The Potential Impact of ICT on Children's learning in Science. Teachers' perspectives in the EYFS: A comparative study between England and Saudi Arabia

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ABSTRACT:

It was the purpose of this research study to elicit the views of preschool practitioners in England and the Kingdom of Saudi Arabia, in order to determine how they consider the science element in their respective curricula would be best taught. The principal method used for the research was a questionnaire using closed and open-ended questions. The results show many similarities between the two groups of practitioners. For example, most had good knowledge of what was in their respective curricula, had received some ICT training and had some ICT equipment available for their classrooms. Most also saw the value of using both ICT and non-ICT exercises in their preschool science lessons. However, significant differences were also apparent between the two groups. The Saudi practitioners seem to make use of more passive ICT equipment such as videos, while those from England are using more active tools such as digital cameras. The practitioners from the KSA reported that children prefer non-ICT methods in science; the opposite was said by the England practitioners. And the Saudi practitioners appear to require additional general online support, technical ICT assistance and continuing professional development, in order to ensure the appropriate use of ICT in their science teaching; these are recommendations that the Saudi Arabian government should consider seriously.

Keywords: ICT, Science, perspectives, EYFS, comparative study.

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تصورات معلمي مرحلة التأسيس للتأثير المحتمل لتكنولوجيا المعلومات والاتصالات على تعلم الأطفال للعلوم: دراسة مقارنة بين إنجلترا والمملكة العربية السعودية

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مستخلص:

يتمثل الهدف الرئيس للدراسة الحالية في استطلاع آراء المعلمين في مرحلة ما قبل المدرسة في إنجلترا والمملكة العربية السعودية حول أفضل سبل تدريس العلوم في مرحلة التأسيس قبل المدرسة، ولقد اعتمدت الدراسة بصورة رئيسة على استبانة في جمع البيانات باستخدام مجموعة من الأسئلة المغلقة والمفتوحة، ولقد أظهرت نتائج الدراسة العديد من صور التشابه بين مجموعتي المعلمين في كلا الدوليتين؛ فعلى سبيل المثال، كان لدى معظمهم معرفة جيدة بما هو موجود في المناهج الدراسية، كما أن معظمهم قد تلقى بعض التدريب على تكنولوجيا المعلومات والاتصالات وسبل توظيفها داخل البيئة الصفية، إضافة إلى ذلك، فلقد أشار معظم المعلمين إلى أهمية استخدام كل من تمارين تكنولوجيا المعلومات والاتصالات وغيرها في تدريس العلوم في مرحلة ما قبل المدرسة، من ناحية أخرى، كانت هناك اختلافات كبيرة واضحة بين المجموعتين، حيث يستخدم المعلمون السعوديون صور أكثر سلبية لتكنولوجيا المعلومات والاتصالات مثل مقاطع الفيديو، بينما يستخدم المعلمون في إنجلترا صوراً أكثر تفاعلية مثل الكاميرات الرقمية، كما أفاد المعلمون من المملكة العربية السعودية أن الأطفال يفضلون أساليب مختلفة من تكنولوجيا المعلومات والاتصالات في العلوم تختلف عن تلك التي ذكرها المعلمون في إنجلترا، ومن ثم يبدوا أن المعلمون السعوديين يحتاجون إلى دعم عام إضافي ومساعدة عبر الإنترنت في مجال تكنولوجيا المعلومات والاتصالات والتطوير المهني المستمر، من أجل ضمان الاستخدام المناسب لتكنولوجيا المعلومات والاتصالات في تدريس العلوم والتي يجب على حكومة المملكة العربية السعودية النظر فيها بجدية.

الكلمات الرئيسية: تكنولوجيا المعلومات والاتصالات، العلوم، تصورات، مرحلة التأسيس الأولى، دراسة مقارنة.

Introduction

From city to city in the Kingdom of Saudi Arabia (KSA), there exists a remarkable gap between the education system, implementation of the curriculum and finally the use of technology in the classroom. As a Saudi Arabian national presently living in London, in the UK, and have previously qualified as a preschool teacher and have worked in the education system there, I endeavour to complete comparative research between the KSA and England in the Early Years Foundation Stage (EYFS).

There are presently many concerns in developed countries about the lack of public interest in science, and the interest of school pupils in science and science careers has not been good. Recommendations for improvement include that provided by the Walport Report (2010) for more hands-on and exploratory science; The Royal Society (2010) recommends increasing the numbers of primary teachers with science expertise; SCORE's (2009) advice to primary teachers is to provide good quality practical work: 'Science without practical is like swimming without water'.

In 2009 Brenneman *et al* published in the NIEER a policy brief on *Maths and Science in Preschool: Policies and Practice (Brenneman et al. 2009)*. This report claims that evidence suggests that preschool teachers tend not to support adequately science teaching; the authors recommend more research on curricula, standards and expectations in math and science. They conclude that a great deal of effort, time and funding is needed to address these issues, and in order to achieve success, teachers will need to be part of the process of change.

As a result, governments like the UK have been studying science teaching, and changes in policy, teacher training and

science education programmes in both the primary and secondary National Curricula have been introduced (Murphy et al., 2007). ICT (information and communication technology) is also included in these Curricula, including ICT in science (DCSF 2008a). In this report, reference is made to work such as that of Williams and Easingwood (2003) on software selection to boost traditional science teaching; Laurillard's (2008) suggestions about including only appropriate technology into science; and Murphy's (2007) survey of primary school teachers attitudes to how science can be enhanced with technology.

At the same time as these studies on science and associated ICT provision at the primary level have been carried out, the government has been developing curricula for preschool children, also containing aspects of science and ICT. In the English EYFS (DCSF 2008a) there are separate sections for both science and ICT. Smyth (2007) believes that science and technology are especially closely linked, even at preschool level, and that the main aims of both science and technology should be 'to do' – 'I hear and I forget, I see and I remember, I do and I understand'.

In the KSA there is an extensive provision of early childhood education and a curriculum for teachers to follow known as the Self learning Curriculum (SLC) (MOE KSA 2005). Although there are large differences between this curriculum and that of the English EYFS, there are also many similarities. For example, science is included in the preschool teaching programme, and progression to primary school science is expected. On the other hand, the Saudi teachers are given clear instructions about the science topics to cover and even how long to spend on each topic. ICT is not mentioned as a separate topic in this curriculum, although preschools have been provided with computers. There is some flexibility about how to deliver the curriculum (Warwick 2006).

Thus, it can be seen that there is interest from governments in improving the quality of science (and ICT) education for all children at all ages, including preschool children. The roles of preschool teachers in this learning are important to define, and the teachers' views about how to best deliver these aspects of the curriculum are very important if the implementation are to be successful. It is the aim of this dissertation to examine the science curriculum presently put in place for preschool children in England and to investigate the use of ICT while teaching science. A similar examination will be carried out in relation to the KSA education system. One of the main aims will be to compare these two education systems, and another goal will be to distinguish the teachers' approaches to ICT from that work done with 'real' objects in science (figure 1). Consequently, the research questions addressed in this study are:

A. How is science taught in preschools in the two countries?
B. What are teachers' perspectives on the use of ICT in teaching science in preschools in the two countries?
C. In what ways do teachers feel that ICT makes a distinctive contribution to teaching and learning in science?
D. Which form of lesson preparation is felt to be time efficient?
E. Which form of teaching is reported as engaging children most in science at EYFS in both England and the KSA?

The study will utilise a survey of English and Saudi Arabian preschool teachers, to determine how capable they feel in executing the present science curriculum, the extent to which they use ICT in their science teaching and its effectiveness. The results of this survey will be used in consideration of how best to improve the science teaching for preschool pupils using ICT.

The Theoretical Framework of the Study

The EYFS Curriculum in England

England now has a curriculum for the EYFS (DCSF 2008a). This follows on from the Curriculum Guidance for the Foundation Stage, first published in 2000. The EYFS Statutory Framework states that the main outcomes from foundation stage education are for each child to stay safe, be healthy, enjoy and achieve, make a positive contribution, and achieve economic well-being. The means of doing this are set out as best achieved by setting standards, providing equality of opportunity, creating a framework of partnership between adults and settings, improving quality and consistency by creating a universal set of standards, and laying a secure foundation for future learning. The English EYFS is a comprehensive framework which sets the standards for learning, development, and care of children from birth to five (preschool would be part of this period). Children attending nurseries and reception classes are included in the EYFS.

In order to help practitioners responsible for implementing the EYFS, they can turn to practice guidance and practice cards published on line. Practitioners are encouraged to plan activities for preschool children based on first-hand experiences, to teach skills and knowledge in the context of practical activities, to encourage children to talk about their work and to support them with ICT. Topics such as exploration and investigation, designing and making, and ICT are included, and standards for all ages from birth to 5+ are listed.

One of the four themes of the EYFS is ‘Learning and Development’. Within this theme is ‘knowledge and understanding of the world’, where both Science and ICT are included. Although practitioners are given, for both science and ICT, development matters, notes on effective practice and

how to plan and resource, much of this is gained through experience (DfES 2010).

Preschool Education in the Kingdom of Saudi Arabia

In 1986 the KSA government first suggested developing childcare for preschool children (MOE KSA 2005). Subsequently, in 1991 a project was devised for continuing development and growth in the preschool education sector, and this resulted in a defined curriculum which included the following aims: developing the skills of local Saudi staff; to determine a universal set of resources and fixed sources of information so as to provide a unified view for all teachers in preschool education and staff concerned with child issues, thus this will provide a mental and educational framework; to improve the standard of all groups working with children in the entire Kingdom, so that all nursery children and their mothers could benefit. Most importantly, the foundation of the educational curriculum is the religion of Islam in the KSA (Samadi & Marwa 1991).

The KSA preschool curriculum

The first official curriculum was created and developed by the Presidency of Girls' Education in Saudi Arabia, the Arab Gulf Programme for the United Nations Development Organisation (AGFUND) and the United Nations Education, Scientific and Cultural Organisation (UNESCO 2006) (MOE KSA 2005).

As of 2005 there has been a revamped curriculum known as the 'Self Learning Curriculum' (SLC) (MOE KSA 2005). In many respects this mirrors the English EYFS Framework. For example, the curriculum places an emphasis on children's self development and learning. It is regarded as a source of comprehensive information for early year teachers in the KSA and also those responsible for training in the educational field.

It puts forward a disciplined educational framework, the goals of which are determined by both theories and practical applications. Teachers can also utilise it to develop an educational understanding, gain direction and improve their knowledge of practical learning methods.

The SLC as updated in 2005 has only minor modifications to the teaching units (Badawood 2006), and The Teacher's Manual Guidance (TMG) provided has not been changed. The general goals as first formulated in 1970 have withstood the test of time. However, according to Badawood (2006), these goals now include more theoretical aspects, and there is some overlap between goals. On the other hand, despite the changes which have been made in the written teaching curricula in Saudi Arabia, there is, in the opinion of many, little evidence of major improvement in educational standards since its first introduction in 1991 (Badawood 2006).

The SLC includes a book on the Main Curriculum, fundamental for nursery teachers as a reference guide and a source of information, and other curriculum books entail aspects of the teaching units and schemes of work (MOE KSA, 2005) (See Appendices A and B). Similarly to the English EYFS Framework, a teacher can choose learning units according to what would best suit the teacher and the children, alternatively a group of teachers can agree between them on choosing different learning units. This will depend to some degree on the nursery facilities and the availability of equipment, tools and materials, such as ICT facilities.

In comparison with England, the only KSA preschools that adhere strictly to the SLC curriculum are the government ones. However, the official curriculum has not changed since 2005; moreover, the SLC has some weaknesses, and it shall be argued below (Al–Ameel 2002).

Al–Ameel (2002) studied and subsequently published work on the effects of different types of preschool curricula on some aspects of children's experiences and development in Saudi Arabia. She noted that there was no clear policy concerning preschool teacher training and there was a lack of educational activities in areas such as mathematics, language and science. Additionally, Zamzami (2000) argued that, although the curriculum met the needs of preschool children, there was a lack of educational activities, especially in reading and writing areas.

In an investigation by Al-Swailam (2005) of Saudi Arabian teachers' attitudes towards the objectives of pre-school education, these researchers found that the teachers put the development of educational activities (reading, writing and mathematics) and preparation for elementary school, last on their lists. Their first choice was an emphasis on religious concepts. Saber (1996) also studied the difficulties that face Saudi Arabian pre-schools when they attempt to apply the Self Learning Curriculum. The main finding of this researcher was that there was/is a lack of qualified teachers and educational activities related to mathematics, reading and writing. Published research shows that this curriculum needs to be developed by adding more activities, materials (Al-Sunaie 2009) and the use of ICT.

Of special significance in the KSA is the fact that the views and perspectives of preschool practitioners are rarely surveyed. This research project will address these views and perspectives and aims to set the scene for developing more extensive research on preschool programmes in the KSA.

The science curriculum in the KSA largely stems from that laid out in the UK preschool curriculum (EYFS). Despite the fact that science is seen to be a means to satisfy the

curiosity and drive which children have to discover new things about the world, science in many preschools consists of only a science corner with only basic tools. However teaching science in the modern world needs more advanced equipment, including the integration of ICT and practical work (Al-Sunaie 2009).

Questions of the Study

The role of ICT in helping to meet these aims is presently being discussed and is still an issue. Therefore, this study addresses the research questions of how teachers in both countries view curriculum provision, including the use of ICT in science at preschool level. The specific questions to be answered are:

A. How is science taught in preschools in the two countries?
B. What are teachers' perspectives on the use of ICT in teaching science in preschools in the two countries?
C. In what ways do teachers feel that ICT makes a distinctive contribution to teaching and learning in science?
D. Which form of lesson preparation is felt to be time efficient?
E. Which form of teaching is reported as engaging children most in science at EYFS in both England and the KSA?

One of the first useful steps in answering these questions is to survey the views of early years practitioners. It is the aim of this research to do this, both in England and in the KSA. A questionnaire issued to preschool teachers from both countries is the main method being used.

Method

It was indicated the use of ICT in preschool and primary level is integrated into science to a certain extent in England, whereas in the KSA this appears to be negligible. Furthermore, the literature review illustrates that there is a minimal amount of research on teachers' perspectives on the use of ICT in preschool science in both England and the KSA.

Therefore, this research study is designed to investigate these issues. It is essential to investigate teachers' perspectives, as on a daily basis they interact with and implement the curriculum. Moreover, making teachers voices heard raises the importance of teachers and the value that they add to education. This chapter presents a detailed description of the method used for this study.

Designing and conducting the study

Brookson (2010) states that adults (parents, carers and teachers) play a major role in aiding children's learning and development, and furthermore integrating ICT into this learning has had a significant effect, particularly in numeracy, literacy and science. Therefore, if the governments in both the KSA and England could be continuously kept informed of the views of teachers this could help improve future curricula and approaches to learning. The primary focus of this study was to determine the effectiveness of using ICT in teaching science at the EYFS and the views of practitioners.

Context

In the KSA, are a total of 1449 nurseries (aged 3-6) including both state and independent preschools. In England there are a total of 448 nurseries (aged 3-4) and 17,361 primary schools (catering for ages 4+) (MOE KSA 2005). Thus England has more EYFS provision than the KSA; but this could simply be due to the larger population of England (DSCF 2007). In both countries, trainee teachers gain varying levels of science and ICT experience, somewhat dependent upon the university or college at which they train. There is also some in-service provision.

Teachers' perspectives are importants can influence educational research in a critical and positive way, particularly as teachers implement the curriculum on a daily basis and face

the challenges of children's engagement. Determining their views is thus of utmost importance.

Research approach and design

Research in education typically utilises quantitative, semi-quantitative and qualitative research methods, these methods serve different purposes (Punch 2010). Previous studies conducted on teachers' perspectives have involved the use of surveys, focus groups, interviews and observations (Barak 2006; Bruce 2010a; Wong & Tsui, 2007). Bruce (2010a) carried out research on teachers' perspectives of ICT using surveys and this was followed up by focus groups. For this study, data was collected using a similar approach as Bruce (2010a) however, the element of the focus group was not feasible for this comparative study due to the constraints of the involvement of two different countries.

A semi-quantitative approach was employed, using a self-administered questionnaire. The questionnaire was first translated into Arabic before being used in the KSA. It was administered in two forms, paper and online for those who could access it (See appendix C). Several data collection approaches were considered and were not selected for specific reasons.

Research question A, 'How is science taught in preschools in the two countries?' has been primarily answered in the literature review. To further complement this, an interview approach can be used complemented by school visits, thus individual interviews could have been conducted by telephone to Saudi Arabia and England and classroom visits made, however, due to time and cost constraints this was not entirely feasible. However, a few informal school visits were made.

Research question B, 'What are teachers' perspectives on the use of ICT in teaching science in preschools in the two countries?' can be addressed through the questionnaire and/or

face to face interviews, however, due to time limitations and the necessity to travel to the KSA during term time, the latter was highly impractical.

Research question C stated 'In what ways do teachers feel that ICT makes a distinctive contribution to teaching and learning in science?', this could be adequately addressed through a focus group setting and would encourage open critical discussion of the topic but some teachers may shy away from open discussion and the lack of anonymity during the discussion may prevent teachers from being completely honest. To tackle this, a self administered questionnaire providing open and closed questions relating to research question C will effectively address this.

Research question D, 'Which form of lesson preparation is felt to be time efficient', can be answered through school visits, classroom and observations, however, up-to-date observations of science teaching at preschools in Saudi Arabia would not have been possible on a regular basis.

Research question E, 'Which form of teaching is reported as engaging children most in science at EYFS in both England and the KSA?' could be addressed through a series of questions built into an interview however for reasons mentioned previously this approach was not implemented. Thus a questionnaire approach was used.

Having critically analysed the different data collection methods, the questionnaire was chosen as the most suited approach to address research questions A to E, as it ensured that all participants received identical standardised questions.

Data collection

The primary form of data collection was the questionnaire which was completed by teachers in England and the KSA. However, some classroom visits did take place

in both the KSA and England to supplement this research. Although these visits were of a very preliminary nature, they did reveal what lessons were being carried out in science and what ICT equipment was available and being used.

Questionnaire

The questionnaire stemmed from the research questions, and hence, set out to answer them. Kumar (1999) defines a questionnaire as '... a written list of questions, the answers to which are recorded by respondents'. The questions should begin with simple ones, progressing with logic, based upon the objectives of the study. Kumar (1999) indicates that the questionnaire approach sustains the interest of respondents and gradually stimulates them to answer the questions. These suggestions were implemented in this study's questionnaire by ensuring that questions followed through a logical order whilst maintaining participant interest. Mitchell and Jolley (2009) advised keeping similar questions together, thus the questionnaire comprised of 4 sections which grouped related questions. Thomas and Nelson (2001) indicated that it is important that instructions be clear and complete to help understanding (Gorard 2001), consequently, participants were provided with a leaflet, consent form and questionnaires instructions (See appendix C).

According to Wilson and Sapsford (2006), there are several types of question and response modes - for example, dichotomous questions, multiple choice questions, rating scales, constant sum questions, ratio data and open-ended questions. Oppenheim (1992) explained that closed questions are a good way to generate numerical data. Bailey (1994) points out that open-ended questions are valuable if the range of possible responses is not known from the exploratory research. Wilson and McLean (1994) added that closed questions are quick to complete and straightforward to code and do not discriminate unduly on the basis of how articulate

respondents are. However, as Oppenheim (1992) says, these types of questions do not allow respondents to add qualifications or explanations. According to Cohen et al. (2007), open questions help participants to write a free account in their own terms to explain and qualify their responses, and avoid the limitations of pre-set categories of response. However, a disadvantage of open questions is that can lead to irrelevant and redundant information if the participant is not giving the questionnaire its full due. On the whole, the benefits of open questions can often be seen to outweigh the minimal disadvantages; therefore, open questions were chosen to be part of this questionnaire. The aim of this study is to explore teachers' perspectives and to value their views to inform educational research - this is yet another reason for including open questions.

The research questions are:

F. How is science taught in preschools in the two countries?
G. What are teachers' perspectives on the use of ICT in teaching science in preschools in the two countries?
H. In what ways do teachers feel that ICT makes a distinctive contribution to teaching and learning in science?
I. Which form of lesson preparation is felt to be time efficient?
J. Which form of teaching is reported as engaging children most in science at EYFS in both England and the KSA?

The questionnaire comprised of four main sections, with the aim of obtaining information about the teaching background of the respondent, his/her use of ICT, views about planning and preparing science lessons, and finally views about exposition and effectiveness of different methods of teaching in order to answer the research questions. Each section contained between four and eleven questions

consisting of tick boxes, short answer and open questions asking for a longer response. The rationale for these questions is based upon the literature review set out in the previous chapter.

Section A evaluated the teacher's experiences with children; questions such as how long they had taught for, the relative age groups and the number of hours they taught science per week were included. As Bruce (2010b) suggests, it is essential to obtain certain details of a teacher's background in order to ascertain each teacher's experience, background, school type and age group taught. These variables will be analysed in the results section.

William et al. (2000), in their ICT survey to collect data on the ways through which ICT is utilised in the classroom, used key questions on the types of equipment used. Therefore, the second section (Section B: 'The Use of ICT') of this study, was used to determine the school's ICT facilities and resources, access to the equipment and school support.

Planning and preparation are crucial for the success of a lesson, and, as Williams and Easingwood (2003) state, that these two elements need to be deliberately thought through in order to execute a lesson. Therefore, the third section (Section C) attempted to analyse the level of preparation and planning involved in the two methods of teaching (i.e., using ICT or traditional methods), especially in terms of time and resources. Holliman and Scanlon (2004) conclude that science teachers are the best judge of how effective the use of ICT is in the delivery of a lesson. Consequently, the fourth section (Section D) investigated lesson exposition associated with both ICT based lessons and non ICT based lessons and their effectiveness in relation to teaching and children preference.

In the KSA Al-Sunaie (2009) has utilised a questionnaire for teachers, comprising of both open and close ended questions. As Punch (2010) argues, the inclusion of open

questions promotes and enables participants to be more honest and personalise their view point. The open questions in this questionnaire were created to be broad, in order to encourage frankness and to enable teachers to fully express their points of view, such as the advantages and disadvantages of using ICT and its impact on the future of education.

Questionnaires were posted, hand-delivered, emailed and completed online via Google Docs™. All questionnaires submitted were returned adequately, however, not necessarily prior to the set deadline. When required minimal costs were endured for printing and posting questionnaires. The questionnaires were sent along with a consent form and information leaflet providing sufficient details about the purpose of the study and assuring participant confidentiality (See appendix C).

Anonymity was maintained at all times - this encourages honesty and openness when answering. However, it cannot be ruled out that participants may not have completed the questionnaire seriously. This was evident in some of the responses to the open questions given by some of the teachers.

Visiting Schools

Preschool classes in a state primary school in England and KSA were observed, the lessons included science and the use of ICT (on the 26th of March 2010 and 20th July 2010 respectively). In England, each class contained an interactive whiteboard which appeared to be frequently used during the science lessons. Science lessons in year 1 and reception were visited. In year 1, the topic being taught was 'Food' where a food pyramid was illustrated on the interactive white board, and children were involved in a matching activity. This was reinforced through a cut and stick activity. In reception, ICT

was being used, however, this was not during the science session.

In the KSA, year 1 classes in both state funded and private schools are inclined towards using non-ICT based teaching methods, and it seems as though the use of natural resources for science is given preference. ICT is utilised mainly during circle time and is not used as an interactive resource, but rather as a presentation medium (PowerPoint presentations, pictures and videos). This does not suggest that children's interaction with ICT is limited, as they utilise the ICT corner during corner time for games, activities and developing their ICT skills.

Pilot study

The first draft of the questionnaire was piloted with one independent preschool teacher and a researcher in the field of Education. Given both their knowledge and experience of the school context and the use of ICT, they were able to provide structural feedback and were requested to assess the language and the suitability of the questions; they were also asked to comment, adding or amending items. They both stated that the questionnaire was easy to complete, questions clearly stated, time-efficient and relevant to the study. Furthermore, they added that the open questions encouraged participants to express their personal views on the given topic and agreed to the appropriateness of the questionnaire.

Sample

A non-selective sample of EYFS teachers from the KSA and England was used in this study. EYFS teachers from both independent and state funded schools participated, 20 teachers from England and 40 from the KSA. Details of the sample group are presented in the results section of this dissertation.

Results and Discussion

The findings of this study have shown significant differences between Saudi Arabian and English teachers in

relation to teaching preference and their perspectives on ICT. This section will discuss the findings in relation to the research questions and will distinguish comparative differences between both teachers' perspectives in the KSA and England.

Successful preschool education is surely the aim of all the adults involved – government departments responsible for devising a programme and providing the required facilities, expert advisors from academia, parents of young children, and practitioners who are responsible for applying the theory and practice in the programme. There may be many ways of determining the success or otherwise of such a programme - for example, government inspections or testing the children in order to assess results. However, one method less used, but of equal importance, is to survey the views of preschool practitioners about their profession and how they practise it. While feedback from practitioners responsible for the implementation of preschool programmes can reveal prejudice as well as reality, it is an effective means of finding out what these professionals think are the positives and negatives of different aspects of their work. In addition, asking for feedback will reveal to the practitioners that someone is interested and listening.

With respect to the research study presented in this dissertation, one of the principal aims was to elicit information from preschool teachers in the KSA. Although the training and education of preschool teachers in England have improved dramatically over recent years, and their views have been heard, less is known about these practitioners in Saudi Arabia. The topic chosen – science and ICT at preschool level - is one that has been discussed recently in UK government spheres (Walport 2010). Preschool practitioners using the English

EYFS curriculum have not been surveyed on their views about the teaching of these subjects, and those from the KSA to our knowledge have also not been asked about this.

The sample size for this study was small in size given that the study was of a comparative nature between two countries. Additionally, given the time scale of this study, a great deal of time would be required to collect data and translate the responses from one language to another for a larger sample size. However, this type of cross national-research is advantageous to both countries, since new ideas, concepts and strategies from the curriculum can be shared and implemented.

The answers to the questionnaires have revealed some key issues which are discussed below in response to the research questions; the main objective of the research questions is to investigate the use of ICT in Science.

How is Science taught in both countries?

Science is a topic included in the curricula of the English EYFS Framework and the KSA SLC. The KSA has a more clearly defined curriculum which is an advantage. The KSA SLC comprises of specific topics alongside detailed activities unlike the English curriculum which comprises of a minimal outline of activities in relation to the topic. As mentioned by Siraj-Blatchford & Siraj-Blatchford (2006), it is important for preschool children to learn how science works. The results from the questionnaire indicate that this subject appears to occupy more time in the KSA's teachers' programmes, and the amount of time devoted to science is more variable compared to England. An issue which might need addressing, especially in the English curriculum, is what exactly is a science lesson? The English practitioner who commented that the way science was taught was less relevant than the need to relate science to experiences may actually be including more science than s/he thinks. There are many aspects of play that incorporate science (Fisher 2010). If, as experts like Smyth

(2007), Baldwin et al. (2009) and Stears (2009) believe that young children are guided in many aspects of their actions by scientific principles, then science is possibly more important to preschool teaching than is presently stated in the EYFS Framework. An important question to ask is whether English preschool practitioners are aware of these ideas, and whether science gets the attention it deserves in the training of preschool practitioners.

Knowledge of the curriculum

A preschool curriculum has been laid out by the governments of both England and the KSA (DCSF 2008a; MOE KSA 2005), and teachers are expected to follow it. There are training programmes for people who wish to train as preschool teachers in both countries, and these include knowledge about the government-approved curricula. The questionnaire put forward in this research has revealed that the respondents in both countries had sufficient knowledge of their respective curricula. The results also show that in both countries there are practitioners who have been teaching at preschool levels for significant periods of time – some for more than 10 years. However, the results seem to indicate that more KSA than English preschool practitioners have taught at more than one level of education. It is clear that this is a true reflection of differences in the profession in the two countries. If the fact that the KSA teachers have broader teaching experience reflects a government policy to extend their expertise, then this may be an advantage particularly as teachers with greater experience would provide a more informed response to the questionnaire. For example more experienced teachers stated that they preferred both ICT and non ICT methods of teaching in response to research question B: 'What are teachers' perspectives on the use of ICT in

teaching science in preschools in the two countries?'. However, if it reflects the fact that some preschool practitioners are previously qualified teachers at higher levels who have moved to preschool level, then this would be less satisfactory.

Professional development

Especially for those who have been teaching for long periods, continuous updating is essential, on theory and on methods (Harland & Kinder, 1997). As noted by many authors, teaching can become stultified if the staff are not exposed to new ideas and methods at regular intervals. Morris (2010) suggests that training teachers in ICT is essential and should address their specific needs. While no specific questions were asked about this on the questionnaire, the practitioners in KSA took it upon themselves to suggest to their government that more material be provided online. The UK DCSF site www.dcsf.gov.uk could be used as a model for this. Whether the information provided was simply the government curriculum or included specific details about how to use a piece of ICT equipment in their teaching programmes, a number of practitioners were asking for help. Practitioners in the KSA are already turning to others for assistance, but these others may be only other teachers based in the same school. The practitioners have noted, for example, that there is no technical assistance provided when setting up ICT teaching. They have asked for updating, and one teacher noted the need to acknowledge the age and experience of the practitioner when providing updating. Despite the KSA being a large, sparsely populated country INSET training with education specialists can be arranged through means such as online chat rooms where much progress could be made.

What are teachers' perspectives on the use of ICT in teaching science in preschools in the two countries?

One of the principal findings from this research study is the perspectives of preschool practitioners in England and the KSA on the impact of ICT on science teaching. As discussed in the literature review, ICT has a dominant presence in modern life (Prensky 2001). However, there are varying opinions about how much ICT should be used in science [e.g. there is a contrast between the views of Brookson et al. (2010) and Foley (2010), the latter recommending more a personal experience].

It is encouraging that the both KSA and English teachers who responded to the questionnaire do know what is available and also know what they need. For example, Saudi Arabian teachers use the Internet widely and would like more programmes in Arabic. Moreover, both practitioners would like interactive white boards in their classrooms despite English teachers using these more often. Some of these requests would take time to implement, but others, such as the provision of digital cameras in every classroom, would not be difficult.

The literature reveals that at least some of the reluctance of teachers to include more ICT in their science programmes stems from insecurity and anxiety and lack of training (Murphy et al. 2007). The English practitioners appear to be more advanced in this respect than their Saudi counterparts, some even expressing confidence in the use of ICT. The English teachers were also looking to take ICT to other levels, for example, one mentioned ICT training for parents and carers, another talked about having equipment banks at local authority levels.

Some surprising findings of this study included the lack of ICT equipment and support within KSA classrooms, English teachers do not run practice ICT sessions as often as

the KSA teachers, majority of English teachers found teaching using both ICT and non ICT methods easy, whereas majority of KSA teachers found teachings using non ICT methods easiest. As a whole, they generally believe children enjoy lessons more when they contain ICT (yet interestingly, the English teachers, unlike those from the KSA, did not think that ICT science lessons were faster). And of greater significance is the fact that only one teacher (from England) mentioned a major advantage of ICT – allowing children to develop at their own pace such as SEN children (Florian & Hegarty 2004). Either the teachers did not see this to be relevant to the questionnaire or they do not consider these advantages to carry over into science teaching. This area needs further investigation.

In what ways do teachers feel that ICT makes a distinctive contribution to teaching and learning in science?

The fact that science exists as a separate subject in the EYFS curriculum is a demonstration of the fact that the government wishes to improve science education even at preschool levels. Whether science is the core of a teaching programme (as described by Smyth (2007), or just one aspect of the preschool teaching programme, should not affect the interest of the young children in science nor their ability to progress to primary science. Siraj-Blatchford and McLeod-Brudenell (1999) put forward a case for combining science, design and technology into an integrated subject. While they accept that the effective teaching of science and design and technology at preschool levels may be very demanding, it is by combining these subjects that the authors feel the most progress is made – going from observation to investigation, using designing and making. In other words, a scientist may propose a theory which an engineer may apply in the real world. Thus an integration of science with technology is possible.

Although we live in a technological age, where most children have some knowledge of computers or other kinds of ICT, teachers have to be clear about the benefits of using ICT – it should enable the children to learn more effectively than they would if ICT were not used (Elston 2007). One wonders whether this is in reality part of most teachers thinking. Perhaps one of the major issues noted in the responses to our questionnaire is the availability of ICT equipment and assistance in using it. This may be of more consequence than any opinions about what type of science teaching is best. Additionally, teachers mentioned that distinctive benefits of utilising ICT in teaching is personalising learning as suggested by Brookson (2010) by catering for different learning styles and as one English teacher mentioned making '*the learning experience richer and allow children to view real life experiences that would be impossible to re-create in the class room.'.*

The role of the teacher in promoting science with or without technology is to enable the development of children towards scientific understanding (Harlan et al. 2003). From the teachers' perspectives, as our results reveal, there are advantages and disadvantages to using ICT in the teaching of science at preschool level. It is not clear whether ICT actually changes the pace of lessons or is easier to use than traditional methods of instruction.

Which form of lesson preparation is felt to be time efficient?

When planning a science lesson, teachers have to decide when it is appropriate to use ICT (Harlan et al. 2003). Kennewell and Beauchamp (2003) state that teachers spend a lot of time learning new ICT tools and during the course of preparation of the lesson itself. The length of time used in

preparing lessons is perhaps dependant on teachers ICT experience, consequently, it was found that some Saudi Arabian teachers require more than two hours to prepare an ICT lesson, where as the majority of both English and KSA teachers required up to 30 minutes to prepare. This indicates that depending on teachers' experience of ICT, lesson planning can take longer than normal. Therefore, the government in both countries should provide compulsory ICT training for teachers to develop their ICT skills and knowledge.

Which form of teaching is reported as engaging children most in science at EYFS in both England and the KSA?

The question of whether science or technology should come first is an interesting one. From the perspective of scientists, technology has traditionally meant the application of principles; however, in more recent times it has also become a stimulus for scientific research. In a preschool classroom, either science or technology can be the stimulus for learning. However, as our results show, teachers believe that science involves more than just technology. Mitchell and Jolley (2009) lists six categories of ICT which can be useful in enhancing different aspects of science learning, at different times and during different activities. Thus for him at least, ICT serves in the learning of science, not the other way round. Whether this is clear to all the teachers who responded to our questionnaire is not really known.

Engaging preschool children is a challenge that teacher face whether using ICT or non-ICT based methods, results from this study showed that majority of both English and KSA teachers noted that children respond positively to ICT based lessons, thus meeting the learning objectives, however, some English teachers found that children responded negatively to ICT based science lessons. When comparing these results to the use of non-ICT based teaching methods, it can be seen that

non ICT methods lead to neutral engagement from the children, this was mainly found by English teachers, however their KSA counterparts reported the use of non-ICT based lessons to be more engaging. Thus it can be concluded that several factors influence the use of ICT and the level of children engagement. For example, children in England are more likely to be 'digital natives', whereas due to lack of finance and resources, children in the KSA are less likely to be born into this digital generation (Prensky 2001).

Conclusion and recommendations for further work

A conclusion from the survey of preschool practitioners in both countries is that ICT is part of their teaching, including science teaching. There are obvious advantages of using videos, computers and the Internet for demonstrating aspects of science which would be otherwise difficult to demonstrate (Al-Majal 2005). However, it is less clear how much ICT is being used in the classroom. Buckingham (2007), talking about the work of Tapscott, discusses the different kinds of ICT learning – active versus passive. It appears from the responses to the questions asked that the KSA practitioners still feel that the best way to learn the process of science is to physically engage with it, mainly using non-ICT methods. However, this attitude may change over time as more ICT programmes become available.

Of utmost importance to all of these decisions about how and when to include science, and how and when to incorporate ICT into that science, this can only be decided by their preschool teacher, thus stressing the importance of understanding and acknowledging teachers' perspectives. Regardless of the method of teaching that is favoured and/or used, children are expected to make progress in science. Clear science learning outcomes are needed, even if ICT is being

used - Siraj-Blatchford and Siraj-Blatchford (2006) discuss the use of ICT tools in preschool in these terms.

As stated by Wilby (Gray et al., 2007), there are strong arguments against advocating a single method of teaching a subject – what is critical are the long term benefits of using one particular programme or another. There are differences in academic ability and personality between children that will affect how strictly a particular approach is adhered to – these are choices that need to be made by the professional practitioner. This level of independent thought was not expressed by most respondents in this survey (only one English teacher talked about different types of learners).

There are many aspects of this study which could benefit from further research. In the first instance, observation by the researcher of classroom practice would help to demonstrate the validity of the responses to the questionnaires, however, this was unfeasible due to time and financial restraints. Secondly, it would be of interest to interview those preschool practitioners in the KSA who completed the closed questions on the questionnaire but had little to add in the open-ended questions, where as the English teachers answered the open-ended questions sufficiently. As discussed in the methodology, some participants may be less reluctant to answer open-ended due to time constraints or lack of interest, this might be overcome by using incentives to recruit participants, such as compensation for their time.

Although the views of the government were studied using the published curricula in both countries, as well as that published on the DCSF web site, interviews with government inspectors of preschool education would have been most useful. Frequently it is only in this way that the attitudes towards government legislation can be ascertained.

This study is only a preliminary one. The results from the questionnaires have indicated that it could have been

improved. For example, it would have been most useful to ask the respondents about their favourite academic subjects – there must be some preschool practitioners who do science because they are expected to, rather than through enjoyment. And it would certainly have been useful to know not just whether the individual teachers had had ICT training, but also when and for how long. Learning how to use ICT equipment properly in order to achieve what is possible can be considered to be a more or less a continuous process.

Yet overall the study has revealed that preschool practitioners in England and also in the KSA are not averse to using ICT in their (science) teaching and they understand at least some of its advantages. As might have been expected, they also appreciate the role played by other types of pedagogy. Further studies (which could be conducted comparatively between countries) should explore teachers' perspectives on the role of the learning environment when teaching science, the use of ICT and non-ICT teaching methods in other preschool subjects and the success of integrating ICT into the EYFS curriculum, consequently, these studies will help inform government guidelines and contribute to the overall success of the EYFS in both countries.

References

Al-Ameel, H. (2002) *Education in Childhood.* Wales: Cardiff University.

Al-Majal, S. (2005) *How does the use of Media technology influence scientific skills and curiosity for preschoolers.* (Unpublished study from the College of Education, KSA) Riyadh, Saudi Arabia.

Al-Sunaie, K. (2009) *Class Context Role in Developing Some Scientific Concepts with the Kindergartner.* Available at: http://faculty.ksu.edu.sa/22934/Documents/master%20e.pdf (accessed 5 May 2010).

Al-Swailam, B. (2005) *The future of Preschool education for the Gulf countries in the years to come.* Riyadh, KSA: Office of Arabic Education for the Gulf Countries.

Badawood, A. (2006) Relationships between shyness and language Development in a Sample of Preschool Children in Saudi Arabia. *School of Social Sciences (Education)* Wales: Cardiff University.

Bailey, K. (1994) *Methods of social research.* Canada: The Free Press.

Baldwin, J., Adams., S. & Kelly, M.K. (2009) Science at the Centre: An Emergent, Standards-Based, Child-Centred Framework for Early Learners. *Early Childhood Education Journal*, **37**, 71-77.

Barak, M. (2006) Instructional principles for fostering learning with ICT: teachers' perspectives as learners and instructors. *Education and Information Technologies*, **11, (2),** 121-135.

BERA (2004) *Revised Ethical Guidelines for Educational Research.* Available at: http://www.bera.ac.uk/files/guidelines/ethica1.pdf (accessed 20 April 2010).

Brenneman, K., Stevenson-Boyd, J., Frede, EC. (2009) *Maths and Science in Preschool: Policies and Practice.*

NIEER Preschool Policy Brief. Available at: http://nieer.org/resources/policybriefs/20.pdf (accessed 21 May 2010).

Brookson, M., Pimentel, R. & Parslow-Williams, P. (2010) E-learning: Using ICT to Support your Professional Development and Children's Learning. In T. Bruce (ed) *Early Childhood: A Guide for Students.* London: SAGE Publications.

Bruce, R. (2010a) *Educational technology in the classroom from the teacher's perspective.* Available at: http://proquest.umi.com/pqdweb?index=0&did=2013980341&SrchMode=1&sid=1&Fmt=6&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1278269713&clientId=45596 (accessed 5 July 2010).

Bruce, T. (2010b) *Early Childhood a guide for students.* London: Sage Publishers.

Buckingham, D. (2007) *Beyond technology: children's learning in the age of digital culture.* Cambridge: Polity Press

Cohen, L., Manion, L. And Morrison, K. (2007) Research Methods in Education. London: Routledge.

DCSF (2007) *Number of Schools in England in January each year.* Available at: http://www.dcsf.gov.uk/rsgateway/DB/TIM/m002003/index.shtml (accessed 5 June 2010).

DCSF (2007) *Every Child Matters EYFS Cards.* England: Crown Copyright.

DCSF (2008a) *Early Years Foundation Stage Statutory Framework.* Available at: www.teachernet.gov.uk/publications (accessed 7 April 2010).

DCSF (2008b) *Practice Guidance for the Early Years Foundation Stage.* England: Crown Copyright.

DfES (2010) *Statutory Framework for EYFS: learning and development requirements.* Available at: http://nationalstrategies.standards.dcsf.gov.uk/eyfs/site/requirements/learning/goals.htm (accessed 10 April 2010).

Florian, L. & Hegarty, J. (2004) *ICT and Special Educational Needs*. Milton Keynes: Open University Press.

Foley, K. (2010) Knowledge and understanding of the world. In T. Bruce (ed) *Early Childhood, A Guide for Students, 2nd Ed.* London: Sage.

Gorard, S. (2001) *Quantitative Methods in Educational Research: The Role of Numbers Made Easy*. London: Continuum.

Gray, C., Ferguson, J., Behan, S., Dunbar, C., Dunn, J. & Mitchell, D. (2007) 'Developing young readers through the linguistic phonics approach', *International Journal of Early Years Education,* **15, (1),** 15 – 33.

Harlan, W., Macro, C. Reed, K. And Schilling, M. (2003) *Making Progress in Primary Science*. London: RoutledgeFalmer.

Harland, J. & Kinder, K. (1997) Teachers' continuing professional development: framing a model of outcomes. *Professional Development in Education*, **23, (1),** 71 – 84.

Holliman, R. & Scanlon, E. (2004) *Mediating Science learning through Information and Communications Technology*. London: RoutledgeFalmer.

Kennewell, S., Parker, J. & Tanner, H. (2003) *Learning to teach ICT int he secondary school.* London: RouteledgeFalmer.

Kennewell, S. & Beauchamp, G. (2003) The influence of a technology-rich classroom environment on elementary teachers' pedagogy and children's learning. *ACM*

International Conference Proceeding Series, **98, (34),** 71-76.

Kumar, R. (1999) *Research methodology: a step-by-step guide for beginners*. London: Sage Publisher.

Laurillard, D. (2008) *Digital technologies and their role in achieving our ambitions for education.* Available at: http://eprints.ioe.ac.uk/628/1/Laurillard2008Digital_technologies.pdf (accessed 18 June 2010).

Mitchell, M. & Jolley, M. (2009) Research Design Explained. Belmont: Wadsworth

MOE KSA (Ministry of Education in the Kingdom of Saudi Arabia) (2005) *Teachers Guide to the Self Learning: The Developed curriculum for Preschools Book No. 1*. Riyadh, Saudi Arabia (In Arabic)

Montie, J.E., Xiang, Z., & Schweinhart, L.J. (2007) *Role of preschool experience in children's development in 10 countries*. Ypsilanti, MI: High Scope Press.

Morris, D. (2010) Are teachers technophobes? Investigating professional competency in the use of ICT to support teaching and learning. *Procedia - Social and Behavioral Sciences,* **2,** 4010-4015.

Murphy, C., Peter, C. & Beggs, J. (2007) Primary Science Teacher confidence revisited: ten years on. *Educational Research,* **49, (4),** 415-4330.

Oppenheim, A.N. (1992) *Questionnaire Design, Interviewing and Attitude Measurement*. London: Pinter.

Pellegrini, A. (2009) *The role of play in human development.* New York: Oxford University Press.

Prensky, M. (2001) Digital Natives, Digital Immigrants. Available at: http://web.me.com/nancyoung/visual_literacy/site_map

and resources files/Digital Natives Digital Immigrants.pdf (accessed on 3 July 2010).

Punch, K. (2010) *Introduction to Research Methods in Education*. London: Sage Publications.

Saber, M. (1996) *Problem that face the preschool during their application of the NDC in Jeddah city.* Makkah: The Scientific Islamic Research Centre. Um-Alqura University.

Samadi, H. & Marwa, N. (1991) *Teachers Guide to new development curriculum for preschools.* Riyadh, Saudi Arabia: Ministry of Education (In Arabic).

SCORE (2009) Explore, inspire, discover: practical work in science. Available at: http://www.score-education.org/downloads/practical_work/primary.pdf (accessed on 5 April 2010).

Siraj-Blatchford, I. & Siraj-Blatchford, J. (2006) *A Guide to Developing the ICT Curriculum for Early Childhood Education.* Stoke on Trent: Trentham Books.

Siraj-Blatchford, J. & MacLeon-Brudenell, I. (1999) *Supporting Science, Design and Technology in the Early Years.* Buckingham: Open University Press.

Smyth, J. *(2007) Enhancing Early Years Science.* Stoke on Trent: Trentham Books.

Stears, M. (2009) How social and critical constructivism can inform science curriculum design: a study from South Africa. *Educational Research, 51,* 397-410.

The Royal Society (2010) *Education Policy*. Available at: http://royalsociety.org/Education-Policy/ (accessed on 7 April 2010).

Thomas, K. M. & Nelson, C. A. (2001) Serial reaction time learning in preschool and school age children. *Journal of Experimental Child Psychology*, ***79,*** 364–387.

UNESCO (2006) *Curriculum as a Way of Attaining Quality in Educational Innovation and Information.* Available at:

http://www.ibe.unesco.org/publications/Innovation/Inno122e.pdf (accessed 12 June 2010).

Walport, M. (2010) Science and Mathematics Secondary Education for the 21st Century. Available at: http://www.ocr.org.uk/download/news/ocr_39277_news_014.pdf (accessed on 15 March 2010).

Warwick, P., Wilson, E. & Winterbottom, M. (2006) *Teaching and Learning Primary Science with ICT*. Berkshire: Open University Press

Williams, J. & Easingwood, N. (2003) *ICT and Primary Science*. London: RoutledgeFalmer.

Wilson, N. & McLean, S. (1994) *Questionnaire Design: A Practical introduction*. Antrim: University of Ulster Press.

Wilson, M. & Sapsford, R. (2006) Data collection and analysis. In R. Sapsford and V. Jupp (eds) *Data collection and analysis*. London: Sage.

Wong, J. L. N. & Tsui, A.B. M. (2007) 'How do teachers view the effects of school-based in-service learning activities? A case study in China'. *Journal of Education for Teaching***, 33, 4,** 457 - 470.

Zamzami, F. (2000) *Evaluation of the Newly Developed Curriculum for the presidency of girls education in Saudi Arabia*. Saudi Arabia: The Scientific Research Centre, Um-Alqura University.