maths formulas on the computer. The other five teachers had received training in using Microsoft Office programmes. Microsoft Office programmes include the training in Excel and could be regarded as training in using math software.

Three out of fifteen teachers had received training for 1-3 months. Two out of the three teachers who had received training for 1-3 months, had participated in a wide range of programmes about using Microsoft office programmes, computerising math symbols and computer support, i.e. how to backup programmes and install programmes. Finally, one participant had received training that was 10 months or longer. This training was received in 1990 and the person was a non-Saudi national.

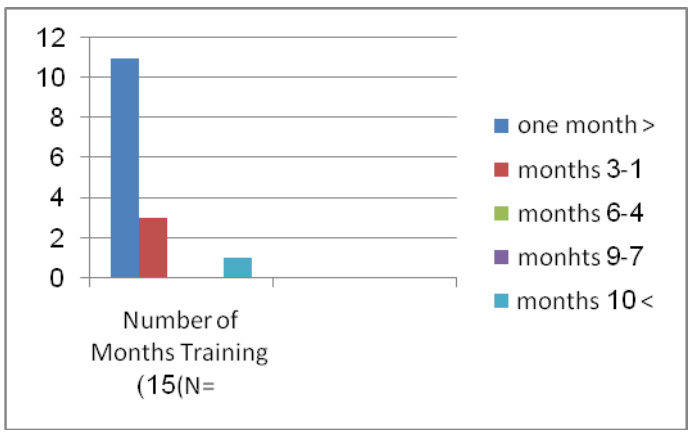

Fig 3. Number of months attending professional training in using computers (N=15).

4.2 Part Two:

This part includes four groups of questions using the Likert scale. The results in this part are analysed by using frequencies, mode, and chi-square tests. In this research, the extreme values were less often used, i.e. strongly agree, or strongly disagree. Thus, most participants choose either agree, neutral or disagree. The scores on strongly agree/agree and strongly disagree/ disagree were combined and chi squire tests were carried out (see Appendix 1). There was a statistically significant difference between strongly agree/agree – neutral – strongly disagree/disagree, chi^2 =116.60, $p < 0.0001$. The difference between Strongly Agree/Agree – Neutralwas significant, chi^2 =104.03, $p < 0.0001$. The test between Strongly Agree/Agree - Strongly Disagree/Disagree suggest that there was a significant difference, chi^2 =40.92, $p < 0.0001$. Finally, there was a significant difference between Neutral – Strongly Disagree/Disagree, chi^2 = 17.15, $p < 0.0001$. Overall, these results suggest that the participants preferred certain choices on the Likertscale, i.e. strongly agree and agree.

Questions related to the Mathematics curriculum and the implementation of a new curriculum.

The first four questions using the Likert scale were related to the Mathematics curriculum and the implementation of a new curriculum (see Fig. 4). The percentages for strongly agree and agree are combined and so are the percentages for strongly disagree and disagree. The frequency distributions are shown in figures; however, the percentages were combined since the low number of responses that was consistently received on some values as well asthis was a small research, only 23 participants.

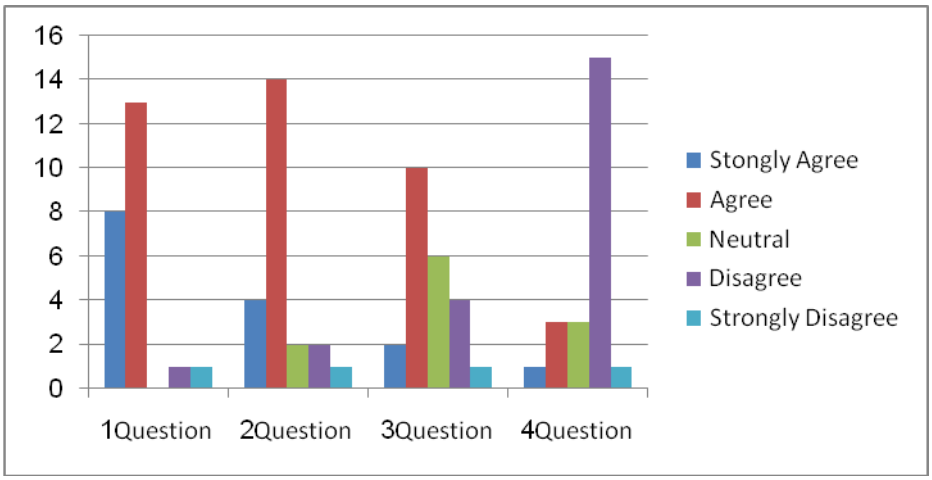

Fig 4.Questions regarding the Mathematics curriculum and the implementation of a new curriculum.

- **Question 1. The curriculum should encourage the use of computers in the classroom.**

There was a positive attitude towards the idea that the curriculum should encourage the use of computers in the classroom and 8 teachers strongly agreed, while 13 agreed (mode=agree). Only two teachers disagreed, one of them strongly.

- **Question 2. Computers can support students to do more interesting and challenging work.**

Overall, there was a positive response to this question and 18 out of the 23 teachers either answered strongly agree (4) or agree (14) (mode=agree). Two teachers answered neutral. However, two teachers answered disagree, while one teacher strongly disagreed (mode=disagree).

- **Question 3. The recent changes in the curriculum have made me aware of ways of using computers in the classroom.**

This question was related to the recent changes in the mathematical curriculum and the answers are a bit more spread out (mode=agree.) Two teachers strongly agreed and 10 agreed that the changes had made them more aware of using computers in the classroom. However, this does not necessarily indicate that they actually did use the computers more frequently in the classroom. Six of teachers answered neutral, while four answered disagree and one teacher strongly disagreed.

- **Question 4. Mathematics is about teaching students to carry out calculations and there is no need to include the use of computers in the curriculum.**

The last question related to the new curriculum is written in a way that an answer marked as disagree or strongly disagree indicates a favourable attitude towards using computers in the classroom. Overall, more teachers answered that using computers is necessary in the classroom, 15 answered disagree, and one teachers strongly disagreed (mode=disagree). Three of the participants answered neutral and three answered agree while one person strongly agreed.

- **Questions regarding the role of the Ministry of Education.**

In this section, the results from questions related to the role of the Ministry of Education are presented (see Fig. 5).

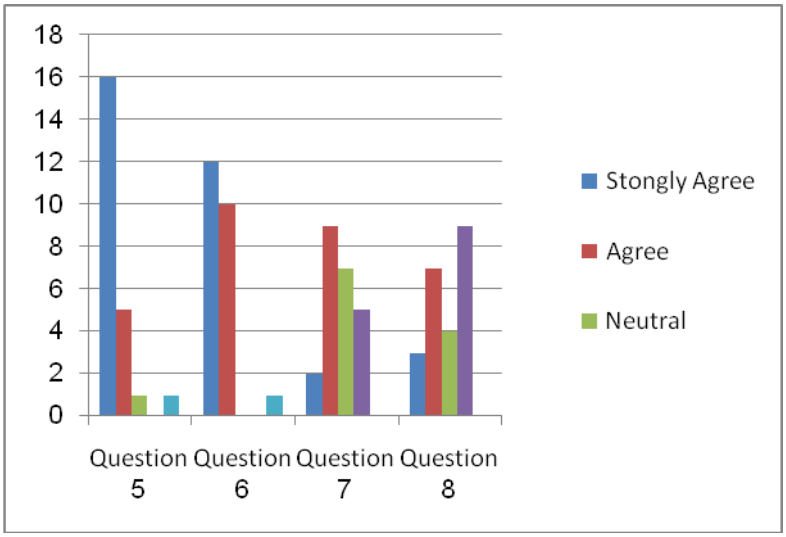

Fig 5. Questions regarding the role of the Ministry of Education.

- **Question 5. With such changing in curriculum, the Ministry of Education needs to ensure that teachers have at least the foundation skills of using a wide range of tools including computers to support students.**

The majority of the participants answered that they strongly believed that the Ministry of Education should ensure that teachers have the required foundation skills, 16 out of 23, while 5 answered agree (mode=agree). One participant answered neutral and one strongly disagreed (mood=disagree). Thus, in contrast to many other answers on the Likert scale, the majority of the teachers strongly agreed with the statement.

- **Question 6. I would like more Training for teachers about how to use computers in the classroom.**

All the participants, except one, agreed with this statement (mode=agree). Twelve participants strongly agreed, while ten agreed. The teacher who disagreed, ticked the box for strongly disagree.

- **Question 7. The priority of the Ministry of Education should be to ensure that all students can use traditional tools to support economic and social development.**

The majority of the teachers strongly agreed (2) or agreed (9) with the suggestion that the priority should be to ensure that all students can use traditional tools (mode=agree). Five teachers disagreed, while seven of teachers answered neutral.

- **Question 8. Computers should be introduced to older students, while younger students should build a foundation in mathematics using traditional tools.**

The majority of the teachers disagreed (9 disagree) with this statement, indicating that computers should not be introduced to younger students (mode=disagree). Three teachers strongly agreed with the statement while seven of them agreed. Four teachers answered that they were neutral.

- **Questions related to teachers' experience and attitude towards computers.**

In this section, the focus is on questions related to teachers' experience and attitude towards computers. The participants looked at five statements and marked their score on the Likert scale (see Fig. 6).

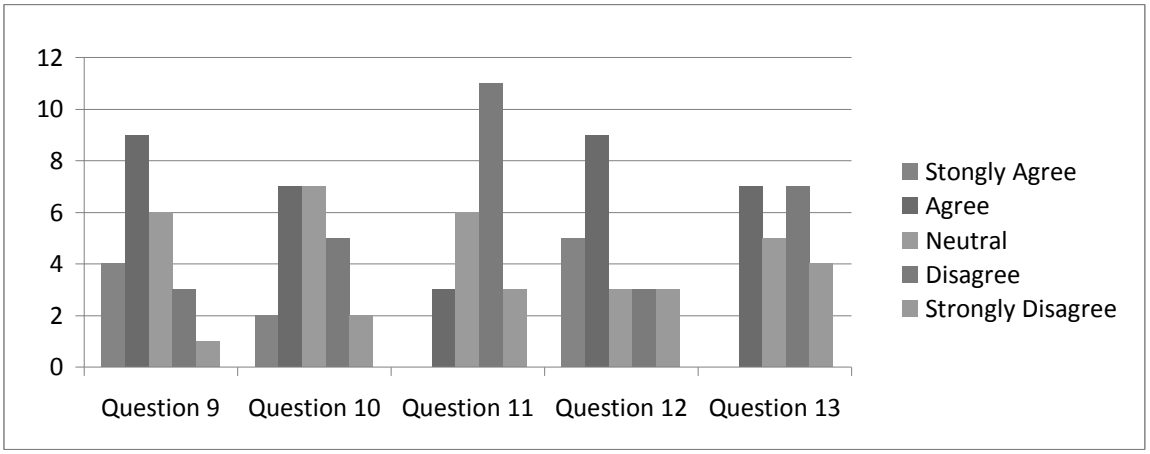

Fig. 6. Questions related to teachers' experience and attitude towards computers.

- **Question 9. I have experience in using computers in the classroom.**

A majority of the teachers had experience of using computers in the classroom (mode=agree). Nine of the participants marked the alternative agree, while four marked strongly agree. Six of the participants answered that they were neutral, which is a bit difficult to interpret in the context. What does it mean? Did the teacher lack experience? Alternatively, did they not? Three teachers disagreed, suggesting that they lacked experience and one teacher strongly agreed.

- **Question 10. I regularly use computers in the classroom.**

Ten out of the 23 teachers marked that they regularly used computers in the classroom, 2 strongly agree, and 7 agree (mode=agree). Two of the teachers strongly disagreed, while five disagreed (mood=disagree). Seven of the teachers answered the alternative neutral. This result is a bit difficult to interpret since the teachers had to decide themselves what regularly referred to in this specific context.

- **Question 11. I am unsure about how to use computers in the classroom.**

The teachers felt confident in the ability to use computers in the classroom. Answers that disagreed or strongly disagreed with the statement indicate that a teacher felt confident, 11 disagreed, 3 strongly disagreed (mode=disagree). Three teachers answered that they agreed with the statement, suggesting that they feel unsure about how to use computers in the classroom. Six teachers were neutral. This result suggests that it may be fruitful to provide training for the teachers about how to use computers in the classroom.

- **Question 12. I lack knowledge and understanding about how to fix problems with computers.**

The results from the previous questions are confirmed by the results on this question. The majority of the participants said that they lacked knowledge and understanding related to how to fix problems with computers, 5 strongly agree, 9 agree (mode=agree). Three participants answered neutral, Three answered disagree and Three answered strongly disagree.

- **Question 13. I am hesitant to use computers for fear of not being able to solve problems.**

The answers agree and disagree were most prevalent on this question, seven participants answered agreed and seven disagree. Five answered neutral while four strongly disagreed. The results on this question suggest that the participants were not hesitant in using computers for fear of not being able to solve any issues, 11 participants out of 23 either disagree or strongly disagreed with the statement(mood=disagree).

- **Questions regarding the use of computers in the classroom.**

Finally, the last seven questions using the Likert scale were related to the use of computers in the classroom (see Fig. 7).

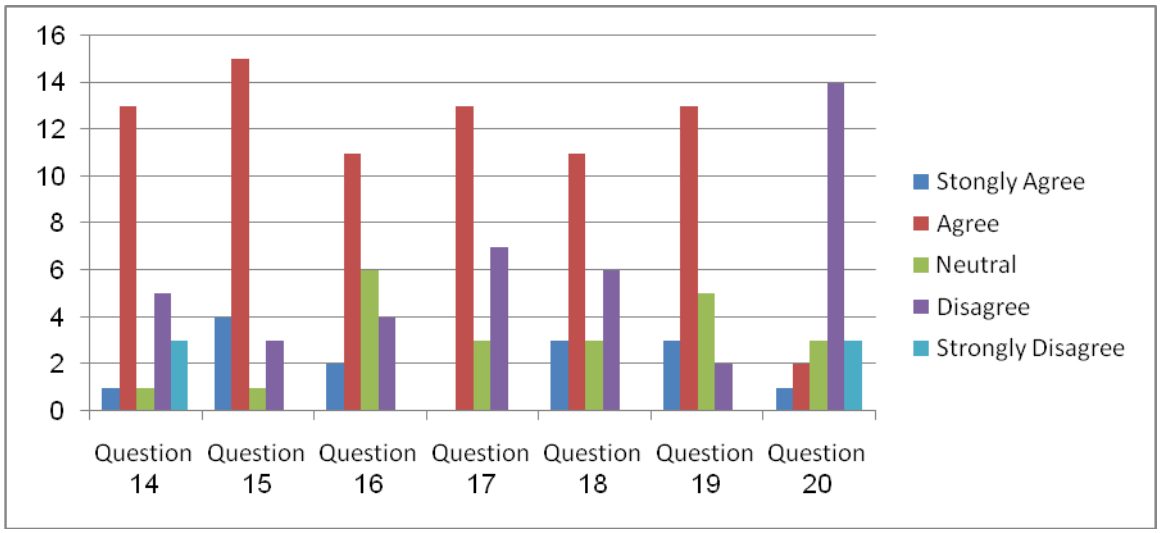

Fig 7.Questions regarding the use of computers in the classroom.

- **Question 14. It takes more time to prepare lessons when using computers.**

The majority of the teachers thought that it took more time to prepare lessons when using computers (mode=agree). Thirteen teachers agreed and one teacher strongly agreed with the statement. Three teachers strongly disagreed, and five agreed. One teacher answered neutral.

- **Question 15. I believe that students benefit from using computers in the classroom.**

A majority of the teachers believed that the students would benefit from using computers in the classroom, 15 agree and 4 strongly agree (mode=agree). Three persons disagreed while one answered neutral.

- **Question 16. There is a wide range of software to choose from.**

The majority of the participants in the research believed that there is a wide range of software to choose from (mode=agree), 11 agree and 2 strongly agree. Four teachers disagreed while 6 was neutral.

- **Question 17. Students can use the computers to practice on their mathematical skills.**

More than half of the teachers believed that computers can be used by students to practice on their mathematical skills, 13 agreed (mode=agree). However, seven teachers disagreed and three of the 23 participants marked the alternative neutral. No one marked either the alternative strongly agree or strongly disagree.

- **Question 18. Students can use the computers to extend their skills and understanding of mathematical concepts.**

Six of the teachers did not agree with the statement, suggesting that they did not believed that students can use computers to extend their skills

and understanding of mathematical concepts (mode=disagree). However, more than half of the teachers agree, 11 agree, 3 strongly agreed. Three of the participants marked the alternative neutral.

- **Question 19. It takes time for the students to get ready to use the computers.**

The time factors was explored in this question and the majority thought that it takes time for students to get ready to use computers, 13 agree, 3 strongly agree (mode=agree). Two participants disagreed with the statement and five were neutral.

- **Question 20. I will only use computers if I am told by other teachers or the Head of School.**

Finally, the last question explored if teachers only use computers if they are told by other teachers or the head of school. The majority of the teachers disagreed (14) or strongly disagreed (3) (mode=disagree) which suggests that they used computers on their own initiative. Two participants agreed and one strongly agreed with the statement, while three were neutral.

4.3 Part 3–Open ended questions

In this section, a qualitative analysis is conducted on open-ended questions. Thematic analysis is carried out where the answers are analysed according to patterns or themes (Braun and Clarke, 2006). Semantic analyses were carried out; however, no search was carried out to explore underlying ideas and assumptions.

- **Question 21. Do you think that there is a need for more support in the schools to make teachers feel confident in using computers? If yes, explain what kind of support teachers need?**

The majority of the participants answered yes there is a need for more support, 21 yes and 2 answered no. The teachers who answered yes, were asked to explain what kind of support teachers may need (several suggestions were put forward by some teachers). Two themes were identified and the criteria for a theme were that three or more of the responses could be identified as containing the pattern in answer.

- **training**. Seventeen of the teachers said that training courses in how to use computer in teaching mathematics was required. The training referred to training of the teachers, one participant mentioned training for students as well as teachers.

The other identified theme was:

- **supplying computer and software**. Four participants mentioned programmes software in teaching math via computer, while the need to provide equipment such as computers was mentioned by ten teachers. Ten of the teachers suggested that it was necessary to provide more computers in the schools. It was also suggested that it should be possible to use computers without having to change classroom (2 teachers). Thus, the teachers wanted more resources to equip the schools and the pupils with suitable technology. In addition, special material to deal with certain mathematical problems was also identified as a necessity. This answer provides support for this idea, "Yes, creating electronic class containing math programs, because there are no specialized programs in mathematics, such as the use of fractions, square roots and geometry." (Questionnaire, P20). This answer highlights a problem with training the teachers in finding suitable software and methods to use technology in the classroom.

In addition, some interesting answers that were not classified into a theme include one answer that indicates a possible lack of support from the school in using computers in the classroom, "Urging computer teachers to cooperate with students and mathematics teacher." (Questionnaire, P18). This answer suggests that teachers may have difficulties in working together with the teacher responsible for computers at the school. There may be several underlying reasons for this problem. One possible reason may be problems on a more personal level, while another possible explanation is the lack of knowledge and understanding about the importance of using computers in the mathematics classroom. Two teachers suggested that moral support was required, and one teacher suggested that incentives were needed to ensure that the teachers were motivated to use computers in the classroom.

Question 22. What do you usually do when you have lesson required using computer?

Three themes were identified:

- **prepare for the lesson.** Twelve of the teachers prepared for the lesson. These preparations consisted of making worksheets, looking up information on the internet, testing the lesson material, and using different math programmes.
- The next theme that was identified was **booking the room** in advance and five teachers were classified into this theme.

- Finally, the last theme includes answers that indicate that the teachers **did not use the computers** in the classroom. Five out of the 23 teachers answered that they did not use computers in the classroom. This theme is partly in conflict with the answer on the quantitative section, where the teachers said that they had a positive attitude towards using computers in the classroom.

In addition, two of the participants said that they ask someone for helping them, for example computer's teacher or someone who is good in using computer. One problem that was identified when teachers are required to use computers was lack of time. One teacher answered, "In the lessons where it is necessary to use computers I don't use it because of the limitation of time." (Questionnaire, P8). There may be several underlying reasons for this answer and lack of knowledge and support may be possible reasons. Another possibility is that the teacher may lack confidence in using computers to ensure that the students learn the necessary skills. This person answered that intensified training was necessary to support teachers on Question 21. Another answer suggests underlying problems related to lack of knowledge about how to use computers, "I haven't faced a lesson that need using computer but it could help but I haven't used because I don't know how to use it." (Questionnaire, P14).

Question 23. What have you wanted the Ministry of Education had done about how to use computers in the classroom before such changing in curriculum?

Training, supply computers, and curriculum were the identified themes for the answers on this question.

- The theme **training** includes answers were the participants specifically said training for the students and teachers; however, the theme also includes answers were the participants simply answered, "provide training". Seven answers mentioned the training of students and this could be compared to the answers on the question 21, which explored what the schools could have done to support the teachers. On this question, one teacher mentioned that training could be provided for students, "giving training to students" (Questionnaire, P1).
- The theme **supply computers** included suggestions such as the Ministry of Education should have equipped the school with enough computers before the implementation. Eight answers were classified into this theme.
- Finally, four answers were classified into the theme **curriculum**. One participant suggested that the Ministry of Education should have changed the curriculum so that computers are used from the first year in school. Another answer provides a similar suggestion "Prepare students

in the early stages before any change in the curriculum" (Questionnaire, P9). It was also suggested that the curriculum should be connected to real life.

One teacher (Questionnaire P16) answered, "Nothing because the new curriculum don't help in using computer". Another answer that was not classified into a theme was the suggestion to allocate a specific room for mathematics (complete math lab) (Questionnaire, P9). Finally, it was suggested that the survey should have been done before the implementation of the new curriculum.

Question 24. To what extent do you think the changes in the curriculum have encouraged you to use computers more in the classroom.

The answers on this question were classified into two themes namely, change and no change. Several small groups were identified containing two answers such as hoping that it will lead to changes and changed the way a search for information is carried out.

- **No change**: in this theme the participants suggested that the changes in the curriculum had not resulted in any change to use computer more in classroom. 9 of the participants answered that it had not led to any changes, weak, or little change. Answers such as "Unfortunately, this change was not encouraging enough to use the computer" (Questionnaire, P19) and "I have not taken any advantage of it, because we 'as teachers' have not trained to use the computer in mathematics, unless via personal effort" (Questionnaire, P20). This answer indicates that there is no support for the teachers to implement the changes; instead, the teachers have to use their own initiative and spend time to ensure that the new curriculum can be implemented into the mathematics classroom. One teacher suggested that the students were not interested in using computers. The students might were more focused on using traditional methods and this had limited the teacher's use of technology. The teacher answered, "Somewhat because the students want conventional means and do not want to use technology" (Questionnaire. P21). Finally, one teacher argued that the change in the curriculum was simply a change without any real changes in the way universities are teaching students. Changes in the way universities are working are necessary to "to develop the learner" (Questionnaire, P23).This teacher also suggested that there was no relationship between the new curriculum and the use of computers and that it was necessary to ensure that the curriculum is based on teaching strategies and the particular style of the teacher. Seven of these teachers had eleven years or more of teaching experience.

- **Changed**: The ten identified answers in this theme suggested that the implementation of the curriculum had led to them using computers more in the classroom. One of these participants answered was ”To better way by concerning computer and searching about programmes and about information in educational forums and others colleagues' contributions” (Questionnaire, P6).

4.5 Discussion

The focus of this research was to explore teachers’ attitudetowards using computers in the mathematics classroom through the new curriculum in Saudi Arabia. The results on these research questions indicate that the teachers had a positive attitude towards using computers in the classroom and they felt confident in using computers. In addition, they had a positive attitude towards the introduction of the new curriculum, which had made them more aware about using computers in the mathematics classroom. These results are similar to results of a recent study in Singapore where links were found between years of computer use, level of confidence, and computer attitudes (Teo, 2008). Zhao, et al. (2001) found that teachers’ attitudes towards using computers were correlated to the level of use of computers in the classroom. In thisresearch, there was no measurement of the level of use but ten out of the 23 participants said that they regularly used computers in the classroom. However, it was observation of how often they used computers in the classroom and they were not asked to provide an estimate.

The teachers answered that computers could be used for extending students’ mathematical skills and understanding of concepts as well as for practising on their mathematical skills. More than half of the teachers believed that computers could be used by students to practice on their mathematical skills (13 participants); however, an even higher percentage thought that computers could be used to extend skills and understanding of mathematical concepts (14 participants). The results suggest that teachers, who had long teaching experience, over 15 years, may have a more negative attitude towards using computers to teach mathematics. Two groups were identified which had not received any training in using computers, one group consisted of teachers with one to five years experiences of teaching and the other of teachers with over 15 years of experience. To gain a clear picture of the effect of teaching experience a larger sample would be required and questions need to be specifically designed to explore the relationship. The results in this research are similar to the results in a study by Abboud-Blanchard (2005) wherein newly trained teachers had a more positive attitude towards using ICT.

The majority of the teachers said that they had a positive attitude towards using computers in the mathematical classroom and the majority answered that they had experience in using computers in the classroom. A surprising result was that six of the participants answered neutral. Did they mean that they lacked experience? Or did they mean that they had little experience?. All participants except one wanted more training and this result is similar to other studies that suggest that training is a vital aspect to ensure that teachers do actually use technology in the classroom(Vrasidis and Glass, 2005). Considering that, the teachers wanted more training it is a bit surprising that they were confident in their ability to use computers. However, many of the teachers, 14 participants, felt unsure about how to fix problems with computers. In addition, approximately half the participants admitted that they were hesitant to use computers for fear of not being able to solve problems. Further training could support the teachers in using the computers in the classroom and a majority thought that the Ministry of Education could have prepared them better for the new curriculum. The results suggest that it may with training and education be possible to motivate the teachers to use technology to a higher extent in the classroom. It was also suggested that the students needed to be prepared for the new curriculum and that they may lack the necessary skills, knowledge and even motivation to use technology. One teacher argued that the students prefer traditional methods and that this had prevented him from using technology in the classroom. This result highlights the problems with making changes in the curriculum without preparing both teachers and students for the changes. In a study by Grove and colleagues (2007), teachers wanted training that contained planning and modelled pedagogical methods to support the use of technology in the classroom. The educators in this study suggested that computers needed to be available in the classroom, rather than in special rooms. One answer highlights the idea that there may be a gap between the design of the curriculum and the way teachers are working. The teacher suggested that the curriculum should be based on teaching strategies and the particular style of the teacher.

The validity of the results may be limited since random sampling was not used and only male secondary schools were included. The validity might have increased if teacher with several years of experience were matched with teachers with ten years of experience or more. Recent research suggests that there is no gender difference related to the attitudes towards computers (Teo, 2008). Nevertheless, research suggests that males often have more experience in using computers and female users may be more anxious (McIlroy, et al., 2001). In this research, the majority of the

teachers, 21 participants, believed that there is a need for more support in the schools to make teachers feel confident in using computers.

In addition, the reliability of questionnaire is debatable, since there were more questions that was answered in a positive way (agree or strongly agree) as compared to in a negative way (disagree and strongly disagree). This may suggest that the questions were formulated in a way that lured the participants into providing similar answers to all the questions. There is a risk when using Likert scales that each participant has an answer pattern, for example, all the questions are answered with either strongly agree or agree even if the answers contradict each other. A more thorough analysis could discover any underlying answering patterns. Results on a Likert scale can be regarded as being on an ordinal scale (Allen and Seaman, 2007). It is preferable to use parametric statistical tests since they are more powerful than nonparametric alternatives and therefore data on Likert scale are sometimes regarded as interval data. However, treating ordinal data as interval data is controversial (Jakobsson, 2004). Thus, results received when using Likert scale should be interpreted with caution. Strength with this research was that open questions were also used.

Moreover, this was a single measurement and it was not possible to determine how stable the answers were. Changes over time are necessary to explore and a longitudinal design could be used to examine the attitude over time. The pattern is that on most questions the participants choose to avoid both strongly agree or strongly disagree: however, this is may change on other occasion. There is a tendency to avoid extreme values and to choose neutral instead of taking side. In this research, this behaviour could explain the results on some of the questions. On question 3, over one quarter of the participants used the neutral alternative when asked if the changes in curriculum had made them aware of using computers in the classroom. This response could suggest that there had been no changes in their thoughts or that they did not know how to interpret their changes on the scale. Thus, a problem with Likert scale is to interpret neutral answers and sometimes only four options are used to force the participants to either agree or disagree with the statements (Allen and Seaman, 2007). However, this approach was not used in this research.

Conclusion:

The goal of the research was to examine teachers' attitudes towards using computers in the mathematics classroom. The results from the quantitative and qualitative parts of the research suggest that the teachers have a positive attitude towards the use of computers in the classroom. One aim with the research was to explore if there is a gap between the theoretical application of computers in the mathematics curriculum and its

practical use due to teacher attitudes and lack of technological skills. The results do not support the idea that the teachers choose not to use computers in the mathematics classroom due to a negative attitude towards using computers. Instead, practical problems such as lack of training in how to use computers mixed with a lack of resources in the form of computers may have been factors that contributed to the teachers not using computers. The time factor was also a problem where the majority of the teachers thought that it took time for the students to get to use computers. In addition, the teachers thought that it takes longer time to prepare lessons where computers are going to be used.

Training was identified as vital to ensure that computers were used in the classroom and this result is supported by other studies. Goos and Bennison (2008) found that teachers wanted more information related to how to integrate technology into the classroom. The training of students was mentioned more frequently when the teachers were asked what the Ministry of Education could have done before the changes in the curriculum were made. In this research, there were no specific questions related to what sort of training that the educators would like and a quick survey could provide the Ministry of Education in Saudi Arabia with more specific information related to what type of professional development training that the teachers would benefit from. For example, enhance the understanding of suitable ways to use computers to enhance students' problem solving skills. Also, it is possible that teachers with extensive teaching experience will require different type of professional development training as compared to teachers who have recently graduated. It is possible that educators with little experience of using computers could benefit from understanding of a more general nature, for example, training in how to use computers as compared to how to challenge students' thinking by using different types of software. Vrasidis and Glass (2005) found that lack of training could lead to a failure in acknowledging the potential of computers. A difference in the attitude towards computers was identified, where the teachers with the most experience had a more reluctant and negative attitude. According to Heinecke and Adamy (2010), the progress and changes in technology may be difficult to embrace in a subject such as mathematics. Thus, ways to support this group of teachers may be required and it is possible that their training should be of a different kind as compared to teacher with little experiences of teaching mathematics.

Another aim with this research was to understand teachers beliefs about the use of ICT in the new mathematics curriculum in Saudi Arabia.Results revealed that despite a positive attitude towards the new curriculum and recognition that ICT is important, there are several aspects

that can enhance the chances that educators use computer in the classroom. The lack of resource in the form of computer and software was mentioned as possible areas where a change could have a positive effect in the terms of teachers actually using computers more frequently in the classroom. It is not possible to draw any conclusion regarding how the teachers used the computers in the classroom; however, the majority answered that computers could be used to more interesting and challenging work. This result is positive and in contrast to the results received in a study of Chinese primary school teachers, where computers were used as a way to enhance learning but also for preparations of activities (Sang, et al., 2011). The teachers in this research agreed that computers could be used to enhance students' skills and this could be interpreted as a success for the new curriculum (two teachers were neutral and disagreed, while one teacher strongly disagreed). If the new curriculum had not been received in a positive light, the answers might have been of a different character wherein more teachers would believe that computers were more useful for other tasks than actually challenging students and providing them with opportunities to grow in their mathematical skills. Goldberg (2000) argues that teachers need to be aware of the different roles that technology can play in teaching mathematics and a possible interpretation is that the Ministry of Education in Saudi Arabia has managed to spread the idea that computers are an important educational tool.

Experience in using Computers wasmentioned as a vital issue in this research.Are a positive attitude towards using computers in the classroom linked to access to computers in the home environment? Al-Khaldi and Olusegun Wallace (1999) found that the use of computers in Saudi Arabia was linked to access to personal computers. The use of computers in the home environment was not examined in this research. However, the results of this research revealed that the teachers wanted more training yet the majority felt confident in their ability to use computers in the classroom. Feeling confident about how to use computers may not rule out the desire to learn more and gain more knowledge about ways to use ICT in the classroom. Over one quarter of the participants did not feel confident and a couple of participants answered neutral on the Likert scale. Thus, this result supports the idea that more training would be beneficial. Actively using computers enhances not only educators' skills and knowledge about computers it may also lead to a more positive attitude towards.

On the other hand, unsuccessful experiences can act as a barrier for not using computers (Lim and Khine, 2006). The majority of the educators answered that they lacked knowledge about how to fix problems with the computer. However, the participants did not avoid using the computers for

fear of not being able to solve problems with the computer. This result suggests that the educators might receive help and support at the school to solve problems with the computers.

Overall, the educators had a positive attitude towards using computers in the classroom and the implementation of the new curriculum might have further inspired them not to let fear of using computers prevent them for actually using them in the classroom. However, this result should be carefully interpreted since there is no actual measurement on how often computers were actually used in the mathematics classroom. It is also possible that the majority of the educators who were not afraid of using computers were the teachers with the least experience. According to Abboud-Blanchard (2005), teachers who have recently become teachers have a more favourable attitude. A more detailed analysis of the results could reveal underlying patterns in the answers. For example, the answers for teachers with more experience could be compared to the teachers with less teaching experience. There were also difference in the amount of training in using computers that the teachers had received and the majority of the teachers who had between 1 to 5 years of teaching experience had not participated in any training. There were also some teachers who had more than 15 years of teaching experience who had not attended any training and it is possible that there are differences in these groups' attitude towards using computers and in the amount of time they actually use computers in the classroom. The sample in this research was small, and further analysis of these results would be analysing groups with less than five participants, which means that it is statistically difficult to draw any conclusions regarding the results (Ary, et al., 2010).

Another aspect that is vital to evaluate is that teaching material. A wide range of resources is available in mathematics but many teachers are not using the material (Lagrange et al., 2003). Lack of material was mentioned by the participants and ways to integrate technology into the curriculum relies upon the teachers finding material to support their teaching. Obeikan Education has developed a range of material to support the implementation of the new curriculum and it is possible that some of the teachers were not familiar with this material (Obeikan Education, 2013a). Lack of suitable software was mentioned as a problem and Obeikan Education Company has provided educational software and websites to ensure that teachers can access material. Four out of the 23 educators did not believe that there was a range of software to choose from and six participants answered neutral. A problem with Likert scales is to interpret neutral answers. A participants may truly feel neutral about a subject and not providing them with a neutral midpoint can lead to

respondent bias, where the participant are forced to choose an answer that is either positive or negative. Overall, in this research the neutral responses were rare yet an explanation to the response would be helpful in some of the incidents were the neutral option was used. A combination of methods could overcome this problem, for example, using a mixture of interview and questionnaire. In this research, this option was not chosen due to the fact that it was regarded as vital to ensure that the participants could be anonymous. The researcher's work as a supervisor in mathematics in this region of Saudi Arabia could have influenced the participants to choose certain options.

Regarding the priority of the Ministry of Education,there were a high number of neutral responses. Seven out of 23 educators answered that they were neutral when asked if the priority should be to ensure that all the students could use traditional tools to support economic and social development. Almost half of the teachers agreed or strongly agreed with the statement. On reflection, this question is difficult to answer since it is possible to agree with half of the statement while disagreeing with the other half. Thus, it is possible to agree with the idea that the focus should be on ensuring that all the students can use traditional tools, while disagreeing with the idea that this will support economic and social development. In a follow-up research, the two ideas could be separated to minimise the confusion. To support this interpretation is the answers on the question related to if the curriculum should encourage the use of computers in the classroom where only one teacher strongly disagreed. In addition, there was a positive response related to the suggestion that students can do more interesting and challenging work when using computers.

An important question that was explored in this research was the perception on the new curriculum and the results related to if the new curriculum had made the teachers more aware of using computers in the classroom is a bit difficult to interpret. The majority did agree with the statement indicating that the Ministry of Education had succeeded in changing the educators' attitude towards using computers. Measuring attitudes is in itself a complicated process where the attitude may vary from different occasions. Thus, attitude measurements have low reliability since a new measurement may not produce similar result even if there was only a short time period between the two measurements. Another problem in this research is that there was no measurement related to the attitudes towards using computers before the implementation of the new curriculum. However, the majority of the teachers believed that their attitudes had positively changed since the introduction of the new curriculum. Research suggests that teachers' view upon technology is based upon their own

learning (Habre and Grundmeier, 2007). In a study by Habre and Grundmeier (2007), the teachers view upon using technology in the classroom were based upon their own learning experiences and the teachers preferred the methods they were used when they were learning a subject. The results from this research do not support the results in this research since the teachers had a positive attitude towards the new curriculum. A possible explanation is that the teachers in the study by Habre and Grundmeier were prospective teachers who lacked experience of teaching students.

5.3 Recommendations for Further Studies:

It is vital to monitor the educators' attitudes and to provide measurements of how much computers are actually used in the mathematics classroom. These types of data could be collected by using classroom observations but they can also be collected by using journals where the educators describe the number of sessions where they have used computers in the classroom for a certain period. Furthermore, it is possible that the Heads of Schools' attitude and knowledge influence the teachers' attitude and the amount of time they let their students use computers. A correlational study could explore the Heads of Schools attitudes and measure the amount of time that teachers at the school in question use computers.

Moreover, only male teachers took part in this study and there may be gender differences. A similar study could be conducted in secondary female schools and the results could be compared.

References

Abboud-Blanchard, M. (2005).Uses of ICT by pre-service teachers. In F. Olivero and R. Sutherland (Eds.), *Proceedings of the 7th International Conference of Technology in Mathematics Teaching, 2, 74–78*. Bristol: John Cabot City Technology College.

Albirini, A. (2006). Teachers' attitudes toward information and communication technologies: the case of Syrian EFL teachers. *Computers & Education*, 47(4), 373–398.

Al-Alwani, A. (2005). *Barriers to Integrating Information Technology in Saudi Arabia Science Education.* Doctoral dissertation, the University of Kansas, Kansas.

Al-Khaldi, M. A. and Olusegun Wallace, R. (1999). The influence of attitudes on personal computer utilization among knowledge workers: the case of Saudi Arabia. *Information & Management,36(4), 185-204.*

Allen, I.E. and Seaman, C.A. (2007). Likert Scales and Data Analyses.*Quality Progress, 40(7): 64-65.*

Andrews, P. (1999). Some institutional influences on secondary mathematics teachers' use of computers.*Journal of Education and Information Technologies, 4(2), 113-128.*

Ary, D., Jacobs, L. C., Razavieh, A and Sorensen, C. (2010).*Introduction to research in education*.8th ed. California: Thomson Wadsworth.

Babbie, E. (2010). *The Practice of Social Research.*California: Wadsworth Publishing Company.

Bingimlas, K. (2009). Barriers to the successful integration of ICT in teaching and learning environments: a review of the literature. *Eurasia Journal of Mathematics, Science & Technology Education,* 5(3), 235–245.

Braun, V. and Clarke, V. (2006).Using thematic analysis in psychology.*Qualitative Research in Psychology, 3 (2).77-101.*

Brosnan, M. and Lee, W. (1998). A cross-cultural comparison of sex differences in computer attitudes and anxieties: The United Kingdom and Hong Kong. *Computers in Human Behavior,14(4), 559-577.*

Cohen, L., Manion, L. and Morrison, K. (2007).*Research methods in education.*Abingdon: Routledge.

Cox, M., Preston, C. and Cox, K. (1999). *What Factors Support or Prevent Teachers from Using ICT in their Classrooms?***Paper presented at the British Educational Research Association Annual Conference, University of Sussex at Brighton, September 2-5 1999.**

Doerr, H.M. and Zangor, R. (2000).Creating meaning for and with the Graphing Calculator.*Educational Studies in Mathematics, 18(2), 13-20.*

Edwards, J.A. and Wright, D. (2005).*Integrating ICT into the mathematics classroom.* Derby: ATM.

Empirica (2006).*Benchmarking access and use of ICT in European schools 2006: Final report from Head Teacher and Classroom Teacher Surveys in 27 European countries*. Germany: European Commission.

Garofalo, J., Drier, H., Harper, S., Timmerman, M.A., and Shockey, T. (2000).Promoting appropriate uses of technology in mathematics teacher preparation.*Contemporary Issues in Technology and Teacher Education, 1(1),66-88.*

Goldenberg, E.P. (2000). Thinking (and talking) about technology in math classrooms. *Education Development Centre, Inc.*Retrieved 02/04/2013 from: http://www2.edc.org/mcc/pdf/iss_tech.pdf.

Goos, M. and Bennison, A. (2008).Surveying the technology landscape: Teachers' use of technology in secondary mathematics classrooms.*Mathematics Education Research Journal, 20(3), 102-130.*

Grove, K., Strudler, N. and Odell, S. (2007). Assessing Technology integration in mentoring practices during student teaching: Multi-case.*International Journal of Technology in Teaching and Learning, 3(1), 66-82.*

Habre, S. and Grundmeier, T.A. (2007).*Prospective mathematics teachers' views on the role of technology in mathematics education.*The Journal, 3 (Technology).Retrieved on April 02, 2013 from:http://www.k-12prep.math.ttu.edu/journal/technology/habre01/article.pdf.

Hardy, J. (1998). Teacher attitudes toward and knowledge of computer technology.*Computers in the Schools, 14(4), 119–136.*

Heid, M.K., Sheets, C. and Matras, M.A. (1990). Computer-enhanced algebra: New roles and challenges for teachers and students. In T. Cooney (Ed.), *Teaching and Learning Mathematics in the 1990s, NCTM 1990 Yearbook, pp. 194-204.* Reston, Va: NCTM.

Heinecke, W. and Adamy, P. (2010).*Evaluating technology in teacher education.*Boston: IAP. 213

Hope, W. C. (1997). Resolving teachers' concerns about microcomputer technology.*Computers in the Schools, 13 (3-4), 147-160.*

Huang, H.M. and Liaw, S.S. (2005).Exploring user's attitudes and intentions toward the web as a survey tool.*Computers in Human Behavior*, 21(5), 729-743.

Jakobsson, U. (2004). Statistical presentation and analysis of ordinal data in nursing research.*Scandinavian Journal of Caring Sciences, 18, 437-440.*

Jurdak, M. (2009).*Towards equity in quality in mathematics education.*New York: Springer.

Kersaint, G. (2007). Toward technology integration in mathematics education: A technology integration course planning assignment. *Contemporary Issues in Technology and Teacher Education, 7*(4), 256-278.

Kersaint, G., Horton, B., Stohl, H. and Garofalo, J. (2003).Technology beliefs and practices of mathematics education faculty.*Journal of Technology and Teacher Education, 11(4), 549–577.*

Laborde, C. (2001). Integration of technology in the design of geometry tasks with Cabri-Geometry. *International Journal for Computers in Mathematical Learning, 6(3), 283-317.*

Lagrange, J.-B., Artigue, M., Laborde, C., and Trouche, L. (2003). Technology and Mathematics Education: a Multidimensional Study of the Evolution of Research and Innovation. In A.J. Bishop, M.A. Clements, C. Keitel, J. Kilpatrick, and F.K.S. Leung (eds.), ***Second International Handbook of Mathematics Education, pp. 239-271.*** Dordrecht:**Kluwer Academic Publishers.**

Lim, C.P. and Khine, M.S. (2006).Managing teachers' barriers to ICT integration in Singapore schools.*Journal of Technology and Teacher Education, 14(1), 97-125.*

Locke, L.F., Spirduso, W.W. and Silverman, S.J. (1993).*Proposals that Work: a Guide for Planning Dissertations and Grant Proposals*.5th ed.Thousand Oaks, California: SAGE Publications,Inc.

Lowry, G. and Turner, R. (2007).*Information systems and technology education.*London: Idea Group Inc.

Markauskaite, L. (2006). Gender issues in pre-service teachers' training: ICT literacy and online learning. *Australasian Journal of Educational Technology, 22(1), 1-20.*

McIlroy, D., Bunting, B., Tierney, K. and Gordon, M. (2001).The relation of gender and background experience to self-reported computing anxieties and cognitions.*Computers inHuman Behavior, 17, 21-33.*

Ministry of Education, (1986).Development of Education in the Kingdom of Saudi Arabia. Riyadh, Saudi Arabia.

Ministry of Education, (2006).Development of Education in the Kingdom of Saudi Arabia. Riyadh, Saudi Arabia.

Obeikan Education, (2013a).General Education.Retrieved on March 02, 2013 from:http://obeikaneducation.com/obeikanmodules/supportpage/k12_edu.

Obeikan Education, (2013b).General Education.Retrieved on March 03, 2013 from:http://obeikaneducation.com/viewer/epubreader_new/index.php?id=431&projid=87&type=free&lang=ar_SA&username=.

Obeikan Education, (2013c).Educational books.Retrieved on March 02, 2013 fromhttp://obeikaneducation.com/obeikanmodules/ebooks/index/all/3/87/0 .

Obeikan Education. (2013d). About us. Retrieved 17/05/2013 from:http://obeikaneducation.com/obeikanmodules/supportpage/about_us

Oliver, E. (1987).*Saudi Arabia: A Study of the Educational System of Saudi Arabia and a Guide to the Academic Placement of Students in Educational Institutions of the United States*. Washington. D. C. : AACRAO World Education Series.

Phelan, C. and Wren, J. (2006).Exploring reliability in academic assessment.UNI Office of Academic Assessment. Retrieved 23/05/2013 from:http://www.uni.edu/chfasoa/reliabilityandvalidity.htm

Pierce, R. and Ball, L. (2009). Perceptions that may affect teachers' intention to use technology in secondary mathematics classes. *Educational Studies in Mathematics, 71(3), 299-317.*

Rovai, A.P. and Childress, M. D. (2002). Explaining and predicting resistance to computer anxiety reduction among teacher education students. *Journal of Research on Technology in Education,35(2), 226-235.*

Russell, M. and Haney, W. (1997). Testing writing on computers: An experiment comparing student performance on tests conducted via computer and via paper-and-pencil. *Education Policy Analysis Archives, 5(3).*

Sang, G., Valcke, M. and van Braak, J. (2011). Predicting ICT integration into classroom teaching in Chinese primary schools: exploring the complex interplay of teacher-related variables. *Journal of Computer Assisted Learning, 27(2), 160–172.*

Schrum, L. and Levin, B. (2009).*Leading 21st-century schools: harnessing technology for engagement and achievement.* London: Corwin Press.

Swanson, R. (2005). *Research in organizations: foundations and methods of inquiry.* New York: Berrett-Koehler Publishers.

Teo, T. (2008). Pre-service teachers' attitudes towards computer use: A Singapore survey. *Australasian Journal of Educational Technology, 24(4), 413–424.*

Yuen, H. K. and Ma, W. K. (2002).Gender differences in teacher computer acceptance.*Journal of Technology and Teacher Education,10(3), 365-382.*

Vrasidis, C. & Glass, G. (2005).*Preparing teachers to teach with technology.*Boston: IAP.

Wiest, L.R. (2001). The Role of Computers in Mathematics Teaching and Learning.*Computers in the Schools, 17(1-2), 41-55.*

Windschitl, M. and Sahl, K. (2002).Tracing Teachers' Use of Technology in a Laptop Computer School: The Interplay of Teacher Beliefs, Social Dynamics, and Institutional Culture.*American Educational Research Journal, 39(1), 165-205.*

Zhao, Y., Tan, H.S. and Mishra, P. (2001). Teaching and learning: Whose computer is it? *Journal of Adolescent & Adult Literacy,44(4), 348–354.*