THE UNIVERSITY OF HULL

The Integration of Information and Communication Technology into Basic Education Schools in Oman: a Study of Teachers' Use of ICT and the Influence of Related Factors.

Being a Thesis submitted for the Degree of Doctor of Philosophy
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By

Amal Obaid Al-Majeeni
B. Ed United Arab Emirates University (UAE)
MSc, Salford University (UK)

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ABSTRACT

This study investigates teachers' use of Information and Communication technology (ICT) in Basic Education schools in Oman. The introduction of ICT was a reform in the education system embarked upon in 1998 which aimed to transfer the schools from the traditional style to more progressive through the integration of technology into teaching and learning. The main focus of the present study is on exploring the influence of different factors on the use of ICT, such as the availability of different types of equipment, teacher training, learning resource centres, administration and attitudes toward the importance of the educational technology to the teaching-learning process.

The study is based on both quantitative and qualitative data gathered using a variety of methods: questionnaires, interviews and classroom observations. The questionnaire sample consisted of 743 teachers. Interviews and observations were conducted with 23 teachers in all regions in Oman.

Results indicate that teachers' use of ICT was low and most of them (around two thirds of the sample) still rely on traditional media tools; ICT use by Basic Education teachers was still confined primarily to laboratory settings; and teachers' technology experiences were not directly integrated into daily classroom instruction or lesson planning. Access to resources, time, training, home use and support were identified as factors that influence the integration of technology into daily instruction.

Among the findings of the study are continuing weaknesses in ICT integration and the need for improved and more flexible in-service training. In addition, the study argues that the main concern of the Basic Education teachers was the lack of support, which

could be improved by offering technical, administrative and suitable guides and knowledge to help them the achieve the higher levels of ICT integration.

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CHAPTER ONE: INTRODUCTION TO THE THESIS

1.1 Background to the Study

The present study is concerned with Basic Education Teachers' use and integration of Information and communication technologies (ICT) into teaching and the related personal and environmental factors which influence this integration. The integration of ICT into teaching is an important element in any educational reform when using the new technology shifts the traditional style of teaching to more progressive teaching. Of course, the use of technology is not the only factor that leads to successful reform; it is an element that cooperates with the other educational elements such as curriculum, educational pedagogy, and the school environment.

Information and communication technologies (ICT) are significantly affecting society, resulting in widespread use of these emerging technologies at both work and home. The impacts of ICT on the society, economy, and workforce include extensive changes in the nature of work, commerce, education and training, entertainment, and quality of life. In common use today are e-mail, the World Wide Web, and all its resources, and multimedia systems that allow users easy access to rich content directly from their computers.

The principal driving force behind these changes is the growing development and deployment of new technologies into almost every sector of the economy. These new technologies are making the world much more interdependent by accelerating the movement of goods, services, ideas, and capital across national boundaries (Cutter et al., 2000).

The globalization of ICT is drawing the attention of governments, corporations, academia and the public at large. ICT use is critical to improved productivity and competitiveness at all levels of society, and facilitates development of high quality information infrastructure.

Yusuf (2000) noted that Information Technology, an extraordinary phenomenon changing and challenging every known field of human endeavour, is at the heart of today's world. The widespread adoption of emerging technologies both at work and at home demands flexible workers who are able to keep in pace with technology, self-directed, and knowledgeable about the world, and cross-cultural communications. The education of new knowledge workers requires emphasis on information access, problem solving, analysis, evaluation, and decision making.

As ICT becomes a natural part of our daily lives, its use in educational institutions is becoming a necessity. Whether they realize it or not, educational institutions are experiencing an increase in the use of a variety of ICT. Information technology should be viewed as a kit of tools which are an integral part of a student's learning experience. However, the future of education is linked to how we deal with the process of complex change.

According to Bowman (1999), futurists contend that primarily demographics, technology, and knowledge drive change. More people, more tools, and more knowledge mean more change. As a result, "orchestrating change will be the greatest organizational challenge in the foreseeable future" (Bowman, 1999, p. 295). However, the downside of change is inevitable: "whenever human communities are forced to adjust to shifting conditions, pain is ever present" (Kotter, 1996: 4). The rapid introduction of technology-related changes in almost all parts of human lives poses a challenge to the education system. The power of ICT to enhance people's lives in so many ways creates a context in which traditional methods of teaching and learning fare badly in comparison. Education has been able to adapt to technological change in the past. The radio, the television, the tape recorder, the video recorder, and others have been introduced successfully into learning processes. What the new technologies offer is of a different order from these devices. Sendov (1986) claims that the basic problem now is not how to introduce computers in education, but how to build education in the presence of the computer. For technology to serve the purposes of change, it must be tied to a coherent, school-wide instructional agenda (Means et al., 1995).

Oman as a country from the developing world may start to use technology in different areas of development. In that of education we can say that the actual use of ICT started in 1998 when the education system was reformed and changed from the general traditional education to Basic Education, which is a more constructivist directed system (See Chapter 2 for more details about the system).

Large investment was put into the reform, which included different areas such as: having new school buildings, training teachers, and preparing the schools with new and modern equipment to give teachers and students good access to ICT resources.

With the entrance of computer-based technology into the classroom, awards for using computers for instruction and learning, and the steady decline in the prices of computers, there has been a steady growth in the number available for classroom use. However, relatively few teachers are using computers, as reflected in the question by Cuban (1993):

> Today, computers and telecommunications are a fact of life as basic as electricity. They have altered the daily work of large businesses and industry. Yet why is it that with all the talk of school reform and

> information technologies over the last decade, computers are used far less on a daily basis in classrooms than in other organizations? (Cuban, 1993: 185).

According to studies in the field, different factors could affect teachers' use of technology depending on the classroom elements which include teachers' personality factors (attitudes, beliefs, and philosophies) and school factors (access, availability of resources, support, and planning).

Teacher training is one of the important issues in preparation for technology skills attainment, use, and integration. While pre-service education can play a vital role in the technology skill development of students aspiring to become classroom teachers, historically, college preparation of pre-service teachers does not provide the required training in the use and integration of technology into their core subject areas. Additionally, schools have provided only minimal training opportunities for practising teachers. Usually these are through beginning-of-the-year workshops that lack follow-up, or one-shot professional development in-service opportunities that are offered after the school day, when teachers are tired and least able to learn new concepts. Given this, it seems likely that teachers remain unprepared to use and integrate technology into their classroom instruction.

Once new technology concepts and skills are attained, teachers may have difficulty in transferring these skills into classroom practice due to such influencing factors as lack of access to resources and lack of technical support. For example, a teacher may know how to integrate computer technology into her or his writing class, but lacks access to functioning computers or software targeted to grade-level needs. Likewise, the fact that computers malfunction and lie idle for long periods awaiting service may discourage their use once repaired.

Given these reasons, it seems important to study the issue of how teachers integrate technology into their classrooms. Such a study may assist in technology planning and preparation at the school level. It may also assist development of future research that deals with technology and its integration into schools.

1.2 Statement of the Problem

Basic Education in Oman refers to alternative non-traditional educational subsystems that include the equivalent of the primary stage, or the primary and intermediate stages, of education.

In the light of the recent government drive to update the education system, especially its concern to benefit from modern educational technology such as the computer and its related resources, for each Basic Education school the Ministry established a Learning Resource Centre (LRC) equipped with new technologies. It was hoped that this new technology was going to be integrated effectively in all subject areas.

The questions, to what extent teachers are prepared for these changes, how they feel about these new teaching methods, and what role is (or could be) played by the school environment in facilitating these changes, now arise.

A number of studies have been carried out in Western countries and in some Arab countries (Chapter 3 discusses previous research in this field in more detail) to investigate teachers' use of new technology and the factors that influence their use. Because it is a new movement started in 1998 in Oman, there is a lack of research studying Basic Education teachers' usage of ICT, their attitudes toward using the new technology, teachers' training needs and the environmental barriers. One research study, which was conducted by Al-Hamdani (2002), examined LRC teachers' attitudes towards integrating technology into curriculum subjects in Learning Resource Centres before and after training. The Al-Hamdani study concentrates only on the LRC teachers who already had the skills and knowledge in using technology with attention to the effect of training on their attitudes and some demographic characteristics such as length of experience, residence areas and amount of training. However, the present study is more comprehensive in dealing with teachers in all subject areas in their use and integration of technology in the classroom environment and not just in the LRC room. In addition to that, this study is open and free to explore all the barriers to ICT use by presenting almost all the factors, which have been found in previous studies in the field from the experience of other countries, which have surpassed Oman in the integration of technology into schools (See Chapter 4 for more details).

1.3 Research Questions

This study sought to answer the following questions:

- To what extent do teachers use ICT in their teaching?
- What are seen by teachers as the main barriers to using ICT in the school?
- What knowledge and skills do Basic Education teachers need to use ICT effectively?
- What are the attitudes of Basic Education teachers towards the introduction of ICT in schools?
- What are teachers' beliefs and educational philosophies about progressive teaching methods?

Several studies found differences in teachers' use and attitudes based upon a number of personal and professional variables, such as gender, length of experience, teaching subject area, and qualification. This provides another focus for this study, and is addressed in the research question:

- Are there differences in teachers' use and attitudes towards ICT based upon personal and professional variables?

There are some studies which have focused on the relation between teachers' philosophy and their integrating and using technology in the classroom in Western countries (Becker, 1998; Dexter et al., 1999; Becker & Riel, 2000), but none has been carried out in the Arabic World. The researcher intended the study of this relationship to be a main contribution of the investigation of this study. This formed the basis of the research question:

- Are there differences in teachers' attitudes and use of ICT based upon their philosophy (progressive or traditional)? (Or, are there differences between progressive and traditional teachers in their use and attitudes towards ICT?)

Previous research into attitudes towards ICT and the level of usage showed that there is an association between some attitudes measured and ICT use. These researches formed the focus of the research question:

- What association exists between teachers' use of ICT and their attitudes towards technology use?

In terms of effectiveness of school environment, previous researches have indicated evidence of associations between teachers' view of their school environment and their use of ICT, which provides the rationale for the research question:

- What association exists between teachers' views of their school environment and their use of ICT?

1.4 Rationale of the Study

This study could be important for the following reasons. First, there are no studies, that have dealt with Basic Education teachers' use and integration of ICT. Second, this study, by covering all educational regions in Oman, sheds light on the barriers to using ICT, which may help to improve the level of technology integration by trying to avoid these factors and to overcome the problems. Third, the study may provide a profile of the technology integration situation in Basic Education schools, which may benefit the evaluation of this new system in this area, and help the policy makers in the Ministry to plan for the next step in Basic Education, paying attention to the factors mentioned in this study. Fifth, the results of this study could be utilised as a diagnostic tool to determine what teachers need to enable them to use ICT more effectively. The results of the present study might generate issues warranting further detailed investigation.

Sixth, the major contribution of the investigation of this study, it was hoped, would lie in dealing with a new area in the Arab world, which is the teacher's philosophy and its affect on the teacher's use and integration of technology. This area is important because teachers are now required to shift to new methods of teaching to more constructive thinking and beliefs but before we change the external environment the change should start for the internal, which means that the teachers should start to think constructively to behave so.

1.5 Limitations of the Study

In any research study, there are a number of unavoidable limitations according to the nature of the study, the features of the population, and the instruments. Therefore in the field of educational research, it is impossible to claim that a study is perfect or without limitation. The same is applicable here. The limitation of this study could be derived from a number of elements related to the nature of research, the first one being the lack of reliable literature in the same field. There has been no study on Basic Education teachers in Oman in the field of ICT use, except that of Al-Hamdani (2002) which concentrates on the effect of training on LRC teachers' philosophy. As a result, there was no way of making comparisons with previous findings in the same educational context. This was one of the major limitations of this study. Secondly, the questionnaire in the study was a collection from different sources because the research aimed to study the effect of different variables on ICT use, which caused low reliability alpha for some items in the first pilot study, and that required a second pilot following changes in the instrument. The second pilot produced reasonable reliability for the questionnaire. Thirdly, the research sample was limited to Basic Education teachers and no other teachers from general education were involved. This was because the study focus was on the new reform teachers who are supposed to integrate ICT into their teaching and practise a more progressive method of teaching.

1.6 Organisation of the Thesis

In order to achieve the research objectives, the thesis is divided into the following chapters:

Chapter One: Introduction

This chapter has outlined the problem, the background of the study, the research questions and the rationale and limitations of the study.

Chapter Two: Education System in Oman

This chapter starts with a general overview of education before 1995 then moves to the period after 1995 when the idea of the Basic Education began after reports about the weakness of the current system (i.e. general traditional education). It will answer the question "Why Basic Education?". Then the main principles of the reform and what areas are going to be changed (child-centred learning, using technology, and so on) will be discussed.

Chapter Three: Learning Theories and ICT

This chapter starts with an overview of constructivism as a learning theory with a description of the constructivist-learning environment, followed by the use of technology as a tool in the constructivist environment. Then it presents some studies on teachers' philosophies and ICT use. Finally, it relates the use of technology to educational reform in Oman.

Chapter Four: ICT Use and Related Factors

This chapter will start with the importance of ICT in education, followed by sections on ICT integration and external and internal barriers, which leads to a consideration of training needs and teachers' attitudes.

Chapter Five: Design and Methodology of the Empirical Study

This chapter provides an overview of the methods adopted in the study, giving details of the plans followed in collecting data in the field. The sampling process and the development and use of the three instruments, a questionnaire, interview schedules and classroom observation, are described fully in this chapter.

Chapter Six: Survey Data Analysis Part One:

This part of the analysis presents the frequencies and percentages of teachers' personal background variables. Then, in more detail, it presents the description of the basic elements of the study: use of technology, environment barriers, training needs, teachers' attitudes towards technology, and teachers' philosophies.

Chapter Seven: Data Analysis Part Two and Three:

Part Two: The second part of the analysis explore the differences between the teachers' use and attitudes based on background variables using t-test and One-way ANOVA test.

Part Three: This part explores the predictors of ICT use by a regression analysis using the factor scores, which summarise the association between ICT use and the other elements in the study, and concludes the reality of ICT use in the Basic Education Schools in Oman and the factors that influence this use.

Chapter Eight: Summary, Conclusions and Recommendations

This chapter provides a summary of the finding from the theoretical and empirical parts of the study, with a recommendation on ICT integration in basic Education schools in Oman.

CHAPTER TWO: EDUCATION SYSTEM IN OMAN

2.1 Introduction

There are four principles on which Omani education is based: first, building positive interaction between the past and the future in the Omani citizens; second, spreading developments in Omani society; third, stressing the need to adopt change and to contribute to it; and fourth, stressing the importance of scientific thinking in life and preparing students to use it both in academic domains and in everyday life (Ministry of Education, 1997). Before reviewing the current education system in Oman, it will be helpful to review the circumstances in which the development of the Omani educational system took place. In this chapter, the researcher will explore the history of the education system by dividing it into three main periods: before 1970, from 1970 to 1995, and after 1995.

2.2 The Education System in Oman before 1970

Oman embraced Islam during the lifetime of the prophet Mohammed, who sent his messenger, Amr Ibn Al Ass, to teach the Omani people Islam and its rules. From that time, education in Oman took the form of what is known in Arabic as *Kuttab*, which is basically a group of boys and girls taught by a single teacher (either male or female) to recite the Holy Quran, and sometimes taught basic writing skills also. In fact, all this required no organised rooms or chairs; because it had a spiritual orientation, teaching and learning usually took place in mosques, houses or even in the shade of trees. It should not be regarded as surprising that education was commonly conducted in mosques, because they were not only places meant for worship, but were also for use as centres of religious teaching and political affairs (Ministry of Education, 1985).

The need to learn the Quran and the Islamic rules helped to spread the *Kuttab* schools through the whole of the Arabic and Islamic world. In these schools, the teacher was responsible for everything, from organising the teaching methods to deciding the text and content of his or her teaching. The fact is that the *Kuttab* education system was the only form of educational discipline in Oman until the 1940s (Al- Shanfari, 1991).

Modern schooling in the country was established by Sayyed Said bin Taymoor, the father of the present Sultan, who came to power in 1932. In 1940, the Sayyidiya school was established in Muscat. This was followed by another Sayyidiya school in Sa1alah (1955), and a third in Mutrah (1959) (Ministry of Education, 1985). These schools are seen as the starting point of modem education in Oman. They were limited to 900 male pupils and were confirmed to the primary stage, grades one to six. There was no age limitation. Even after the establishment of those first formal schools, the *Kuttab* system remained the dominant educational system in teaching reading and writing. Some writers see this period as an important educational transitional period which had its effect on society. Birks and Sinclair (1980) state that:

> Before 1970, Muscat and Oman, the name of the country before 1970, was not entirely without modern education. There were three government primary schools. .. in Muscat, Matrah and Salalah, and an American mission school which provided limited elementary education. These schools together only gave education to some 800 pupils, but those pupils were influential; apart from their having been educated outside the kuttab school system, they were also of the leading families (Birks & Sinclarir, 1980: 178).

2.3 The Education System in Oman from 1970 to 1995: General Education

His Majesty Sultan Qaboos came to power in Oman in 1970. At this time, there were still only three schools, with 909 students, situated in Muscat, Salalah and Mutrah. Education was limited to urban areas and, apart from these three schools, was available only in houses and mosques, where the curriculum was limited to the teaching of Arabic and religion. However, from 1970, plans were made to spread education all over Oman.

In general, the decade of the 1970s witnessed a continuous investment in the education sector as a result of two important factors. First, there was a lack of any educational infrastructure able to absorb the large increase in the number of children who wished to attend schools and further education institutions. Second, there were large increases in the oil revenue received by the government during this period, which allowed it to allocate large sums of resources to this important sector. In addition, since Sultan Qaboos believes that education is the right of every Omani, since 1970, the education of girls as well as boys has been given high priority in Oman (Ministry of Education, 2002).

Table 2.1 shows that education achieved enormous progress during the period 1970-2001. In 1970 there were only 16 schools, with a total of 7000 students and 196 teachers, while in 1990 the total number of schools and institutes had increased to 779, with a total of 356,000 students and 15,121 teachers. In 2001 the total number of schools had increased to 1174, with a total number of 616,829 students and 31,423 teachers.

Table 2.1: Development of education indicators

Details	1970	1975	1980	1990	1999	2000	2001
Schools*	16	207	373	779	1135	1158	1174
Students*	7000	56000	107000	356000	589193	602986	616829
Teachers*	196	2,230	5,150	15,121	27663	29421	31423

Source: Monthly Statistical Bulletin, Ministry of National Economy, April, 2001, Sultanate of Oman. *Including students, schools and teachers of general education and the like (government and private education including foreign communities' schools). It also includes kindergartens and special education schools.

The structure of the general education system in Oman is divided into three stages: primary, preparatory, and secondary. The first stage, primary school education, usually begins at the age of six. Having passed the sixth primary grade examination between the ages of twelve and fourteen, the pupils move on to the second stage, preparatory education, for three years. When they have passed this stage, they move on to secondary schools. Here they select the appropriate type of secondary education. Successful students can go on to advanced training at specialised colleges or enter higher education institutes (Ministry of Information, 2000).

The general education system in Oman includes both public and private schools. The public schools account for the largest share and cater for both Omani and non-Omani students. The private schools are regulated and supervised by the Ministry of Education, and cater for both Omani and non-Omani students. Most of the private schools are located in Muscat. According to the 1997/98 Educational Statistics Year Book, in 1997 there were 93 primary and 6 preparatory schools run by the private sector, accounting for nearly 23% of all the primary schools and just over 1% of the preparatory schools (Ministry of Education, 1999).

Given the fact that Oman had a legacy of an agrarian economy with a relatively high rate of illiteracy, in the three decades of the renaissance, the education system has made spectacular progress.

Besides General Education, there are other kinds of education such as Eradication of Illiteracy and Adult Education, Technical Education, Teacher Education and Sultan Qaboos University.

2.3.1 Eradication of illiteracy/ adult education

Oman's sixth and seventh five-year plans aim to eradicate adult illiteracy, teaching Oman's estimated 108,000 illiterate adults to read and write. Adult education started in 1974/5. By 2001/2 there were 346 literacy centres in Oman, with 418 male and 5,214 female students, 2, 214 adult education centres had enrolled 8,696 students, and a further 18,540 students signed up for free education.

Oman celebrates annual Arab Literacy Day every January. Government campaigns highlight the consequences of illiteracy for both the individual and society. During World Literacy Year in 1990, incentives were offered to Omani teachers, supervisors and directors to increase literacy programmes. Table 2.2 shows the fall in the illiteracy rate from 1990 to 2000.

Table 2.2: Estimated illiteracy rate and illiterate population aged 15years and over

Year of survey	Age	Illiteracy rate (%)			Illiterate population (000)		
		Total	Male	Female	Total	Male	Female
1990	15+	45	32.1	61.6	430	173	257
2000	15+	28.1	19.6	38.3	398	152	246

Source: UNESCO statistical Yearbook, 1999

Students who graduate from literacy programmes to university are honoured by the government, together with ordinary citizens who promote literacy. In 2000/1, Omani high school graduates were recruited to promote adult literacy in remote areas. The 2001/2 school year saw 127 students – mostly women - trained to deliver literacy programmes.

2.3.2 Technical education

Technical education is a government priority, to meet the market demand for trained manpower. The number of Higher Technical Industrial Colleges increased from just one in Muscat in 1984, to five around the country by 1993, when the government converted vocational training institutes in Nizwa, al Musanah, and Salalah into technical colleges.

Oman's technical colleges launched the Omani National Diploma (OND) programme in 1999, a programme that offers intensive theoretical and practical training, to provide scientific and technical skills. The OND programme trains young Omanis as technicians, and graduates can obtain higher certificates.

2.3.3 Teacher education

The first Teacher Training Institute was created in 1977. The increased demand for Omani teachers and the popularity of this profession, in particular for Omani women, allowed the expansion in teacher training colleges. The colleges accept Omanis who have successfully completed their secondary education and, after two years of study in these colleges, they become qualified teachers (Ministry of Information, 1997). Since 1980, Teacher Training Colleges have accepted general secondary graduates on a one-year programme. More than 2,500 graduates have qualified at these centres. In 1984, Oman launched two colleges of education to run one-year and two-year post-secondary teacher training courses. By 1990, there were nine such colleges across Oman.

In 1994, two colleges were designated university colleges and began to award BA degrees in teaching, one in Nizwa for male teachers, and the other in Rustaq for female teachers. The Ministry of Higher Education was created under Royal Decree 2/94. It is responsible for the institutes of higher education and funds scholarships, to ensure equal opportunities for students with high academic qualifications.

Royal Decree 42/95 transferred responsibility for the male and female colleges of education from the Education Ministry to the Ministry of Higher Education. Nine intermediate colleges were restructured to create six university colleges. Candidates compete for places against students from across Oman and are accepted on the basis of availability of places. By 2001/2, 8,896 male and female students were enrolled at teacher training colleges and 6,049 students graduated with BA degrees.

Table 2.3 shows that between 1996/97 and 2000/2001 there was an increase in the number of female teachers at an average rate of 6.5%, while the number of male teachers decreased by -1.6% (Ministry of Education, 2001).

Table 2.3: The number of teachers in the general schools from the year 96/97 to the year 2000/2001 according to the gender

Year / Sex	96/97	97/98	98/99	99/2000	2000/2001	% growth
Male	5856	5883	5798	5647	5495	-1.6
Female	5317	5306	5649	5942	6770	6.2
Total	11173	11189	11447	11589	12265	2.4

Source: Ministry of education. Statistical yearbook 2001

In 2002 programmes were launched to recruit more than 9,700 people - mostly women - to reverse a shortage of female staff due to sick leave or maternity.

2.3.4 Sultan Qaboos University (SQU)

Since Sultan Qaboos University opened in 1986, the number of students has increased from 557 students to 10,902 in 2001-2002. The university develops its teaching, scientific and social research, working closely with other academic institutions. It has seven colleges: Engineering, Sciences, Arts and Social Sciences, Commerce and Economics, Medicine and Health Sciences, Education, and Agriculture and Marine Science (Ministry of Information, 2003).

Its reputation rests on its research laboratories and on its highly qualified teaching staff. Sultan Qaboos bin Said visited the university in May 2000, launching a new debate about the value of history, scholarship and learning, and encouraging students and lecturers to adopt a conscientious and pragmatic approach. His Majesty donated OR 5 million to build a multi-purpose auditorium, with space for more than 6,000 people to host university activities (Ministry of Information, 2003).

Opened in 1989, Sultan Qaboos University Hospital is a training institution for College of Medicine students, which has 500 beds and sophisticated equipment. In 2001, 546 Omani doctors graduated from the College of Medicine.

Sultan Qaboos University runs several other highly specialised scientific and research centres:

- Centre for Educational Technology

- Language Centre
- Centre for Information Systems
- Educational Research Centre
- College of Commerce and Economics Information Centre
- College of Arts and Social Sciences' Radio and Television Studio
- Solar Cells Testing Centre
- Water Desalination Research Station
- Agricultural Research Station
- Earthquake Detection Centre
- Virtual Reality Carbonic Study Centre
- Energy Research Centre.

2.4 The Reform in Education System

The idea of the reform was the result of a number of studies, which sought to evaluate the General Education system. These results indicated that there were weaknesses in the general education system which required the Ministry of Education to plan for a new education system, which can fulfil the requirements of the development in all sectors. This weakness was referred to different reasons. According to Al-Hammami (1999), the outcome of General Education did not satisfy the labour market because graduates lacked important personal and intellectual qualities. This shortage was attributed by Al-Hammami to the curriculum, its methodology and the system of evaluation. Poor education facilities, such as libraries, laboratories and teaching aids, weak teachers as a result of low qualifications, lack of professional training for teachers, class size, and the unsuitability of some schools buildings for teaching and learning, all of these reasons had a major effect on teaching and learning quality.

Another reason for reform was the recommendations from national and international conferences to reform the education system in the Arab World in general. One of the World recommendations of the Conferences on Education for All in 1990 was to improve the quality of formal basic education as a start point of educational innovation (Ministry of Education, 1996). According to the Ministry of Education (1997):

> The Oman renaissance has started the education service in the country within a strategy that coped with the urgent need for accession and rapid spread of education at the beginning. Accordingly, the measures taken at that time were the best option available for implementing that strategy (Ministry of Education, 1997: 4-5).

The above issue showed that the General System became out of date because it is not a suitable system for the fast changes and developments in Oman. Al-Hammami (1999) stated that for the last 27 years the education system had concentrated on the amount of education and not the quality. Therefore the antiquity of the system was a main factor in the demand for the change. He concluded that:

> What was suitable to meet the needs and goals of the pest may be less suited to meet the needs and goals of the present and the future (Al-Hammami, 1999: 141).

It is obvious that internal and external demands on the education system caused the reform which aimed to transfer the education system to the requirement of the new developments in the world in general and to fulfil the demand of the Omani society.

2.5 The Education System in Oman after 1995: Basic Education

There is common agreement that the introduction of the Education Reform and Development Plan is the most significant achievement of the education system. Now that the goal of universal access to primary education had been achieved, the Education Reform Plan has attached top priority to raising the quality and relevance of Basic Education to enable it to meet the educational challenges of the 21st century (Ministry of Information, 2003).

According to the Education Reform and Development Plan, Basic Education refers to alternative non-traditional educational subsystems that include the equivalent of the primary stage, or the primary and intermediate stages of education. This concept is designed to fulfil the needs of the region that applies it (Ministry of Education, 1995).

Basic Education in the Educational Development Plan of the Sultanate of Oman has been defined as follows:

> "A unified ten-year education provided by the Sultanate for all children of school age. It meets their Basic Education needs in terms of knowledge, skills, attitudes and values, enabling them to continue their education or training based on their interests, aptitudes, and dispositions, and enabling them to face the challenges of their present circumstances and future developments, in the context of comprehensive social development (Ministry of Education, 1995: p15)".

According to the Education Reform and Development Plan, the Sultanate of Oman (1995) adopted Basic Education for several compelling reasons:

- The need to reform education and improve its effectiveness, due to the challenges and requirements of the present and the future.
- The inadequacy of primary education to meet the Basic Educational needs of learners.

- The necessity of integrating the early stages of education into a unified stage in order to avoid waste.
- The excessive focus on rote-learning in the existing education system, and the lack of meaningful connection to application and practice.
- The need to respond to the pertinent national and international recommendations of educational conferences which advocate the adoption of Basic Education by the end of the twentieth century.
- The emphasis in the Arab Strategy for the Development of Education on the generalisation of Basic Education, along with a reform of its content and structure in order to achieve flexibility and diversity.
- The call of the 'Future Vision Conference for the Omani Economy' (Oman 2002) to prepare Omani human resources of high calibre in competencies and skills, capable of keeping abreast with scientific and technological developments, and able to cope professionally with these changes, as well as to face continuing changes locally and worldwide, whilst also preserving Islamic values and Omani habits and traditions (Ministry of Information, 1995).

In general, Basic Education aims at the comprehensive and integrated development of the learner's personality within the context of Islamic principles and Omani cultural identity, as well as cultivating his or her ability to interact with the surrounding world and instilling loyalty towards the country, the Arab-Islamic nation, and humanity (Ministry of Information, 2001). In addition, the objectives of Basic Education include that the learner develop the following:

- Life skills through communication.

- Self-learning.
- Scientific and critical thinking.
- The ability to understand contemporary science and technology, as well as the ability to adapt to innovation.
- The ability to deal rationally with problems of the present era: conservation and wise exploitation of the environment.
- The ability to internalise the values and ethics of mastery of work, production, sensible use of leisure time, and participation in civil life (Ministry of Information, 2001).

In the new education structure, education is divided into basic and secondary education, with Basic Education taking in the original primary Grades 1–6, Preparatory Grades 7–9 and secondary grade 10, for children from 5 to 15 years inclusive, in compliance with the 10-year comprehensive education reform plan "Reform and Development of General Education" currently under implementation. This started with 17 selected schools spread throughout the country in 1998, has now been expanded to 200 schools, and more schools will continue to be added each year. The new system was introduced initially for the first cycle (Grades 1-4) only, and is gradually being extended to the second cycle (Grades 5-10) as successive cohorts of pupils move up the education ladders. Table 2.4 shows the distribution of Basic Education schools and teachers by region in the academic year 2001/2002 (Ministry of Education, 2003).

Table 2.4 : Distribution of basic education schools and teachers by region in the academic year 2001/2002

Area	Muscat	Al-Batinah	Al-Sharkiah	Al-Dahrah	Al-Dakilliah	Al-Wastah	Dofar	Musandam	Total
Schools	28	55	40	20	25	4	21	7	**200**
Teachers	1053	2206	1539	664	996	78	666	185	**7387**

Source: Summery of Educational Statistics for the Academic Year 2001/2002, Ministry of Education.

Basic and secondary education is free for all. Entrance to secondary education (two years) is, however, conditional upon successful completion of the Basic Education cycle, as determined by examination at the end of the cycle.

Further to facilitate universal access to Basic Education, the Ministry of Education has established schools in all inhabited areas of the country, and provides free transportation to and from schools wherever required. In very sparsely populated areas, separate hostels are constructed for those girls and boys who cannot commute daily.

The government is sparing no effort to make Basic Education easily accessible for every school-age child, as well as to every citizen who was not able to attend school at the usual age, for whatever reason. In 1998, the budget of the Ministry of Education (which is not responsible for tertiary education) was 14.7% of the total national budget (excluding defence and national security).

The minimum academic qualification required for teaching primary classes was formerly a two-year Post-Secondary Diploma in Education. Under the current educational reform, the required qualification for primary teachers has been raised to a

Bachelor's Degree (Ministry of Education, 2000). Table 2.5 shows the qualifications of teachers in Basic Education for the year 2001/2002.

Table 2.5: Distribution of Teachers in the Basic Education schools by qualification and gender for the academic year 2000/2001

Teachers' Qualifications	Omani		Non Omani		Total
	Male	Female	Male	Female	
Secondary school	0	1	0	0	1
Secondary+ Training	0	1	0	0	1
Diploma(Secondary level)	0	6	10	83	99
Diploma after secondary	217	2250	9	98	2574
University	0	10	8	39	57
University with education degree	0	125	16	149	290
Higher Diploma	0	1	0	3	4
Master	0	0	1	0	1
Total	217	2394	44	372	3027

Source: Ministry of Education, Statistical Yearbook 2000/2001

2.5.1 Curriculum

Within the framework of the Omani concept of Basic Education, and according to current educational trends, the curriculum includes all the learners' experiences in school and out of school, whether curricular or extra-curricular, in addition to the programme or content of study. This extended concept of the curriculum also encompasses ways of interpreting and applying it through its operational constituents in order to integrate all the elements of planning and implementation involved, and to empower the entire process (Ministry of Information, 2001).

The main aspects of the curriculum which are taken into consideration are as follows:

2.5.1.1 Relevance of curriculum

This refers to the extent to which the curriculum is appropriate for learners at a certain age and level of study. This criterion is determined by multiple considerations: educational, philosophical, social, economic, and scientific, and being in accord with societal aspirations and the benefit of the learners. It is an imperative imposed by social, scientific, technological, and economical progress, within the context of continuing global change. Close attention is paid to making these these social, economic, and international factors work closely to ensure the appropriateness of the curriculum and its continuous development (Al-Hamami, 1999).

On this basis, the Ministry has reconsidered the plan of study in all its constituents, and restructured it to fit these new orientations in terms of content, balance and dynamics (Ministry of Information, 2001). The developed study plan consists of the following subjects:

- Islamic Studies
- Arabic
- Mathematics
- Science
- English (from Basic Education Grade 1)
- Social Studies (from Basic Education Grade 3)
- Environmental Life Skills
- Information Technology (in the first cycle, Grades 1-4)
- Computer Studies (in the second cycle, Grades 5-10)
- Physical Education
- Art

- Music

Due to the educational and psychological desirability of achieving integration in implementing the curriculum, the post of Field Teacher has been established in Basic Education. The Field Teacher teaches several subject matters in a connected way. In the first cycle (Grades 1-4), Islamic Studies, Arabic and Social Studies are considered as one field; Science, Mathematics and Information Technology another; English as a third field; and Environmental Life Skills, Physical Education, Art and Music as a fourth field. Each field is taught by one Field Teacher (Ministry of Information, 2001).

2.5.1.2 Core curriculum

In Basic Education, all kinds of education tend to connect with each other in a core of basic and balanced general education for all learners. This core represents a complex of basics derived from the various disciplines and their applications, designed to equip the learner with a cultural background necessary to live and work. As the learner progresses in his or her study, these basics evolve to pave the way for specialisation (Ministry of Information, 2001).

2.5.2 Learning and teaching strategies

Since Basic Education is a formative stage for the learner's habits of mind, work, and behaviour, most of what the learner acquires during this period is expected to remain in later stages of study, and to be part of his /her personal repertoire throughout his /her regular and productive life. This is the rationale behind the crucial role of learning and teaching strategies and methods to make the process of education alive and active, and deploy the curriculum in all its vital dimensions.

Consequently, the Education Reform and Development Plan of the Sultanate of Oman recommended that teachers should not limit themselves to one strategy, method, or technique, but should diversify their teaching and use the various learning and teaching strategies, methods and techniques judiciously and purposefully. These strategies should be employed according to the needs of learners and the nature of their learning-teaching situation, in which subject requirements are specifically interwoven. Individual differences are positively honoured, so that all learners develop simultaneously, and ultimately reach the desired levels of mastery or excellence at their own pace, and within the constraints of their own circumstances. Teachers' guides are rich resources for the continuous improvement of learning and teaching strategies (Ministry of Information, 1995).

All of this means that the entire curriculum, and its complete implementation, is learner-centred. Teachers attend to the common needs of learners as well as their individual needs, in a holistic manner that encompasses their physical, affective, social, and intellectual development. This is especially true for the first cycle of Basic Education. In the second cycle (Grades 5-10), learners continue their growth and development and gradually become socialised into the demands of society and organised social life.

2.5.3 Learning and teaching technologies

Educational technologies do not stand apart by themselves; rather, they are embedded in the context of learning and teaching strategies and methods. These, in turn, are closely related to curriculum objectives with theoretical and practical backgrounds.

This connection among the contributing elements of the educational process is essential, in order to preserve its dynamism and lead to worthwhile outcomes in quality and quantity.

In the realm of Basic Education, learning and teaching aids and technologies can be of great help to learners, if they are relevant, well-selected, and used in the appropriate manner, at the proper time, and to the extent needed, so that they contribute to the realisation of educational objectives (Ministry of Information, 2001).

2.5.4 Assessment strategies

Assessment in Basic Education is a continuous process of gathering and reviewing information to help students succeed. It concentrates on authentic assessment which is defined by Hart (1994) as follows: "An assessment is authentic when it is involves students in tasks that are worthwhile, significant, and meaningful. Such assessments look and feel like learning activities, not traditional tests" (Hart, 1994: .9).

One feature of the reforms of the system was extending the school day and the school year. The school year in the Sultanate of Oman used to be short when compared to that in other countries (Al-Balushi, 1997). Therefore, the school year of 32 weeks (160 school days) was lengthened to 36 weeks (180 days) was to bring it more into line with hours of schooling in other countries. Class hours were increased from 4 to 6 hours a day and lesson periods were extended from 35 to 40 minutes to increase the number of hours a pupil spends in class during the first ten years of education, from 5,693 hours under the previous system to 9,600 hours (Ministry of Information, 2000).

The Ministry formed a comprehensive plan to modernise the education system to meet the needs of the 21st Century. By the year 2000/2001, 1,045 schools had been built. This enabled the Ministry to dispense with the double shift system and to extend the number of hours in the classroom. Also, Table 2.6 shows the increase in the teaching hours for each subject.

Table 2.6: Comparison between the basic education system and the general system in the total number of hours for each subject

Subject	General E. system	Basic E. system	The difference
Islamic studies	914	1176	261
Arabic studies	1381	1992	611
English Language	541	1200	659
Mathematics	933	1776	843
Science	635	1200	565
Social Studies	448	696	248
Physical education	299	384	85
Arts	187	336	149
Music	168	216	48
Vocational training	149	0	-149
Practical Activities	37	0	-37
Life Skills	0	240	240
Information technology	0	120	120
Computer Skills	0	264	264
Total	5693	9600	3907

Sources: International Yearbook on Teacher Education (1997).Vol. 1.

2.5.5 Human resources (manpower)

The principles and foundations embedded in the concept of Basic Education in Oman require the restructuring and reintegration of the various functions and roles of educational practitioners in the school. New posts have been introduced to strike a balance between the administrative and pedagogical daily work of participants in the school community who are involved in continuous specialised training.

The School Principal is the general supervisor of the learning-teaching process, pedagogically and administratively. In performing his or her multiple duties, he or she is helped by specialised personnel.

The traditional role of the teacher in imparting knowledge is no longer valid. The teacher is a designer of educational experiences. She is a guide, a coach, and a facilitator. The teacher accurately diagnoses the strengths and weaknesses of the learners and provides a scaffold for them to keep moving ahead in their development. She also helps them acquire the necessary self-learning skills, including locating and using knowledge in a way that induces the learner to internalise the ethics of work, mastery, and creativity.

The Senior Teacher is a resident supervisor in charge of coordinating the fields or subjects, and discussing them with the teachers concerned.

In addition to the School Principal, the Assistant Principal, and the Senior Teacher, the supervisory team contains the following:

- A Field Supervisor for the first cycle of Basic Education.
- A Subject Supervisor for the second cycle, reporting to a Senior Supervisor based in the region, and then to a General Supervisor for every subject, centrally-based at the Ministry of Education. This General Supervisor is responsible for the planning and development of all educational supervisory work through field work and supervision conferences.
- An Administrative Officer in the school, reporting to an Administrative Supervisor and to a further Senior Administrative Supervisor, based in the region, in addition to the General Administrative Supervisor centrally-based at the Ministry of Education (Ministry of Information, 2001).

The Administrative Officer is in charge of various matters, including those related to administration, finance, pupil discipline, transportation, and maintenance.

The Learning Resource Centre Technician is responsible for equipping the Learning Resource Centres and the computer laboratories in schools, and maintaining them ready for pupils' use.

The role of the Student Counsellor has been revised, to enable him/her to be more effective in contributing to the establishment of a healthy educational climate in the school. The goal is to set up an educative climate necessary for learning and development. The Student Counsellor fulfils his/her job through a comprehensive study of the multiple social and personal concomitant conditions that influence a pupil's achievement. The Student Counsellor is also there to help the learners overcome the problems generated by these conditions and cope with their challenges (Ministry of Information, 2001).

In addition to this, the Career Guidance Counsellor in the second cycle of Basic Education (Grades 5-10) is responsible for providing information on careers and working in career guidance to help students consider vocational fields and select occupations consonant with their interests and capabilities when they have completed their Basic Education (Ministry of Information, 2001).

The feminisation of administrative and teaching personnel in the first cycle of Basic Education (Grades 1-4) is now complete. The rationale here is to make the learners feel secure psychologically at this early age, and to motivate them to learn in an appropriate climate that meets their needs and supports their progress in further development, especially during this critical period of transition from home to school (Ministry of Information, 2001).

No matter how much preparation a system goes through, it will not be successful if teachers are not fully ready for it. Thus, the Ministry of Education has introduced a pre-service programme of training in co-ordination with the Ministry of Higher Education to train teachers to teach effectively under the reformed system. There are also in-service programmes to help teachers to apply the new practices in the classroom. Moreover, serving primary teachers who have qualified through a two-year college course will go through upgrading courses to end up with four years of teachers' education (Al-Balushi, 1997).

A recommendation for in-service teacher education was made in the 45th session of the International Conference on Education (ICE). The main idea of this recommendation is that in-service teacher education should be both a right and a duty for all educational personnel, and that initial and in-service teacher education should constitute an organic whole (UNESCO, 1997).

Among the measures suggested by this recommendation are the following:

- A minimum of training opportunities should be guaranteed for all teachers;
- Special attention should be given to beginning teachers through induction courses and in other forms;
- Teacher-training institutes should be actively involved in in-service training activities and benefit from the experience thus gained for improving initial teacher education;
- In-service programmes should be organised to a greater extent within the school;
- In-service teacher education programmes should be accompanied by professional support services, in order to help teachers in their professional development (Adamets, 1997).

2.5.6 Outcomes

According to the Education Reform and Development Plan of the Sultanate of Oman (1995) at the end of the Basic Education stage, as outlined above, the learner is expected to reach a level of achievement comparable to that of his/her contemporaries in most developed countries, i.e. to acquire the following knowledge, competencies, and skills:

- The basics of the Islamic sciences that are necessary to lead a Muslim life.
- The basics of the Arabic language.
- An appreciation of the Omani, Arab and Islamic heritage.
- The ability to cooperate, communicate, use symbols, enquire and investigate.
- Developed self-learning competencies and the ability to locate and obtain information.
- The competencies of scientific and critical thinking, creativity, and aesthetic appreciation.
- A strong background in mathematics and science, and computer skills.
- Proficiency in English.
- Mastery of work- and time-management.
- An awareness of conservation and wise use of natural resources.
- Life skills in his/her own environment.
- Respect for and a positive attitude towards manual work (Ministry of Information, 1995).

2.5.7 Major problems and challenges facing the education system

The government has established a solid infrastructure for education in Oman. This has involved articulating the philosophy and aims of education, developing the basic structure of the educational system, specifying curricula and developing appropriate teaching and learning materials, providing resources and equipment, setting up pre-service teacher training programmes as well emphasising the need for in-service training and professional development, establishing and refining the administrative structure, constructing school buildings and providing physical facilities, ensuring educational supervision and management as well as educational evaluation, and generally encouraging growth of the system in every aspect.

The strengths of this system depend largely on the abilities and skills developed by Omanis because of the experience acquired during the process of developing an educational infrastructure. The sections of the Ministry which benefited most from this capacity building were the directorates-general and departments at Ministry and regional levels. The Ministry also considers that critical evaluation and review of the education system are the most powerful and important factors affecting the development and modernising of education. Close cooperation with international experts in various specializations has contributed to enhancing the ability of the Ministry to supervise the education system, to review its achievements and to enhance its potential to meet the changing requirements of education in Oman.

Furthermore, practical experience acquired in various areas has contributed to building national expertise in planning and implementing quality basic education of an international standard. This experience has been gained in areas such as curriculum development, decentralization of the in-service training of teachers, supervisors and administrators in the newly introduced learner-centred approaches, implementing developmental programmes in the field and in the field of programme evaluation involving formative evaluation through continuous monitoring. A growing strength of the system is the educational information management process, which has been partially completed in some institutions and some regions. There has been an increasing interest in and attention paid to information-based decision making on the part of Ministry senior management. In addition, cooperation between Ministry departments and their close collaboration with non-governmental organizations and national, regional and international organization collectively contribute to strengthening the basic system of education.

On the other hand, there are some weaknesses in the Current Education system. A shortage of highly trained and skilful Omani personnel in various specializations is one of the major impediments that are affecting the effectiveness and quality of education. The situation is now rapidly improving since the Government has given considerable priority to the human resource development of the Omani workforce. While the Ministry of Education's aim behind effecting changes in the administrative and organizational structures was to strengthen administrative effectiveness, time is still needed to eliminate inefficient, deeply rooted work practices.

The instability experienced by oil-based economies has caused bottlenecks in the education sector as well as in other economic sectors – although in 1998, when other Ministries suffered budgetary cuts, the Ministries of Education and Health maintained their full budget allocations. In spite of this, a shortage of financial resources resulted in priorities being amended und changes being made to some programmes, while others were postponed or even cancelled. The result was a slowing down of progress. Since the problem is attributed to dependence on an oil-based economy, it is likely to recur at some future date. The Government has long been aware of this potential threat and started planning the diversification of the national economy paying attention to industry, commerce and tourism, which has had a positive impact on national incomes.

The Government has started encouraging the private sector to provide pre-school education services and has encouraged it to invest in vocational training. The response was not as great as anticipated, in spite of the great demand for vocational training. However, the indications are that there is now considerable interest in participating in the provision of this sort of education.

The Ministry has identified the most important challenges at the beginning of the third millennium as being:

- Provision of sufficient numbers of qualified Omani teachers for general schools, Basic Education schools and post-Basic Education secondary schools. Discussions are underway with the Colleges of Education of the Ministry of Higher Education to offer new teacher education programmes. At the moment most of the serving teachers are two-year diploma holders. It is anticipated that the Colleges of Education will meet the requirements of the Ministry regarding the training of new teachers for Basic Education schools and post-basic secondary education schools.
- A shortage of professional Omani personnel having the capabilities to participate in developmental work. Some measures have been taken to resolve this problem, such as:
    - Sending employees abroad to study for Master's and Doctorate degrees.
    - Offering new subject specializations at Sultan Qaboos University such as Diploma courses in school management and in educational

supervision, and Master's degree courses in science, maths, psychology and other subjects.

- Little educational research - although this is vital for educational development. There is a conspicuous lack of curriculum research in Oman and there are insufficient researchers in this area. The Ministry is now trying to resolve this by sending Omani personnel abroad for Master's and Doctorate degrees.
- Difficulty of providing sufficient funds for development. The development plan entails refurbishing school buildings, setting up learning resource centres in all schools and the provision of information technology education, all of which need large budgets.
- Reluctance by the private sector to participate in educational provision. This has prompted the Ministry to offer more attractive incentives to this sector, in order that they assume and play a more substantial role in the development of the educational system.
- The low enrolment in adult education centres by adult males in spite of the facilities offered by the Ministry: adult education centres, teachers, free learning materials, and free transportation.

2.6 Summary

The above sections have discussed the education system in Oman in general, from its initiation until the present, with a particular focus on the recent introduction of Basic Education. It was shown that in 1970 there were three schools in Oman, with just over 900 pupils. Today, there are over a thousand a new schools and more than 600,000 students. In addition, notable development has taken place in other kinds of education:

Eradication of illiteracy and Adult Education, Technical Education, Teacher Education and Sultan Qaboos University.

In 1998/9, a new Basic Education system was introduced, which consists of Basic Education in two cycles, i.e. Grades 1-4 from 5-10 years and Grades 5-10 from 11-15 years, and secondary education, which extends over two years. It aims to teach communication and learning skills, critical thinking, science and modern technology. In the 2002/3 academic year 288 schools will follow the Basic Education System.

CHAPTER THREE: REVIEW OF THE LITERATURE ON ICT AND LEARNING THORIES

3.1 Introduction

It is important to set a research study in the context of the theoretical underpinnings of the study and in the light of related research. In so doing, a rationale is developed for the research questions to be addressed. This study concerns the use by teachers of basic education in Oman of ICT; therefore, the purposes of this review are to (a) present current issues on ICT use, relating to learning theories; (b) highlight significant research on ICT use; and (c) develop a rationale for the research questions of this study.

This chapter provides a theoretical context for the present study by exploring the nature and role of ICT, and begins with a description of learning theories that can support the use of computers in teaching and learning. It is followed by a description of ICT use within such theoretical approaches, followed by a discussion of methods of child centred learning, and finally presentation of studies related to the effect of teachers' philosophies on their use of ICT.

3.2 Theoretical Background

Since the turn of the last century, psychological theorists have sought to explain how learning occurs. The resulting learning theories were initially applied in traditional classrooms where teaching aids were limited to chalk and chalkboards. In these classrooms, very often the teacher served as the "sage on the stage" in the teaching and learning process. As radio, television, and motion pictures become available, technology was gradually introduced into education with the belief that it might enhance the teaching and learning process. The introduction of technology into education spurred efforts to try to match learning theories with various uses of technology in order to produce the best learning. Spencer (1991) named Edward Thorndike, Ivan Pavlov, and John Watson as the major theorists whose early work strongly affected the development of educational technology throughout most of the last century. Simonson and Thompson (1997) also included B. F. Skinner as being most influential in providing theories that supported computer use in education.

Thorndike's connectionism theory states that learning consists of a series of connections between the problems of a particular situation and previous accomplishments. Complex ideas should be broken down into prerequisite concepts, and positive reinforcement should be applied as these concepts are learned so that they can be applied to more complex, higher-level learning activities (Simonson & Thompson, 1997).

Thorndike's theory provided the foundations for many changes in education, such as the specific goals of education, one of which is the ability to read at a certain level. It also promoted the measurement of educational outcomes.

Ivan Pavlov discovered that any neutral stimulus, when paired with an original unconditioned stimulus that is associated to a natural response, could replace the original stimulus and become a conditioned stimulus that produces that response (Spencer, 1991). However, this conditioned stimulus is gradually weakened and subjected to extinction without the continuous presence of the unconditioned stimulus. Pavlov's method became known as classical conditioning. It follows that higher-order conditioning can be built from complex chains of stimuli that control behaviours (Simonson & Thompson, 1997).

Classical conditioning provided a foundation for computer-based instructional design in that learning should be organized from very simple to complex events. Pavlov's theory had a significant impact on the development of learning theory, and was noted by Spencer (1991) as having paved the way for the behavioural science movement that was founded by John Watson.

Watson approached psychology in terms of stimulus and response. He emphasized that psychology should not dwell into the issues of memory and mind, and that attention should only be paid to observable changes in behaviour (Chambers & Sprecher, 1983). This brand of psychology hinges on the argument that (a) humans and animals adjust to their environment through heredity and habit; and (b) certain stimuli lead organisms to make responses, and it is possible to predict a stimulus, given the response and vice-versa (Spencer, 1991). Through stimulus-response (S-R) relationships, Watson conducted various successful conditioning and de-conditioning experiments that provided support for his theory. B. F. Skinner introduced radical changes to the stimulus-response theory. He proposed that the stimulus can be eliminated from S-R, leaving only the response followed by reinforcement (Chambers & Sprecher, 1983). Thus, while acknowledging the applicability of Pavlov's classical conditioning, Skinner introduced a second kind of learning, termed operant conditioning. Operant conditioning involves the use of reinforcement to promote the desirable changes in behaviour, and this reinforcement occurs following the desired actions. For example, where activities in a computer-assisted instruction lesson elicit praise for students giving correct answers, with cues given to students to maximize the likelihood of correct answers. These cues would gradually be removed so that in later exercises, students could work on their own. The students are said to be conditioned by the computerized reinforcement so that eventually, they could proceed without any cues.

The aforementioned theories remained dominant until the 1970s. Since then, alternative theoretical perspectives have surfaced. These new theories soon accumulated enough support to shift the paradigm of educational psychology from the behaviourist to the cognitivist perspective, one that considers learners' internal processes during learning. Among the main cognitive theorists are Jerome Bruner, Jean Piaget, and Seymour Papert. Cognitive theorists believe that instruction must be based on students' existing state of mental organization, or schema. The way knowledge is internally structured has an effect on how new learning will occur.

The spectrum of learning theories consists of many approaches or ways of explaining how humans learn. As preference for a learning model has evolved from a behaviourist approach to a cognitive approach to modern constructivist approaches, the field of instructional technology has evolved as well, following the needs of the teaching-learning process (McDonough, 2001). Valdez et al. (1999) believe that there have been three distinct phases in technology uses and expectations, depending on the development of the learning theories: the first phase is Print Automation (the 1980s where the personal computers and its software was quite primitive), the second phase is Expansion of Learning Opportunities (the early to mid-1990s where the technology use shifted to the quality of learning), and the third phase is Data-Driven Virtual Learning. In the first phase, instruction was characterized by the use of behavioural-based branching software that relied heavily on drill and practice to teach segmented content and/or skills. During the second phase, computers became tools for learner-centred practice rather than content delivery systems, helping teachers move from largely isolated learning activities to applications that involved working in groups. Phase III carried with it the additional expectation of making schools more effective through the use of data-driven decision-making of a much more sophisticated nature than previously expected. Ideally, both teachers and students have access to the data and use it to meet accountability expectations.

Learning models are often classified as being behavioural or cognitive. Objectivism, also referred to as the traditional model of learning, is the behavioural model of learning and represents the traditional view. The primary competing cognitive model is constructivism. The constructivist model has a number of derivations including collaborativism and cognitive information processing. The socioculturalism model shares some assumptions and goals with constructivism, but challenges some others (Leidner & Jarvenpaa, 1995).

A brief description of each of the main theories will be given as a basis for critical examination of the use of computer technology as a learning tool.

3.2.1 The behaviourist model of learning

Behaviourism was one of the learning theories that influenced the design and the use of technology. Essentially, the behaviourist model is derived from Skinners' stimulus and response theory. Under this theory, the learner is conditioned to respond to a stimulus. Behaviourism viewed the behaving organism as a 'black box', and 'inner processes' were of no concern (Skinner, 1974). In his book entitled, The Technology of Teaching, Skinner wrote:

> The application of operant conditioning to education is simple and direct. Teaching is the arrangement of contingencies of reinforcement under which students learn. They learn without teaching in their natural environments, but teachers arrange special contingencies which expedite learning, hastening the appearance of behaviour which would otherwise be acquired slowly or making sure of the appearance of behaviour which otherwise never occurs (Skinner, 1974: 64).

Skinner believed that more complex learning could be achieved by this process of contingencies and reinforcement "... through successive stages in the shaping process, the contingencies of reinforcement being changed progressively in the direction of the required behaviour" (Skinner, 1968: 10).

Skinner argued that since it is not possible to prove the inner processes with any available scientific procedures, researchers should concentrate instead on 'cause-and-effect relationships' that could be established by observation. According to Jonassen (1994) the goal of teaching is to facilitate the transfer of knowledge from the expert to the learner. Errors in understanding are the result of imperfect or incomplete knowledge transfer. The model makes several pedagogical assumptions regarding learning and instruction. In terms of learning, the first assumption is that there exists a reality that is agreed upon by individuals. Second, this reality can be represented and transferred to a learner. Third, the purpose of the mind is to act as a mirror of reality rather than as an interpreter of reality. Fourth, all learners use essentially the same processes for representing and understanding the world. In the opinion of the current researcher, these assumptions are dubious. While this model has proved useful in implementing programmed learning, modern ways of using computers in education have moved to conveying and developing more sophisticated levels of learning.

In terms of instruction, the objectivist model assumes that the goal of teaching is to transmit knowledge efficiently from the expert to the learner. Instructors structure reality into abstract or generalized representations that can be transferred and then recalled by students (Yarusso, 1992). Feng (1995) argued that behaviourist educators consider that the function of mind is to mirror an external reality. So, they believe that learning is a change in the behavioural 'dispositions of an organism', and the role of teaching is to provide stimulus-response reinforcement to bring about the change.

Applying the theoretical principles of behaviourism to learning environments, we can recognise that there are many behaviourist models in the learning world. According to (Jonassen, 1993; Yarusso, 1997; & Feng, 1995), an analysis of the traditional teaching approaches used for years would reveal the powerful influence that behaviourists have had on learning, for example the concept of direct instruction, where the teacher is providing the knowledge; the use of exams to measure observable behaviour of learning; and the use of rewards and punishments in the school system.

The present study deals with the new reforms in education which are more constructive and the use of ICT into Basic Education schools. It also gives attention to the behaviourist theory principles through the effect of teachers' philosophies and classroom practice on their use of ICT.

3.2.1.1 ICT use in the behaviourist approach

The use of ICT by behaviourists includes traditional tutorial and drill and practice types of programmes. They are typically designed to be used by individuals and are good tools for supporting basic information and knowledge such as the multiplication table (Hung, 2001).

3.2.1.1.1 Drill and practice

Drill-and-practice exercises were designed to increase the speed and accuracy of a skill. Research has demonstrated that time limits on drill-and-practice exercises improved progress over time. Speed is a necessary component of competence in any field, and the use of technology can help students rise above the level of mechanics. Computers provide an ideal medium for providing drill and practice (Vargas, 1986). Handal & Herrington (2003) argued that drill-and-practice activities, because of their repetitive nature, still reflect a traditional, behaviourist approach that focuses on mastering basic skills or reviewing material that has been previously learned.

Kulik (1994) argued that drill and practice is one type of computer application that usually results in positive gains in achievement at the elementary and secondary levels of computer tutoring. According to Kulik (1994), few innovations have effects as large as those of computer tutorials. Kulik also found that software classified as drill-and-practice significantly improved achievement test scores.

Kulik conducted one of the most comprehensive studies of the effectiveness of using computers to increase student achievement. Kulik (1994) observed that at least a dozen meta-analyses on CAI effectiveness have been performed. He reviewed these and discovered that they were conducted by different researchers at eight different research centres, and further discovered the following points:

1. Students usually learn more in CAI classes as compared to traditional instruction. Achievement effect sizes in the meta-analyses range from 0.22 in elementary and high school science courses to 0.57 in special education classes.

2. CAI students learn in less time as compared to students taught in the traditional way. Savings in time range from 24% in adult education to 34% at the college level.

3. Students like their classes more when taught through CAI.

4. Students in CAI classes develop more positive attitudes toward computers.

5. There were no differences in attitude toward subject matter between CAI students and students taught in the traditional manner.

Kulik summarized his review by saying that "adding computer-based instruction to a school program, on the average, improves the results of the program" (p.13).

Kulik's research is typical of the focus of that time, in studies of the use of technology as a tool for learning, on the computer-assisted instruction (CAI) popular in the 1970s and early 1980s based on Skinner's behavioural model (Wood, 1995). Widely studied during that era, CAI was primarily used for skill-and-drill exercises that provided instant feedback. Basic arithmetic and word recognition skills were popular choices for CAI software. This was, however, an expensive proposition because an electronic worksheet was not cost effective even though some studies suggested that the results of CAI were often superior to traditional instructional methods of the day (Kulik & Kulik, 1991).

3.2.1.1.2 Integrated learning systems (ILSs)

Behaviourist ideas of learning also match the style of teaching and learning associated with the use of Integrated Learning Systems (ILSs). Rogers & Newton (2001) defined ILSs as computer-based programs of instruction in particular skills such as mathematics or spelling. The programme sets questions and tasks for the student. It modifies the material presented depending on the response of the student. The system provides immediate feedback to the student and records the students' performance. An ILS consists of three components: curriculum materials for the student, records of the student's performance on each course and a management system.

Becker (1993) identified the learning theories of Skinner and others as those that underpin the model of learning used by Integrated Learning Systems. Working on a computer with mathematical exercises to perform, or text to read, requires only interaction between child and computer. It is this solitary learning environment, which is promoted as "giving the student privacy to make their own mistakes". This diet of presented examples, text and simulations requires the student to develop concepts and skills based upon pre-existing knowledge and skills. The benefit of the individualised mode of delivery of materials from the ILS is that each student has a different set of pre-existing skills and knowledge from which to draw. The individualised nature of the ILS suits this model.

Extensive research has been conducted in the field in evaluating such systems. For example, Durham University looked at the impact of ILS on examination performance. Pupil performance at Key Stage 3 (age 14) and GCSE (age 16) for pupils who had used an ILS for at least a year prior to sitting their examinations was compared with control groups who had not used one. Predictions about expected examination performance were made using the Durham University Midyis (Middle Years Information System) and Yellis (Year 11 Information System, on-line at http://cem.dur.ac.uk/). These tests are part of a wide-ranging project to predict examination performance using school performance, demographic and attitudinal measures. The tests also give an indication of "value added" i.e. is the pupil performing better than expected given the underlying circumstances The findings of the Durham research team were:

- At Key Stage 3 the ILS pupils' performance was slightly lower than the control. Effect size from -0.04 to -0.62.

- At Key Stage 4 (GCSE) the ILS pupils' performance was also lower than the control. Effect size from -0.03 to -1.29.

- However, pupil performance was proportional to the length of time on the ILS. That is a pupil who spent longer on the ILS performed better than one who had had less use of the system.

- Significant correlation between the information provided by the RM SuccessMaker management system and examination performance. SuccessMaker can provide reports of student levels, learning gains and National Curriculum Levels for Mathematics and English, (though the English NC level reporting system was not available at the time of this research).

The Leicester University research for Phase 3 of the BECTA study also focused on the impact of learning gains achieved on an ILS and examination performance at Key Stages 3 and Key Stage 4 (GCSE in England and Wales). Their research looked at a smaller sample of pupils from 6 schools. However, the ILS pupils and their non-ILS control groups were selected to form similar ability groups, thus removing much of the bias that may have been present in the Durham research. The findings of this research were:

- There were no discernible differences between ILS and non-ILS pupils within the same school.
- There were major and inexplicable variations in performance between schools (http://www.cbltwork.soton.ac.uk/purcell/prin/).

On the other hand, research evaluation in UK has reported some weakness points in the system. For example, Brown (1997) indicated that there is a general lack of adaptive features, and Wood (1998) stated that ILSs appear to make little impact in improving skills in reasoning and interpreting problems. Show & Johnson (1993) recognise the need for integrated learning systems to develop from the behaviourist approach to the constructivist style of learning. Developing the software to combine the current ILS technology with video-conferencing, multimedia and telecommunications links as a tool for use in the classroom rather than the laboratory will increase the flexibility to provide for the needs of individuals.

3.2.1.1.3 Tutorial

Handal & Herrington (2003) argued that tutorials are one-step ahead of drill-and-practice activity, because they not only present information but also guide students through their learning processes. A tutorial usually follows a structured sequence. The tutorial starts with an introduction to the lesson and information is presented. Next, the learner answers a series of questions and the program evaluates them. Typical responses are "sorry," "very good," "try again," and "right answer is," among others. In contrast to drill-and-practice approaches, the tutorial will give feedback giving the procedure to get the correct answer. The cycle closes when the lesson is terminated, either by the learner or by the program. A summary appears at the close of the lesson.

Tutorials have potential in online interactive learning because they provide many possibilities to motivate students through multimedia capabilities. In addition, a tutorial allows learners to work at their own pace in an individualized mode of instruction and provides many opportunities for reinforcement, correction of mistakes, and elucidation of misunderstandings. There are, however, a number of different ways in which tutorial software can be used. For instance, a tutorial may be employed to support and reinforce classroom instruction, to teach a selected topic, to activate prior knowledge in an area before proceeding to the main topic, or to generate classroom discussion and group work. Tutorials can also provide instruction to students who have missed classes, to review previously encountered topics, or for remediation (Merrill, 1991). Tutorials can be combined with other computer devices, such as print, still video, full-motion video, CD-quality audio, computer-generated graphics, animation, and textual overlays.

3.2.2 The Constructivist Model of Learning

Constructivist theory is a general framework for instruction based upon the study of cognition. Much of the theory is linked to child development research (especially that of Piaget and Bruner). The ideas outlined in Bruner (1960) originated from a conference focused on science and maths learning. Bruner illustrated the application of his theory in the context of mathematics and social science programs for young children (Bruner, 1973).

The main constructivist principles may be summarized under five headings extracted from the wider list given by Cunningham (1991). These principles provide a useful framework for summarizing the constructivist proposals for learning environment design.

Authentic Learning Tasks: A central constructivist criticism of traditional formal teaching is that it is disembodied from the students' experience outside the classroom. The tasks lack meaning for the student. Constructivists argue that learning tasks should be embedded in problem-solving contexts that are relevant in the real world. Learners must see the relevance of the knowledge and skill to their lives, and the influence it provides in problems they see as important.

Interaction: Interaction is viewed as the primary source material for the cognitive constructions that people build to make sense of the world. Many constructivist theorists place particular emphasis on social interaction. Dialogue and the negotiation of meaning provide the basis for individuals to develop, test and refine their ideas.

Encourage Voice and Ownership in the Learning Process: The theme of student-centred learning is continued with an argument that students should be allowed to choose the problems on which they will work. Rather than the teacher acting as the taskmaster, the teacher should serve as a consultant to help students to generate problems which are relevant and interesting to them. It is argued that this is a vital part of solving problems in the real world.

Experience with the Knowledge Construction Process: Constructivists argue that experiencing and becoming proficient in the process of constructing knowledge is more important. In other words, it is learning how to learn, how to construct and refine new meaning that is most important.

Metacognition: This is the ultimate goal of a constructivist approach. Problem-solving involves the processes of reflecting on problems and searching for solutions. Metacognition is the higher order process of reflecting on our own thinking and problem-solving processes. Cunningham (1991) refers to this ability as reflexivity. Metacognition has powerful problem-solving potential. If we are stuck with a problem we can reflect not just on the structure of the problem, but on the structuring of our approaches to the problem. We can then try to generate alternative, more productive strategies. This is viewed not just as a useful problem solving ability, but the ultimate expression of education - the ability to reflect back on what has been created by the process of education. Papert (1994), psychologist and contemporary critic of Behaviourist teaching methods, writes in his book, *The Children's Machine*:

> Thus, constructionism, my personal reconstruction of constructivism has as its main feature the fact that it looks more closely than other educational -isms at the idea of mental construction. It attaches special importance to the role of constructions in the world as a support for those in the head, thereby becoming less of a purely mentalist doctrine (Papert, 1994: 142).

Jonassen et al. (1999) points out that although the notion of constructivism is a fairly new idea to education, and even newer to educational technology, it is an old idea to sociology and art. In fact, it is an ageless idea as a way of understanding how learning occurs. Constructivists believe that knowledge is constructed by the individual, rather than transmitted to the individual. People make sense out of whatever they experience by constructing their own meaning based on what they already know, and how they perceive the new information. In this view of learning, it is assumed that one individual cannot fully understand anything in exactly the same way that another individual understands it. Meaning-making, Jonassen et al. (1999) explains, is at the core of constructivist philosophy.

Klemm (1998) argues that, although not new, constructivism has more compelling relevance in education today because of the dawn of the Information Age. Such profound changes require us to re-think learning processes and to design instructional tools that equip learners to cope in the Information Age. In most academic fields, it is no longer possible to expect learners to master more than a small subset of the total information. Nor is it even reasonable to attempt mastery, given that in many modern disciplines the subject content changes too rapidly. The new requirement is for learners to learn how to find information, understand it, and apply it. These are constructivist activities. The power of information technologies dictates the implementation of constructivism.

Almost all those who support major reforms of schooling, particularly through the use of computers, have the view that learning needs to be more informed by constructivism. Often arguments for school reform involve constructivist concepts such as the need for students to develop higher order thinking skills, and the failure of current schooling methodologies to provide the opportunity for this (Clouse & Nelson, 2000).

3.2.3 The Cognitive Approach

According to Leidner & Jarvenpaa (1995) cognitive information processing model in an extension of the constructive model. A major assumption of this model is that learners differ in terms of their preferred learning style. Instructional methods that match an individual's learning style will be the most effective. This suggests the need for individualized instruction. The cognitive processing model also assumes that the individual's prior knowledge is represented by a mental model in memory and that the mental model or scheme is an important determinant of how effectively the learner will process new information. The implication is that the instructional support required is inversely related to the depth of existing knowledge as well as to the effectiveness of the learner's information processing style. A third assumption is that given a learner's limited information processing capacity, attention is selective. Selective attention is an interrelated function of the display, the cognitive structure of the learner, and the prior experience of the learner (Bovy, 1981). Messick (1993) defines cognitive styles as "characteristic modes of perceiving, remembering, thinking, problem solving, decision making" that are "reflective of information processing regularities that develop in congenial ways" (Messick, 1993: 3).

Semple (2000) added to these ideas that learning is viewed from this perspective as a process of making symbolic, mental constructions involving active mental processing on the part of the learner. The development of computers and software with a strict input-processing-output architecture reflects these ideas. In this theory, more cognitively oriented, learner-centred approaches to e-learning design were also developed based on Piagetian style experiments.

3.2.4 Social Constructivism

Vygotsky placed more emphasis on the social context of learning. Vygotskian theory emphasizes the importance of the socio-cultural context in which learning takes place and how the context has an impact on what is learned (Vygotsky, 1980). Since Vygotsky emphasized the critical importance of interaction with people, including other learners and teachers, in cognitive development, his theory is called "social constructivism" (Maddux, et al., 1997). Much of collaborative problem solving strategy is built on the best known of Vygotsky's ideas, the zone of proximal development (ZPD).

For social constructivists, learning should involve interaction with other people or environments, which foster potential development, through instructors' guidance or in collaboration with more capable peers. Creating a social negotiation environment can foster reflective response and support collaborative construction (Jonassen, 1994).

Hung (2001) concluded that balancing the two dominant schools of thought – constructivism and social constructivism – is an emphasis on both the social and individual dimensions of cognition. Adopting the general premises of both schools of thought, we have:

1. Learning is an active process of constructing rather than acquiring knowledge;
2. Knowledge can be socially constructed where the social interact may include just oneself;
3. The interpretation of knowledge is dependent on (a) the prior knowledge and beliefs held in one's own mind and (b) the cultural and social context through which the knowledge was constructed.

Leider & Jarvenpaa (1995) summarized the differences between the learning theories. They stated that the behaviourist theory assumes that an instructor should be in control of the learning environment (i.e., pace and material), that learning is dissemination of knowledge, that dissemination best occurs via abstract representations of the reality, and that learning occurs best in isolated settings (i.e., the context of the learning environment need not be "real").

The main concepts of the learning theories are summarized in table 3.1

Table 3.1 Key concepts of dominant learning theories

	Behaviourist	**Cognitivist**	**Constructivist**	**Social constructivist**
Learning	Stimulus and response	Transmitting and processing of knowledge and strategies	Personal discovery and experimentations	Mediation of different perspectives through language
Type of Learning	Memorizing and responding	Memorizing and application of rules	Problem solving in realistic and investigative situations	Collaborative learning and problem solving
Instructional strategies	Present for practice and feedback	Plan for cognitive learning strategies	Provide for active and self-regulated learner	Provide for scaffolds in the learning process
Key concepts	Reinforcement	Reproduction and elaboration	Personal discovery generally from first principles	Discovering different perspectives and shared meanings.

Source: Adapted from Hung, D. (2001)

Constructivism assumes that the learner needs to be in control of the learning environment, that learning is the creation of knowledge, and that the realism of the context for learning needs to be high. Cognitive information processing differs from constructivism in emphasizing that learning is the formation of abstract concepts to represent reality and that the context need not necessarily be high in order for such abstraction to occur.

Socioculturism assumes that the learner must be in control of learning, that learning is interpretation of knowledge by the learner, that specificity and immersion in experiential activities promote learning, and that learning best occurs in the context in which it will be used.

3.2.5 ICT use and constructivist theories

Constructivist designers develop learning tools and software which is much different than the standard drill and practice or linear presentations used in the past.

3.2.5.1 Informative tools

Informative tools provide necessary materials and resources for students to construct their knowledge. Examples of such technologies include encyclopaedias and Internet resources. These tools support the generation of ideas and can provide students with information based on different perspectives. Moreover, these tools also serve as good external sources where students can counter-check the validity of their knowledge negotiations (Table 3.2).

Semple (2000) argued that, according to cognitive theories of learning, computer technologies are cognitive learning or mind tools amplifying human abilities such as memory and processing, rather than instructional media.

Another important informative tool is the Internet. Eadia (2001) believes that today's classrooms need Internet access for research, multimedia curriculum materials distributed on line, access to digital libraries, distance education courses and remote collaborative tools. Information on demand for students also includes video, live video broadcasting, desktop videoconferencing and 3D modelling.

> "The use of voice (for activities such as interviews, speeches, background music, explanations) and video (for live conferences within and between schools) will change the way schools operate" (Eadia, 2001: 34).

A key area of rapid growth has been that of on-line learning, both in web hosted environments and in packaged form on CD. The use of web-based courses is proliferating in Australia, the UK and the USA, amongst others. Schools are providing wider curriculum choices and more individualised programmes through the use of web courses; home-based students of all ages are now able to choose courses and gain qualifications from a widening range of organisations. www.ultralab.net, www.notschool.com and www.vsg.edu.au are examples of web-hosted, virtual classrooms where the students may be distant from the teacher and resources. Curtin University, Western Australia has developed a comprehensive offering of on-line courses, qualifications and resources for educators. Another example is Using Oracle software; (Think.com) Netherhall, UK has created an online community of students, most staff and parents with Internet access at home or work. This has "torn down the classroom walls" and enables teachers to utilise the home computers to extend the school's capabilities. On-line communications are enabled and students can work on projects from both school and home. Students who are ill or absent for other reasons can maintain contact (Eadia, 2001).

Serim & Koch (1996) gave reasons why teachers use the Internet such as: The Internet provides teachers with free (or low cost) materials they need, the Internet can help teachers focus on learning, instead of on time, by assisting them to manage their communications, provide "just in time" materials, and by being "open" 24 hours a day and the Internet refreshes teachers' professional lives.

3.2.5.2 Individual constructive tools

These are multimedia authoring tools, spreadsheets, word processors, simulations, etc., which can support guided inquiry and can be used constructively (Table 3.2).

Ravenscroft, (2001) argued that Seymour Papert had delivered the most engaging application of the constructivist theory to E-learning in his book, *Mindstorms*, and with the LOGO programming language that he developed. This program was designed specifically for children to develop the thinking processes as described by Piaget. In this, procedures may be combined to draw more complex shapes, building on concepts previously mastered. In developing her/his powers of thinking, the child builds up new insights. Any mistakes are treated as opportunities to learn rather than as errors, an important feature of constructivist learning (Boyle 1997). Papert (1994) believed that children as learners have a natural curiosity to construct the meaning of their world. The educational system, as Papert saw it, was too structured and it stifled this natural curiosity. The means by which children were being taught relegated them to the role of passive recipients of teaching; hence, they were not motivated to construct any learning for themselves. Learning according to Constructivists is a question of motivating an individual to attach new meaning to past cognitive experiences.

Papert's desire to have children become motivated learners, critical thinkers, problem-solvers and metacognitionists is to be achieved through educational reform that provides the learner with the necessary tools to participate and to take ownership of the learning process. According to Papert, the computer is the appropriate tool to achieve such desired educational reform.

Another tool of this type is simulation; according to Michael (2000) simulation technology could provide the learner with numerous advantages. For example, computer simulators can:

- Provide students with the opportunity to engage in activities that may otherwise be unattainable.
- Enhance academic performance and learning achievement levels of students.
- Be equally as effective as real life hands-on laboratory experiences.
- Foster peer interaction.

- Provide students with immediate and reliable feedback.

3.2.5.3 Social communicative tools

These include video conferencing, lab management systems, multimedia, e-mailing and similar systems, which enable communicative processes between users. These tools, however, do not provide the means to organize knowledge and discussions (Table 3.2).

Socially constructive tools, for example, document sharing, computer-supported intentional learning environments (CSILE), MindBridges, MUDs (Multi-User Domain) and MOOs (MUD Object-Oriented), are computer-mediated environments that support the social constructivistic process. Although these environments may differ to some extent, they generically allow users to negotiate knowledge. These environments particularly make overt hidden metacognitive processes that would otherwise have remained implicit. Students would be able to generate knowledge and organize their ideas with the support of systems such as CSILE and MindBridges, which thread student discussions along thematic spaces. In addition, environments that support document sharing allow users to co-edit documents relevant to their work.

The Internet began in the 1990s to have significance for professional communication among teachers. Sixteen percent of teachers communicated with peers outside their buildings on professional matters. The rate rose to 33 percent for those who had Internet access at home and at school (Becker & Ravitz, 1999).

Valdaz et al. (1999) suggest that some applications of home and school computers, e-mail, and multimedia projects lead to success in advanced courses as well as to gains in the higher-order skills of thinking critically, solving complex problems such as multi-step word problems, understanding scientific methods, and synthesizing different points of view.

Table 3.2: Computer-mediated tools and learning theories

Theories	Computer Tools	Examples
Behaviourism	Variety of drill and practice computer-based learning software	For example, CBLs that drill students on multiplication and addition (individual instructive tools)
Cognitivism	Tutorials and information databases	For example, encyclopaedia and internet resources (informative tools)
Constructivism	Individual generic purpose tools	For example, Excel, Word, PowerPoint, simulations, hypertext and hypermedia, organizational tools (individual constructive tools)
Social constructivism	Collaborative generic environments	For example, e-mails, bulletin boards, knowledge co-construction/exchange forums, computer-mediated collaborative problem solving environments (social communicative/constructive tools)

Source: Adapted from Hung (2001)

3.3 Teaching and Learning in Constructivist Environments

The aim of this section is to highlight some of these attempts at integrating constructivist characteristics into the practice of teaching and learning.

Wilson (1996) defines a constructivist learning environment as: "a place where learners may work together and support each other as they use a variety of tools and information resources in their guided pursuit of learning goals and problem-solving activities" (Wilson, 1996: 5). He emphasizes learning environments as opposed to 'instructional' environments in order to promote "a more flexible idea of learning", one which emphasizes "meaningful, authentic activities that help the learner to construct understandings and develop skills relevant to problem solving" (Wilson, 1996: 3).

Jonassen (1994) summarizes what he refers to as "the implications of constructivism for instructional design". The following principles illustrate how knowledge construction can be facilitated:

1. Provide multiple representations of reality;
2. Represent the natural complexity of the real world;
3. Focus on knowledge construction, not reproduction;
4. Present authentic tasks (contextualizing rather than abstracting instruction);
5. Provide real-world, case-based learning environments, rather than pre-determined instructional sequences;
6. Foster reflective practice;
7. Enable context-and content dependent knowledge construction;
8. Support collaborative construction of knowledge through social negotiation (Jonassen, 1994: 35).

Jonassen (1994) argued that Constructivism is child-centred; it proposes that learning environments should support multiple perspectives or interpretations of reality. Constructivism is focused on knowledge construction facilitated by context-rich, experience-based activities-rather than knowledge reproduction.

An important component of constructivist theory is the focus of a child's education on authentic tasks. These are tasks, which have real- world relevance and utility for the child. The tasks are integrated across the curriculum and provide appropriate levels of difficulty or involvement. Because it would be impossible for us all to become masters of all content areas, instruction is anchored in a meaningful, real-world context (Jonassen, 1994).

Lunenberg (1998) described the constructivist teacher is one that

> "encourages and accepts student autonomy and initiative ... uses raw data and primary sources, along with manipulative, interactive, and physical materials ... uses cognitive terminology such as 'classify,' 'analyse,' 'predict,' and 'create,' when creating tasks ... allows students' responses to drive lessons, shift instructional strategies, and alter content ... inquires about students' understandings of concepts before sharing their own understandings of those concepts ... encourages students to engage in dialogue, both with the teacher and with one another ... encourages student inquiry by asking thoughtful, open-ended questions and encouraging students to ask questions of each other. Seeks elaboration of students' initial responses ... engages students in experiences that might engender contradictions to their initial hypotheses and then encourages discussion ... allows wait time after posing questions ... provides time for students to construct relationships and create metaphors" (Lunenberg, 1998: 79-80).

Airasian et al. (1997) described the role of the teacher in constructivist environment:

> "Constructivist teachers must create an open, non-judgmental environment that permits students to construct, disclose, and expose their constructions to scrutiny" (Airasian, 1997: 4).

Anyone who has ever taught would realize the difficulty of creating this type of environment. "Time is needed for teachers and pupils to learn and practise how to perform in a constructivist classroom" (Airasian et al., 1997: 4). The teacher must become the "guide on the side" and provide a risk-free environment to encourage students to voice their constructions and to have students accept the "diversity" of responses and not "search for the one 'right' answer" (Airasian et al., 1997: 4).

Brooks and Brooks (1993) describe what assessment in a constructivist classroom looks like: Rather than saying "No" when a student does not give the exact answer being sought, the constructivist teacher attempts to understand the student's current thinking about the topic. Through non-judgmental questioning, the teacher leads the student to construct new understanding and acquire new skills. Constructivists believe that assessment should be used as a tool to enhance both the student's learning and the teacher's understanding of the student's current understanding. It should not be used as an accountability tool that makes some students feel good about themselves and causes others to give up. Below is a list of the important principles that guide the work of a constructivist teacher:

1. Constructivist teachers encourage and accept student autonomy and initiative.
2. Constructivist teachers use raw data and primary sources along with manipulative, interactive, and physical materials.
3. Constructivist teachers use cognitive terminology such as "classify," "analyze," "predict," and "create" when framing tasks.
4. Constructivist teachers allow student responses to drive lessons, shift instructional strategies, and alter content.
5. Constructivist teachers inquire about students' understandings of concepts before sharing their own understandings of those concepts.
6. Constructivist teachers encourage students to engage in dialogue both with the teacher and with one another.
7. Constructivist teachers encourage student inquiry by asking thoughtful, open-ended questions and encouraging students to ask questions of each other.
8. Constructivist teachers seek elaboration of students' initial responses.
9. Constructivist teachers engage students in experiences that might engender contradictions to their initial hypotheses and then encourage discussion.
10. Constructivist teachers allow a waiting time after posing questions.
11. Constructivist teachers provide time for students to construct relationships and create metaphors.
12. Constructivist teachers nurture students' natural curiosity through frequent use of the learning cycle model (Brooks & Brooks, 1993).

These 12 characteristics are offered as a guideline for creating a constructivist atmosphere in the classroom. Constructivism is a philosophy that views students as thinkers, problem solvers and life-long learners who are the creators and constructors of knowledge. This is a drastic change from the traditional view of students and the classroom.

There are several ways that student-centred learning can be described, and they all lead back to the same basic idea, the student. First, student-centred learning can be defined as a discipline that involves the interaction of a team of students that experience creative learning to be used in the real world (Thornburg, 1995). Thornburg (1995) also mentions that students are essential to the classroom, just like a team member is essential to a game. He says that teachers are part of the definition of student-centred learning, but they are not the main attraction. The students are the focus, and the teacher is the one who can assist among small groups of students. Another way of looking at student-centred learning is that the goals of a system (school) should meet the goals of the students (Harmon, & Hirumi, 1996). Cass & Csete (1995) use the term "learner controlled instruction" instead of a student-centred approach. Learner controlled instruction can be termed as when the learner has some control in the type of instruction that is given. The control factors can range from "procedures" to "time restraints" to "evaluation". The point is that each student's needs are different, in student-centred learning and learner-controlled instruction the learner can decide how and what they want to learn, to function in the real world.

Finally, student-centred learning will be difficult without the use of technology in the classroom. According to Harmon and Hirumi (1996), student-centred learning was not feasible because of the labour and time involved in the traditional classroom.

> "Because of new emerging technologies such as networking and rapid access to vast stores of knowledge, the students can become active seekers rather than passive recipients to knowledge" (Harmon & Hirumi, 1996: 269).

Technology such as the Computers, Multi-media authoring tools, the World Wide Web, email, and chat rooms can have a profound effect on student learning.

In conclusion, there are many reasons that teacher-centred learning needs to shift to student-centred learning. One is that student-centred learning is more aligned with the life long learning skills needed in the workforce of the Information Age. Those include learning how to learn, problem solving, team skills, communication skills, and interacting and processing information. Second, with the rapid changes in history and culture, textbook-based teacher led learning has become obsolete. Instead, multi-media and online resources are replacing these obsolete approaches to create an interactive learner-centred classroom.

3.4 ICT and Teachers' Philosophy

This section explores how teachers' beliefs shape what they choose to do in their classrooms and explain the core of instructional practices that have endured over time. Becker (1998) suggests three possible theories that might explain the link between using technology and certain teaching styles:

Theory of Technology-Induced Belief Change: Computers encourage and may require changes in practice that do in fact change the pedagogical beliefs of teachers as they use the technology. Becker refers to this as "the Trojan Horse" theory. When computers are brought into the classroom, teachers use more constructivist teaching approaches even if they had not subscribed to them previously.

Theory of Facilitating Conditions: Computers are catalysts that support changes in teaching that match pre-existing personal philosophies and make it possible to put them into effect. The computer affords the opportunity to try out these pedagogical points of view. This theory would explain some, but not all the changes exhibited by the more traditional teachers.

Theory of Spurious Correlation: There is little impact of the computer per se; rather, change occurs because those teachers who are most innovative in teaching practice are ready to try new things, in new ways. This does not explain the changes in teaching practice noted in the more traditional teachers, however.

Becker & Ravitz. (1999) found that use of computers and the Internet is more consistently related to certain types of changes in practice and teacher perception than others. Frequent computer and Internet use seem to be related to: (a) teachers being more willing to discuss a subject about which they lack expertise and allowing themselves to be taught by students; (b) arranging multiple activities occurring simultaneously during class time; (c) assigning long and complex projects for students to undertake; and (d) giving students greater choice in their tasks and the materials and resources they can use to complete them. In general, those teachers who reported having changed their instructional practice in constructivist-oriented directions were the same teachers who had most thoroughly employed computers in their teaching and who had taken advantage of new opportunities incorporating the Internet into their instruction. This study was consistent in its finding with that of Jonassen et al. (1998) who suggested that computers can help teachers accomplish constructivist approaches that might be difficult, if not impossible, to accomplish otherwise.

Becker & Riel (2000), in their national survey entitled 'Teaching, Learning, and Computing' involved more than 4,000 teachers from grades 4 to 12 in over 1100 schools across the US in constructivist classrooms that examined the relationships between professional engagement and teaching practice, including instruction involving computer use. Professional engagement was measured by the frequency with which a teacher had informal substantive communications with other teachers at their own schools, the frequency and breadth of professional interactions with teachers at other schools and the breadth of involvement in specific peer leadership activities, mentoring, workshops and conference presentations. The study found that teachers who regularly participate in professional interactions and activities beyond their classroom teach in different ways from teachers who have minimal contact with their peers or profession. The more extensively involved teachers were in professional activities, the more likely they were to have teaching philosophies compatible with constructivist learning theory, teach in ways consistent with a constructivist philosophy and use computers more and in exemplary ways. Their use of computers with students was not limited to gaining computer competence, but extended to involvement in cognitively challenging tasks where computers are tools to promote communicating, thinking, producing, and presenting ideas. Data on software use and objectives for computer use suggest that these teachers recognise the features of technology that grant students access to a broader community and knowledge base beyond the walls of the classroom. They are able to incorporate the use of computers into student activity more effectively than teachers who fail to participate in their professional community. Such teachers are more likely to focus on traditional methods of delivery of information, on direct instruction. They do not place a high value on collaborative knowledge building in the classroom or for themselves in the educational community. The role of the student is to listen, learn and repeat. Becker & Riel concluded that those teachers extensively involved in professional activities are in a position, with sufficient authority and time, to help other teachers move towards being more accomplished users of computer technology.

Scrimshaw (1996) examined the teacher's role in classrooms with computers. He argued that teachers need to teach the process of learning rather than its products.

The conventional learning skills, such as locating, collating and summarising information, and identifying connections and contradictions within a body of information, all need to be explicitly moved to the centre of the curriculum. The development of such skills needs to be supported using appropriate forms of software. This requires the explicit teaching of ways of organising cooperative activities involving computers, whether in face-to-face groups around a single machine, or through cooperation at a distance via a conferencing or email system. In order to do this, teachers themselves need more opportunities and support in using the new technologies in collaborative contexts, so that they can both identify the problems and possibilities for themselves, and find ways to model these activities in their own practice with learners. Finally, when introducing these newer technologies teachers too need time to reflect upon and research what is happening.

Dexter et al. (1999) examined the use of computers by teachers and their perceptions of the impact of computers on their classroom practice. The data drew from 47 teachers from 20 K-12 schools across three states in USA who each completed a questionnaire, participated in three semi-structured interviews, and allowed three observations of the classroom.

The teachers were designated as either "non constructivist" "weak constructivist" or "substantially constructivist". The teachers who had adopted more progressive teaching practice over time felt that computers helped them change, but they did not acknowledge computers as the catalyst for change; instead they cited reflection upon experience, classes taken, and the context or culture of the school. The researcher concluded that for teachers to implement the use of educational technology in a constructivist manner, they must have opportunities to construct pedagogical knowledge in a supportive climate.

Goos et al. (2003) in a three year project in Australia found that teachers' own pedagogical beliefs and values play an important part in influencing the learning opportunities provided by ICT, whether ICT is used to reinforce existing teaching approaches or as catalyst which will change the way teachers and students interact with each other and with the tasks.

The researchers suggested four roles for technology in relation to such teaching and learning interactions:

Master: Teachers and students may be subservient to the technology if their knowledge and usage are limited to a narrow range of operations over which they have technical competence;

Servant: Here technology is used as a fast, reliable replacement for mental or pen and paper calculations, but the tasks of the classroom remain unchanged. That is, technology is a supplementary tool that amplifies cognitive processes but is not used in creative ways to change the nature of activities;

Partner: Here technology is used creatively to increase the power students' exercise over their learning by providing access to new kinds of tasks or new ways of approaching existing tasks. This cognitive re-organisation effect may involve using technology to facilitate understanding or to explore different perspectives;

Extension of self: The most sophisticated mode of functioning, this involves users incorporating technological expertise as a natural part of their mathematical and/or pedagogical repertoire.

From Goos et al.'s (2003) suggestion for the role of technology in the classroom, this role can be use as a measurement of how constructivist the classroom is. This development in technology use shows how teachers moved form the traditional stage of practice to more constructivist level.

Al-Hamdani (2002) in his study in Oman which aimed to examine the effect of training on teachers' attitudes towards the constructivist learning environment found that when teachers received training in the theoretical approach, which was about introducing the theory of constructivist followed by giving teachers some IT skills, their attitude was shifted from disagreement towards agreement.

3.5 Summary

This chapter reviewed some of the literature relating to the development of the learning theories, followed by detailed description of the main theories, which influenced the development of ICT. The review showed that each of the learning theories (behaviourist, cognitive, constructivist or social constructivist) has an impact to some extent on the development and use of ICT. It can be said that ICT is a 20^{th} century movement, and the major development in it took place during and after World War II. The emphasis began with the use of audio-visual tools, and then progressed to focus on teaching and learning procedures, however, these procedures were grounded in behavioural psychology. Recently, other fields seem to have contributed generously in ICT, the most prevalent ones being cognitive theory and constructivist theory.

The influences of theories in developing instructional design have their roots in the work of Thorndike and other who were mentioned earlier in the chapter. These are all of great importance and value for technology, but there is need to expand the idea of instructional design to give further attention to the social and cultural aspects. The social constructivists emphasise that the more meaningful, the more deeply or elaboratively processed, the more situated in context, and the more rooted in cultural background, metacognition, and personal knowledge an event is, the more readily it is learned.

In spite of the fact that constructivism is not a model of learning, it can provide a strong and coherent theory or set of principles which can serve as a guide in the design of learning environments. Teaching in the constructivist classroom may be further enhanced by the use of educational technology, in any or all of its forms. Software, CD-ROMs, video taping and editing, digital photography, internet searches and Web Quests, E-Books, and on-line leaning environments are beginning to change the fabric of today's classroom. However, how all of this hardware and software is used depends tremendously on the teacher, his or her own comfort level with the technology, and the extent to which it is integrated into the learning environment.

Constructivism reminds us that these are not only important philosophical notions. On the contrary, they can significantly affect how we see the world and, more importantly, how we behave in it. Perhaps an important challenge for educational reform is to begin to question and come to a greater understanding of the philosophy and theory that presently informs educational practice.

Finally, the chapter ended with summary of some studies, which showed the interaction between teachers' philosophies and their implementation of ICT.

Chapter four sheds light on teachers' integration of technology and the factors that enhance or hinder the use of ICT.

CHAPTER FOUR: ICT USE AND RELATED FACTORS

4.1 Introduction

From a constructivist perspective, technologies are cognitive tools which help learners to elaborate on what they are thinking and to engage in meaningful learning (Jonassen, 2000).

ICT has an influential role in enhancing and developing the positive and constructive elements in our personal, educational, social, commercial and recreational lives (Velle & Nichol, 2000). Technology provides us with a tool that can promote real educational changes. If used properly, it can help education shift from didactic, passive instruction to more interactive learner-centred and learner-directed instruction (Zisk, 2002). Technology can benefit education in many ways. The right technology used in the right way and at the right time can help teachers and students in the areas of classroom management, instruction, and evaluation. Technology not only affords opportunities and the means to improve traditional instructional strategies but also to reconceptualize classroom practice (Hooper & Rieber, 1995).

A lot of changes can happen when technology is integrated into teaching. Valdez et al. (1999) found that technology has an important role to play in K-12 education, but it will not solve all educational problems. Technology can:

- Make learning more interactive.
- Enhance the enjoyment of learning.
- Individualize and customize the curriculum to match learners' developmental

needs as well as personal interests.

- Capture and store data for informing data-driven decision making.
- Enhance avenues for collaboration among family members and the school community.
- Improve methods of accountability and reporting.
- Technology may transform the educational content and motivate students toward lifelong learning.

The role of technology should be active and positive for technology to play a positive role; Valdez et al. (1999) argued that the success or failure of technology is more dependent on human and contextual factors than on hardware or software. Teachers are a key component in the learning environment and therefore the impact of ICT on them, and the strategies they employ to facilitate the environment, are critical. There sometimes appears to be an assumption that using ICT to support learning requires change for all teachers, whereas clearly some teachers have been creating appropriate learning environments for years without using ICT. However, these teachers, when they do use ICT, do so because they readily perceive it will make good environments even better (Becker et al., 1999).

The impact on teachers is varied and distinctive although some general areas of impact may be identified such as:

- The balance of roles they play with a perceived risk of reduced influence,
- providing greater access to information, leading to increased interest in teaching

and experimentation requiring more collaboration and more communication with teachers, administrators and parents,

- requiring more planning and energy,
- requiring the development of skills and knowledge of ICT, and
- providing more time to engage with students, leading to greater productivity (Cradler & Bridgforth, 2002).

Technology can benefit teachers and instruction in different ways; among the general benefits and impact of technology in education, some researchers have concentrated on areas that were clearly influenced by its implementation. Statham & Torell (1996) found increased teacher-student interaction, cooperative learning, and, most important, problem solving and inquiry. Technology tools can increase, extend, and enhance human cognition. They can facilitate access to human, material, and technological resources and help students to store, reshape, and analyse information. They enable students to be hypothesis testers, with the result that the knowledge that is acquired can be used more effectively (Jonassen & Reeves, 2001).

ICT gives teachers access to information to support them in trying new strategies, thinking, reflecting on practice, and engaging with new material (Committee on Developments in the Science of Learning, 2000).

In addition, technology tools can free teachers' time so they can interact with students more. Teachers can leave fact-finding to the computer and spend their time doing what they were meant to do as content experts: arousing curiosity, asking the right questions at the right time, and stimulating debate and serious discussion around engaging topics

(Hancock, 1997). Teachers are able to give students more control once they see what students are able to do with technology, and how willing and able they are to take responsibility for their own learning (Means & Olson, 1995). While observing students working with computer applications, teachers can see the choices students are making on the monitor or printout, pose questions regarding students' learning goals and decision-making, and make suggestions for revisions when needed. Technologies can also be designed to provide a window to the ways in which students construct meaning--their misconceptions, conjectures, and the connections they make among ideas (Collins, 1990). Teachers can use this information to revise and refine instruction.

4.2 Teachers' Use of ICT

4.2.1 Technology and its integration into instruction

In the past, the idea of integrating technology into the regular classroom curriculum was a relatively weak component of teacher preparation (Yildirim, 2000). Whereas there are those who are seeking to maximize the integration of technology in their programmes, others are doing the best they can, given the availability of resources and their comfort levels working with these tools. Many teachers who have integrated technology to support teaching and learning have only used it for activities which they can control (e.g., drill and practice and tutorials). Other teachers, however, have used technology for instruction in ways which are more student-centred (e.g., collaborative learning activities) (Office of Technology Assessment, 1995). Yet other teachers may still be reluctant to integrate technology beyond the traditional ones (e.g., overhead projectors, videotape recorders, 35 mm projectors) in their programmes (Duhaney, 2001).

Historically, most of the studies related to educational technology have focused on quantifying the numbers of computers or Internet access in classrooms, rather than investigating the manner in which the technology is integrated into the curriculum (Smerdon, et al., 2000). Beck & Wynn (1998) stated that schools, colleges, and departments of education may be placed along a continuum in their integration of technology. Ertmer et al. (1999) notes that technology integration has evolved over the past three decades and has moved from teaching about technology to using it as a tool to communicate and interact with. For the purposes of this study, it is necessary to establish a working definition of technology integration and for this Ertmer provides one that is a both "curriculum-based and future oriented" (p. 49). His definition of integration is when technology "adds value to the curriculum not by affecting quantitative changes (doing more of the same in less time) but by facilitating qualitative ones (accomplishing more authentic and complex goals)." Technology integration has been shown to be an evolutionary process. Before starting to integrate technology the classroom environment should be prepared for this change. Mann (1997) stated that there are distinct changes that must occur in the classroom for technology to be integrated into instruction.

These changes include:

• **Teacher-Centred to Student-Centred Activities:** Teachers need to move from the didactic mode of lecturing and directing to facilitating and coaching. The term being used is "moving from the sage on the stage to the guide on the side." The teacher can no longer be the fountain of knowledge because there is simply too much to know.

• **Whole Class to Small-Group Instruction:** Using technology will mean that teachers need to promote and organize small group activities more than whole class instruction.

Groups of students will be able to work on different projects and at a different pace.

- **Structured to Exploratory:** Computers, videotapes, and other technologies allow students to explore diverse worlds. These activities would need to be open-ended and flexible as there are possibilities which teachers cannot predict.

- **Competitive to Cooperative:** Teachers need to teach students to work in a different mode that requires cooperation and problem solving in small groups. Students can no longer be lost in a large class, but now will need to contribute to and participate in real-life tasks.

- **Classroom to Whole-World Interaction:** The "real-world" context has been emphasized in teaching and is now made a reality through the use of technological resources. Issues and case studies using actual real-world problems are possibilities and require an interdisciplinary awareness and multiple resources.

Many integration models have been established and designed by researchers in the field. The following paragraphs present different models of integration.

A model of ICT integration is presented by Fogarty (1991), who described ten ways of integrating technology within the curriculum. Across the ten models, three integration strategies are presented. These are single discipline, multiple discipline, and within and across learners. The first strategy involves integrating technology within a single discipline in which teachers begin to use technology as an extension of their traditional practice. An example of this strategy would be to use a single piece of application software to study a specific subject being taught in the classroom. The second strategy allows integration across several disciplines of study or classes. An example of this would be students studying ways to create spreadsheet formulas (e.g., to calculate interest) in a computer technology class and studying interest and percentages in a maths class. The final and most ambitious strategy is that of integration within and across learners. This strategy involves student collaboration and creation of an end product. Using this strategy, classrooms are student-centred and teachers increasingly take on the role of facilitators of learning.

Mann stipulated in general a change in the learning environment to achieve a fruitful technology in the educational process. By the learning environment, he meant the classroom environment, the teaching philosophy and the syllabus.

The above-mentioned study makes clear three levels for the use of technology in the field of education. The use of technology in a traditional manner is the first level, the medium level where use of technology is to some extent increased. The final level is where use of technology is wider, along with other educational elements and complementary to them.

In the 1980s, researchers began to analyse the process of technology integration and attempted to measure how teachers used technology in the classroom. The Apple Classroom of Tomorrow (ACOT) project was an important initiative in this area. It began in 1985, and it involved collaboration among universities, research agencies, Apple Computer, and a cross-section of K-12 schools. Each participating student and teacher received two computers – one for home and one for school (Apple Computer, Inc., 1995). Several findings related to the integration of technology emerged from the project. For example, the study found that technology:

- Encourages fundamentally different forms of instruction among students and between students and teachers.

- Engages students systematically in high-order cognitive tasks.
- Prompts teachers to question old assumptions about instruction and learning (Dwyer, 1994: 8).

The ACOT also produced an adoption model which asserted that educators go through five stages of thought and practice when adopting technology:

- Entry: Learn the basics of using technology.
- Adoption: Use new technology to support traditional instruction.
- Adaptation: Integrate new technology into traditional classroom practice.
- Appropriation: Focus on cooperative, project-based, and interdisciplinary work, incorporating the technology as needed and as one of many tools.
- Invention: Discover new uses for technology tools (Apple Computer, Inc., 1995).

The ACOT model is more common than Fogarty's model in the process of use of technology in learning as it provides more detailed steps in use of technology as well as providing concrete examples for each stage.

A similar model, called the "Levels of Technology Implementation" (LoTi) scale, was developed by Moersch in 1995 (Moersch, 1999). Teachers were asked to complete a 50-item questionnaire, indicating their perceptions about how they were using technology in their classroom. The scale consisted of eight levels ranging from 0 to 6:

- Level 0 (Non-use),
- Level 1 (Awareness),
- Level 2 (Exploration): Technology-based tools serve as a supplement to existing instructional programmes ,
- level 3 (Infusion),
- Level 4a (Integration (Mechanical)): Technology-based tools are mechanically integrated, providing a rich context for students' understanding of the pertinent concepts, themes, and processes,
- Level 4b (Integration (Routine)): Teachers can readily create integrated units with little intervention from outside resources. Technology-based tools are easily and routinely integrated, providing a rich context for students' understanding of pertinent concepts, themes, and processes,
- Level 5 (Expansion): Technology access is extended beyond the classroom,
- Level 6 (Refinement): Technology is perceived as a process, product (e.g., invention, patent, new software design), and tool to help students solve authentic problems related to an identified real-world problem or issue.

In a survey of 120 teachers from the Los Angeles Unified School District (LAUSD), the responses showed that for 49% of the teachers, their classroom use of technology did not exceed level 2, meaning they were using technology primarily for extension or enrichment activities, rather than as an integral part of the curriculum. The highest level for 28% of the teachers corresponded with level 4 classroom technology use; meaning that technology was being used as a tool to solve problems and increase students' understanding of concepts. Based on this study, LAUSD recommended that all classroom teachers should have a working computer and printer in their classrooms, that assistance be provided to teachers who showed lower levels of technology implementation, and that higher-level teachers be encouraged to design units that illustrated how they use technology in their curricula (Moersch, 1999).

The LoTi system provides more details on transition from the traditional application of technology in education to a higher and more advanced level which can be used as a way to assess the improvement of teachers in dealing with technology and the effect of training on the use of technology by employees working in the field of education. This model provides a method for assessing the extent of use of technology through the use of a standard questionnaire based on the model.

Evans-Andris (1995) summarised three styles of computing use among teachers: avoidance, integration and technical specialisation. These styles play a significant role in student access to computer technology. Her study evolved over an 8-year period in the elementary schools of a large metropolitan area in US. The dominant style of computing among teachers was that of avoidance. Here, teachers typically distanced themselves from computers and otherwise reduced the amount of time they spent attending to computer-related activities. Their pupils had limited and repetitive use of software intended for drill and practice or word processing. Generally, these teachers sustained a low level of interaction with students while they worked with computers. In contrast, teachers engaged in 'integration' generally embraced computers. They integrated the technology into their teaching methods and curriculum, their working day, and the learning experiences of students. They selected drill and practice software based on curricular goals and the needs of their students. In addition they introduced a broad range of computer applications and developed creative and engaging projects that integrated computer activities with more normal instruction.

As in integration, teachers engaged in 'technical specialisation' embraced computers and viewed the technology as a challenge. These teachers promoted computers in their schools and their activities relating to computing typically demonstrated strong teaching methods such as consistent use, preparation, and delivery of planned lessons involving the computer. During lessons they generally integrated the computers rather than using them to supplement the traditional curriculum. They also focused their efforts on teaching students about the technical aspects of the computer.

The model presented by Evans-Andris differs from the other models as it clarifies the way teachers move from one level of use of technology in a hesitant manner to the other level of use of technology in a confident and creative manner. Such levels were not mentioned in the other models.

In one way this model is similar to the LoTi model, particularly in that both include the level of non-use of technology. However, whereas it is elsewhere ascribed to environmental factors, it is ascribed to psychological factors in this model.

The Fogarty, ACOT, LoTi and Evans-Andris projects provide insight into teachers' various stages of technology use and integration, and in many ways set the stage for universal standards to emerge. The similarities and the differences between the three models are presented in Table 4.1.

Table 4.1: Stage models of technology integration

Fogarty (1991)	ACOT	LoTi	Evan-Andris Model
	Entry	Non-use	Avoidance
		Awareness	
Single discipline	Adoption	Exploration	
		Infusion	
Multiple discipline	Adaptation	Integration (mechanical)	Integration
Within and across learner	Appropriation	Integration (routine)	Technical specialisation
		Expansion	
	Invention	Refinement	

The four models show how teachers move gradually from the entry level to the invention level (to use the ACOT terms), which can be used as a guide to measure the changes in teachers' use of technology if they have changed their attitudes or if they have received training courses. The models show in general four main stages of integration. The first one is the 'no integration' stage, which means that the teachers may have the basics of using the new technology but avoid using it. The second stage is that of limited integration, which means that the teacher may use the technology as a supplementary tool to support traditional instruction, i.e. for extension or enrichment activities in the classroom. The third stage is integration, which means that the teachers employ the technology in the classroom, having the ability to integrate units with little intervention from outside resources; technology-based tools are easily integrated, providing a rich context for students' understanding of pertinent concepts, themes, and processes. Technology is perceived as a tool to identify and solve authentic problems relating to an overall theme/concept, and the fourth stage is high integration, which means that the teacher discovers new uses for technology tools.

While with each model there are subtle differences between each category, it would seem logical that they may be broken down into three groups, to fit low-end, mid-range, and top-end users of technology and technology integration.

On the basis of the above presentation we can conclude that the four models, though they may differ in the details of transition from one stage to the other in use of technology, agree that the learning environment plays a vital role in the extent of use of technology. The more advanced the learning environment, the more improved the level of use and application of technology in the field of education.

The current study seeks to establish whether the learning environment in the classroom and the technological awareness of the teachers, in the Sultanate of Oman are sufficient for the full application of the technology. This is a necessary step to prepare the teachers and the learning environment, as failure of technological education may be due to inadequate preparation of the learning environment, rather than to the simple question of whether or not the technology is being applied. The study is being carried out through field study in the Basic Education schools in the sultanate, and will make use of the three different levels discussed above. It will also make use of the concepts and principles outlined by Mann as well as including the different studies, and the success of the study should help to validate the method.

4.2.2 Recent research studies on integration

The American National Centre for Education Statistics (Smerdon et al., 2000) conducted a survey on public school teachers' use of computers and the Internet, involving 2,019 full-time teachers in elementary, middle, and high schools in 50 states in the USA. It found that half of the teachers in the sample who had computers or the

Internet available in their schools used them for classroom instruction. Teachers used these technologies most frequently (61%), for word processing or creating spreadsheets, followed by Internet research (51%). Moreover, many teachers used computers and the Internet to conduct a number of preparatory and administrative tasks (e.g., creating instructional materials, gathering information for planning lessons) and communicative tasks (e.g., communication with colleagues). According to the LoTi implementation framework the teachers in the National Centre for Education Statistics research were in level 4b (Integration (mechanical)) which means that the technology in this level provides a rich context for students' understanding of the pertinent concepts, themes, and processes.

Barron, et al. (2003) conducted a survey in order to investigate primary teachers' use of technology in the classroom. The survey targeted 2,156 teachers in Florida (17% males, 83% females). The respondents represented a range of educational backgrounds, a variety of disciplines, and a diversity of teaching experience. The study provided data that indicated that many teachers are implementing technology as a tool for research, communication, productivity, and problem-solving; however, the goal of technology integration across all subject areas and grade levels is yet to be reached. The proportion of teachers using computers as a tool in the classroom ranged from 20% (problem-solving tool in high schools) to 59% (communication tool in elementary schools). Across subject areas, the range was 10% (problem-solving tool in English) to 59% (communication tool in science). Most of the teachers in this study may be classified as being in the mid range level of their integration of technology.

In the UK, a group of researchers conducted a survey between October 1997 and April

1998 to investigate the ICT skills and knowledge needs of teachers working in Scotland. The research was commissioned by the Scottish Office Education and Industry Department. A sample of 300 primary schools and 100 secondary schools was chosen at random from lists of all (2313 primary and 403 secondary) schools in Scotland. The study was conducted in two parts: the first part, a survey of primary and secondary teachers, provided basic data on the current levels of ICT use in schools, teachers' experience of ICT training to date, and their perceptions of their ICT knowledge and skills needs; the second part, a number of scenario interviews, provided a more in-depth understanding of these issues and the contextual factors that influence teachers' responses to ICT and ICT training. The findings of the study were grouped under four subheadings: use of ICT problems and challenges; attitudes; skills; training and organisational culture, however this section concerns ICT use; the other findings will be reviewed in more details in subsequent sections (Williams et al., 2000). The findings showed that the use of ICT was relatively low and was focused on a fairly narrow range of ICT. ICT was used most frequently in primary and secondary schools for word processing. There was very little use of the Internet and WWW or e-mail by either primary or secondary teachers. Primary teachers used ICT primarily to support classroom practice, while secondary teachers used it as much or more for professional development and personal use than in the classroom. In general, the study found that ICT was still seen as an extra or add-on rather than an integrated resource within teaching and many teachers were still concerned with teaching ICT rather than teaching with ICT. This study indicated that most teachers are in the mid range of the integration, although there are teachers who are trying to reach the high end in their use of technology.

In 1996, the British Educational Communications and Technology Agency (BECTA) carried out a study (Youngman & Harrison, 1998) that sought to develop teacher competence and confidence in the use of ICT with portable computers. Approximately 1150 teachers in 575 primary and secondary schools were provided with a multimedia portable computer together with two Internet subscriptions, core software and a number of CD-ROM titles. The evaluation of the project made use of three sources of data: the databases which held records of the teachers and their schools, including self-ratings of initial self-confidence and competence with ICT; a detailed questionnaire administered at two points, 3 months and 8 months into the academic year; and case study data. It was found that a very high proportion of teachers (98%) made effective use of their computer; a very high proportion made use of desktop publishing software; and over 94% of teachers attempted to use the CD-ROM, and 91% were successful. The use of e-mail (62%) and the Internet (76%) was high. The degree of computer literacy of many teachers increased to the extent that even relatively inexperienced teachers were quickly able to use their computer's power to evaluate a variety of software packages, and to filter, import and export information in order to better suit their own curriculum purposes. Teachers' confidence and competence changed for the better; they felt that their knowledge of IT had increased 'substantially', teachers changed their ways of working and their enthusiasm for their work increased. The most significant benefit to pupils was indirect, through the teachers' more expert use of tools for creating high-quality classroom materials and improved access to resources, which means that this group of teachers were in the high end level of ICT integration through their creative activities.

The study showed that four conditions contributed to the success of the project:

- Initial and immediate success with the technology through hands-on demonstration and the provision of user-friendly hardware and software.
- Personal ownership and exclusive use of a machine over an extended period.
- The portability of the equipment so it could be moved between work areas and between home and school.
- Formal and informal support – the combination of the ownership and portability provided teachers with a greater variety of support from peers and other sources.

It was concluded that this Multimedia Portables for Teachers Pilot was very successful in leading to a significant enhancement of the ICT skills of the great majority of teachers who took part. The findings from this study shows that when teachers own their own computers they made more integration of technology and having access to technology increased their level of technology implementation. Similar findings were made by Selinger in a study of the effect of the loan of computers on 1000 students studying at a distance on a part-time initial teacher education course at the UK Open University (Selinger, 1996). It is important to note that Selinger's study did not report any significant correlation with teachers' use of ICT in the classroom.

Miami Dade County Public Schools officials commissioned a study in the spring of 1999 to serve as a basis for the next phase of their implementation of learning technology. As prescribed in the district technology plan developed by the Instructional Technology and Media Support Services, this study was commissioned to provide the district with an accurate profile of the current status of learning technology in Miami

Dade County Public Schools. The data sources included: surveys of 1,085 teachers, 30 principals, 27 technology coordinators, 1,265 parents and 2,320 students from a statistically valid cross section of 30 of Miami Dade County's 300 public schools; focus groups representing perceptions, attitudes, opinions and expectations of parents, community leaders, educators and administrators; and site visits of a stratified random sample of 30 MDCPS schools, drawn fairly to represent the district as a whole across elementary, middle and secondary levels, as well as it terms of race and socio-economic status (Milken Family Foundation, 1999).

A range of effective uses of learning technology was found to be emerging – along with the increased connectivity of classrooms and innovative studies demonstrating new applications. Those studies suggest a continuum of effective applications for technology in learning. To date MDCPS has focused, with some exceptions, on one end of that continuum - basic skill development through integrated learning systems or drill and practice. Some individual teachers and select schools inside the district are beginning to explore the use of technology in the academies across that continuum, moving into discovery learning, cooperative learning, exploratory learning, and more independent and project-based learning that allows students to bring real-world applications to the content areas, this means that they are in the high end of integration. Not surprisingly, the district has yet to systemically enable teachers in all buildings to incorporate such applications. Thus, with some notable exceptions, the impact to date on student learning has been limited to remediation and drill and practice. While those are very important, the district has yet to broaden access to emerging applications beyond prototype classrooms or buildings (top-end level of ICT integration).

The International Association for the Evaluation of Educational Achievement (Kozma, 2003) carried out an international study of technology and classroom practice. The research teams in each of the 28 participating countries (Australia, Canada, Chile, China Hong Kong, Chinese Taipei, Czech Republic, Denmark, England, Finland, France, Germany, Israel, Italy, Japan, South Korea, Latvia, Lithuania, Netherlands, Norway, Philippines, Portugal, Russian Federation, Singapore, Slovakia, South Africa, Spain (Catalonia), Thailand and the USA) formed national panels to select the innovative practice to be included in the international study. 174 case studies were included in the research. The research teams in each country used standard instruments and protocols that were field tested in 17 of the countries and revised based on these tryouts. The data were collected from a variety of sources that included interviews of administrators, teachers, students, and parents; classroom observations; and the analysis of documents, such as teacher lesson plans and samples of student work. The data collection typically took two researchers approximately one week at each site.

The findings showed that only 21% of the cases involved computer education or informatics as a subject area and that only 8% were focused on vocational studies. The other cases were in a variety of subject workers, suggesting that ICT has become integrated throughout the curriculum, at least in this set of innovative cases. Indeed, many of these ICT-based innovations involved multidisciplinary projects (28%) or multiple subject areas, with 37% of the reports involving several subject areas and 32% involving nearly all of the subject areas in the school. In only 29% of the cases was the innovation limited to a single subject area.

Nearly 90% of the cases said that teachers were engaged in advising and guiding their students' work as part of the innovation. A large number of cases also described more traditional practices such as creating structure (81%) and monitoring or assessing student performance (76%), although only 25% reported that the teacher engaged in lecturing as part of the innovation. Nearly 59% of the cases reported that teachers collaborated with other teachers as part of their innovation. But only 23% reported that teachers collaborated with people outside the class, such as professors, scientists, or business people. The reported impact on teachers was primarily the development of their ICT skills (63% of the cases reported this) and pedagogical skills (57% reported this). Another group of cases – 35% – reported that teachers acquired collaborative skills as a result of the innovation.

Regarding the kinds of technology teachers and students use and the role ICT plays in supporting these innovations, a large majority of the innovations used productivity tools (78%), Web resources (71%), and e-mail (68%). Many (52%) used multimedia software. Some used Web design tools (34%). Very few used specialized educational software such as simulations and microcomputer-based laboratories (13%). In almost all of the cases – 94% – computers were used in regular school settings such as the classroom, library, or computer laboratory. In a few cases (28%), technology was used outside the school. Software packages were used to create products or presentations (80%), Web browsers or CD-ROMs were used to search for information (77%), and e-mail was used to support communication (55%). In far fewer cases, teachers used ICT to plan or organize instruction (26%) or to monitor or assess student work (22%). In a small number of cases ICT was used to support student collaboration (17%), or simulations or modelling software packages were used for research or experimentation (13%).

The findings of the studies summarised above show that teachers in many countries are beginning to use ICT to help change classroom teaching and learning, and are integrating technology into the curriculum. Students are working together in teams and using computer tools and resources to search for information.

Jabber & Moore (1999) conducted a survey of K-12 teachers in two rural county school systems, one was in southern West Virginia and the other in south western Virginia, to study the factors, which influence teachers' use of computer-based technology. Only 30% of the teachers responding to the survey had computers. Of those who had access, 67% used computers for instruction. An investigation was carried out among the teachers with access to computers in the classroom of seven instructional activities: tutorials, remediation/acceleration, drill and practice, recreational and educational games, enrichment activities, information access via CD-ROMS, and problem-solving. This produced a significant chi-square relationship between computer access, the instructional activity, and frequency of use. Thus, it is not surprising that it was concluded that classroom access to computers is a key factor to using computers instructionally. Anecdotal comments from teachers support the importance of classroom access to computers, and suggest that obsolescence is a barrier to the instructional use of computers.

In the Arab world however, the few studies conducted so far suggest that computer adoption in education is still in its infancy, and computers are little used by teachers. In Saudi Arabia Al-Rashid (2002) conducted a study to investigate primary teachers' use of ICT, their attitudes towards ICT, their perceptions of their ability and their perceived need for in-service training. The study included 800 primary stage teachers; 390 males and 410 females. He found that none of the resources were widely used in the classroom or for professional development. Even the most used resources, word processing, and educational software packages were used by fewer than a third of the teachers. On the other hand teachers' personal use of ICT was higher than in the classroom or professional development. Although teachers' use of ICT is still low, almost 40% of the respondents use it sometimes.

In Oman, Al-Rabiey (2002) investigated use of instructional technology by 240 staff in Colleges of Education in Oman, the factors in the under-use of instructional technology, attitudes towards instructional technology, and their opinions on improvements that would encourage more effective use in the future. He reported that staff tended to use the traditional items more than the new technology.

These rare studies of the use of ICT in the Arab world do not as yet tell us much about its impact. However, as seen from the previous studies in the West discussed above, research into technology integration gives support to the idea that that technology can be used to transform classrooms and change how teachers teach. The increased use, both quantitatively (as in the Miami study) and qualitatively (as in the BECTA study), shows clearly that ICT allows a much improved input into teaching, raising the levels of cognition used by pupils.

4.3 Barriers to ICT Use

In the previous section, the integration of ICT into teaching was classified into the different levels. This section explores the barriers and factors which adversely affect teachers' use and integration of ICT. Most education leaders believe the under-utilization is a result of at least four factors: inadequate teacher training; a lack of vision of technology's potential for improving teaching and learning; a lack of time to experiment; and inadequate technical support (Office of Technology Assessment (OTA), 1995). Specifically, the OTA lists the following barriers to teachers' use of technology:

Lack of teacher time: There is never enough time to:

- Experiment with new technologies
- Share experiences with other teachers
- Plan lessons using technology
- Attend technology courses or meetings

Access: Problems with access include:

- Hardware and software are limited
- Upgrades, support, and training are continuing costs
- Technologies may not be located in or near the classroom
- Much of the hardware in schools is old and cannot handle newer applications
- Telecommunications requires new or updated wiring or phone lines

Vision:

- Schools and districts need technology planning and leadership
- Teachers need an understanding of curricular uses of technology

- Teachers lack models of technology for their professional use
- Messages on best use change as technologies change

Training and support:

- Districts spend far less on teacher training than on hardware and software
- Training focuses on the mechanics, not on integrating technology into the curriculum
- Few schools have a full-time school-level computer coordinator

Current assessment practices:

- Standardized tests may not reflect what students learn with technology
- Teachers are held immediately accountable for changes that take time to show results

As stated in the first chapter, the main objective of the present research is to study teachers' use of ICT. In order to look at the other side of the coin, it is very helpful to study the barriers that hinder the use and integration of ICT into teaching.

Chiero (1997) states that the results of research on computer use in education indicate that resources such as time, space, human support services, training, access to the technology, supplies and group norms and values of collaboration and collegiality are key to computer use. Most of these reasons are barriers to ICT integration and use in the classrooms, as they are presented in the following studies. A classification of the factors that affect teachers' use of ICT presented by Dusick (1998), in her literature review about the social cognitive factors that influence faculty members' use of computers for teaching, refers to a number of environmental factors: (1) a supportive administration, (2) availability of computers in the classroom, (3) support and sharing of resources, (4) a strong support staff, and (5) training. In addition, there are personal social cognitive factors that affect whether a faculty member will take advantage of the resources available: (1) attitude, (2) self-efficacy, (3) competence, (4) time commitment, (5) the risk of using technology, (6) beliefs and perceived relevance, and (7) lack of knowledge.

Another classification was cited by Snoeyink et al. (2001), who categorised barriers as external or internal. The external barriers include lack of equipment, unreliability, lack of technical support and other resource-related issues; the internal barriers include both school-level factors such as organisational culture and teacher-level factors such as beliefs about teaching and technology, and sincerity to change.

Dusick and Snoeyink depended on the same system of classification; what Snoeyink classified as external barriers were called 'environment factors' by Dusick, and Snoeyink's internal barriers were 'personal and social factors' in Dusick's classification.

According to Eadia (2001) in 2000, a group of New Zealand secondary school staff cited the following reasons for delays in the introduction of ICT (in no particular order).

- lack of money leading to limited access to computers
- high price of software
- limited availability of equipment such as data projectors

- ❖ difficulty in linking ICT to the curriculum
- ❖ needing IT facilities in classrooms rather than laboratories
- ➢ teachers' lack of ICT qualifications
- ➢ too little time to plan and learn the skills effectively
- ➢ students' anxiety to learn only what would be tested in examinations
- ➢ timetable restrictions
- ➢ lack of creativity
- ➢ unwillingness to change

If we refer back to Dusick and Snoeyink's classifications, we might classify the first set of the previous list of barriers as environmental or external factors and the second set of barriers could be classified as personal or internal factors.

Ertmer et al. (1999) examined the relationship between both external (first-order) and internal (second-order) barriers to technology implementation by observing and interviewing several teachers within a single school, in Midland in the USA, who had achieved varying levels of integration using the ACOT model as a guide of technology integration. The study found that although teachers experienced similar barriers in term of limited resources and time, these barriers did not affect their technology use in the same way. Even within one school, levels of use varied. The findings suggested that teachers' beliefs interact with first-order barriers to facilitate or limit teachers' technology use. First-order barriers were noted by all teachers, although for different reasons and to different degrees. Second-order barriers were mentioned most by teachers who used computers as a supplement to the curriculum or to support the curriculum. On the other hand, it was not apparent in the teachers who envisioned higher level of use.

4.3.1 External (environmental) factors

This section presents the studies that have found external factors as a barrier to the use of ICT. It is based on the classification proposed by Dusick (1998) and Snoeyink (2001).

4.3.1.1 Lack of support

In the survey by Williams et al. (2000) in 1998, lack of ICT support is seen as a particular problem in primary schools and rural schools, and technical support and advice on selecting ICT resources is badly needed. The researchers recommended that the need for ongoing support should be identified as an essential component of ICT development. This support could take various forms, such as technical support, peer support and support from the top.

In particular, lack of support appears to be a main barrier in a study by Saye (1998) who found that providing personnel to support the technology and those using it are one of the conditions that must be met before teachers will admit computers into their classrooms.

Robertson et al. (1996) carried out a study that looked at the information technology (IT) skills of staff and Year 8 students in a secondary school prior to receiving personal palmtop computers after a short acquaintance with them. The researchers argued that lack of support from the administration was a main reason for teachers' resistance to the computer.

Reynolds et al. (2003) concluded the teachers who usually had the support of a technician during ICT lessons tended to be much more confident in their use of computers. The World Bank Institute (Hawkins, 2002) emphasized the importance of technical support, stating that getting computers into schools is relatively easy; keeping them working is a greater challenge. A number of problems ranging from electrical spikes, to viruses, dust, heat, and normal wear-and-tear can bring activity in the computer lab to a screeching halt.

4.3.1.2 Lack of access

Teachers need ready access to technology while they plan, along with flexible scheduling for team teaching and for learning its use during the school day (Honey & McMillan, 1996).

The problems in the findings of Williams et al. (2000) centred on the lack of access to, or problems with the availability of, hardware and software, and users' lack of familiarity, skills and knowledge. For example, in classroom management, providing fair and equal access for all pupils is seen as a major challenge when hardware is limited. Teachers of lower primary levels feel that upper primary levels have greater priority when it comes to the allocation of ICT resources. Williams et al. (2000) recommended that teachers need to be made aware of the existence of ICT within their own school. Therefore, the authorities in each school should inform all teachers about the availability of ICT resources.

Norris, et al. (2003) in the Snapshot Survey, a multidimensional survey of demographics, educator attitudes, classroom practice and technology access, analysed responses from 4,000 teachers throughout the U.S.A. surveyed during the 2000-2001 school year. The research found a significant and substantive correlation between technology access and use; using regression analysis, the strongest predictors of teachers' technology use were measures of access to it. Based on the data collected, the researchers concluded that the reason that technology had not had a greater impact on teaching and learning was that students had for all intents and purposes, not actually used the technology. The reason for this non-use lies not in the teachers, but rather in the very real lack of access to technology. They stated that having only one computer in a classroom means no access for the student.

The National Centre for Education Statistics (Smerdon et al., 2000) reported that certain characteristics of classrooms and schools, such as equipment, time, technical assistance, and leadership, may act as either barriers to or facilitators of technology use. The 1999 survey indicated that the barrier to the use of computers and the Internet most frequently reported by teachers was not enough computers (78%).

Reynolds et al. (2003) in a survey carried out in secondary schools in UK during the autumn term, 2001 found that one of the main barriers to integrating ICT into teaching was lack of ICT resources in departments, or difficulty in booking ICT suites, often because these are almost always being used by discrete ICT lessons. 85% of teachers said that their school did not have enough ICT resources for them to use as they would like to. Many also added that the recent NOF (the New Opportunities Fund) training which many teachers had by this time received had increased the demand for the ICT equipment, and this had made access even more difficult.

Robertson et al. (1996) found that access to the palmtop increased the staff's use of generic applications in their work, particularly for administration (e.g. class registers and assessment scores). A minority of staff remained unconvinced about the potential of the computer and many were dissatisfied with the amount and quality of professional development in the use of the palmtop and in ICT in general. Students learned about the main content-free applications relatively quickly and used them frequently (Content-free software aims to represent flexible tools which can be shaped by teachers or learners to suit their needs; such as word processors, desktop publishers and databases).

In Al-Rabieys' (2002) study in Oman among the factors most often reported for under-use of ICT by staff were the difficulty of moving technology to and from classrooms, because most college classrooms were not well equipped, and the lack of suitable software programs in the teaching area.

4.3.1.2.1 Home use of computer

As seen in the above section on barriers to ICT use, access is the main external barrier which hinders teachers from using ICT. If they have access at home, it can encourage them to use ICT more often at school, as the following research studies show.

Cradler et al. (2002) pointed out the importance of teachers having computers at home. They concluded that teachers should be encouraged to use computers at home to learn at their own pace, pursue their own interests, and gain an understanding of the range of technology applications that can be used in the classroom.

In the UK in January 2000 the government launched the CfT (Computers for Teachers) scheme which enabled participating teachers to purchase a personal computer to increase their confidence and competence in using ICT in their teaching. The scheme offered the teachers 50% funding (up to £500) towards the cost of a personal computer.

This grant was open to all teachers who had participated in the new Opportunities Fund (NOF) ICT training. A total of 28,000 teachers purchased computers under phase 1 of the scheme (Kington et al., 2003).

In the BECTA report (Kington et al., 2003) an evaluation study of the impact of personal access to ICT on teaching and learning, it was found that having more access to computers at home influenced teachers in different ways. Teachers felt that they were increasingly able to organize their workload more effectively, providing them with improved flexibility as to when and where to carry out tasks related to teaching and learning. They found it easier to differentiate information on the basis of ability level and age group for use in their classrooms. Teachers felt that the participation in the scheme encouraged and promoted communication between colleagues within the same school and at other schools. Teachers also believed that they could produce work of a more professional standard than before. Also, teachers reported improvement in their confidence and increased interest in ICT as a result of having regular or improved access to a computer.

Regarding to the impact in teachers' classrooms, they reported being able to access a wide range of resources, they were increasingly incorporating ICT into classroom teaching.

This result is consistent with an earlier study of ICT use in the UK (Williams et al.2000), where the researchers found that access to computers at home had a positive impact on the use of ICT within schools. They reported that those who use computers at home use ICT more frequently in school in the following contexts: classroom practice, professional development, personal use and administration. No clear relationship between home use and attitudes towards ICT was found.

Smerdon et al. (2000) in a report to the National Centre for Education Statistics in the USA found that teachers who used computers for instruction during class and teachers who assigned projects that required their students to use a computer were more likely, to a large extent, to use computers and the internet at home than teachers who did not use these technologies for such purpose. Also, teachers with the fewest years of experience were more likely than teachers with the most years of experience to use computers or the Internet at home to gather information for planning lessons and creating instructional materials. Teachers with less teaching experience would be younger and may have trained more recently.

From the above studies it could be seen that using computers at home creates familiarity with such technology and helps the teachers to be less anxious and more confident in using technology with their students. Home access increases their ability to search for new materials and resources.

4.3.2 Internal (personal) factors

This section presents the studies that have found internal factors such as lack of time and personal beliefs as a barrier to the use of ICT. It is based on the classification proposed by Dusick (1998) and Snoeyink (2001).

4.3.2.1 Lack of time

The National Centre for Education Statistics (Smerdon et al, 2000) reported that the barrier to the use of computers and the Internet most frequently reported by teachers was lack of release time for teachers to learn how to use computers or the Internet (82%), and lack of time in the timetable for students to use computers in class (80%). These barriers reflect the use of computers or Internet; teachers who perceived lack of computers and time for students to use computers as great barriers were less likely than those who did not perceive these conditions as barriers to assign students to use computers or the Internet for some instructional activities.

Time is an important factor for integration as reflected in recent research. Teachers need greater amounts of time when integrating technology into classroom practices. This includes time for technical skill improvement, time to become acquainted with how the various technologies operate, and time to become aware of new pedagogical strategies made possible through the technology (Mouza, 2003). The lack of time set aside for teachers to learn how to use new software entering into the school or classroom is one of the biggest obstacles to its use (Chiero, 1997). Two additional aspects of time as a factor in integration is that of time for planning use of technology and time for personal reflection about its use (Dexter et al., 1999).

BECTA (2003) gathered data on the ICT barriers currently perceived by teachers, through a questionnaire completed by 170 teachers. One of the main barriers as seen by teachers was lack of time.

In Oman, lack of time in the computer laboratory timetable for using instructional technology was one of the main factors for under-use of ICT reported by Al-Rabiey (2002).

4.3.2.2 Teachers' attitudes towards ICT

Many studies have investigated teachers' attitudes toward the use of technology and their anxiety about it. As shown before, teachers' beliefs and attitudes were classified by Dusick as internal personal factors which affect teachers' use and integration of ICT. Williams (2000) found that there was a significant correlation between levels of ICT use and teachers' attitudes. Teachers who were more inclined to identify with the positive benefits to themselves and their students also tended to use ICT more often, and those for whom the problems and worries they encounter appeared to outweigh the possible benefits, tended to use ICT less often. Although attitudes towards ICT were mixed, overall teachers were generally positive and the vast majority wanted to develop their ICT skills and knowledge.

A strong correlation has been found between teachers' attitudes and training. Yildirim (2000) found that teachers' attitudes towards the computer, in particular measures of comfort/anxiety and perceived usefulness, were significant predictors of the need for learning computing skills, which, in turn, greatly, affect the computer literacy level. The finding suggests that in computer training courses, it is important to assess and change the trainee's attitudes to enhance the effectiveness of the training. Reynolds et al. (2003) concluded that teacher confidence and competence in the use of ICT has been found to have a very significant impact on both the amount of ICT used in a classroom, and how effective that use is. It follows, therefore, that the quality of training which teachers receive in ICT will have a massive effect.

Simpson et al. (1999), in a study of current skills and attitudes of some Scottish training institutions and students' related experiences, indicated that most of the Scottish teacher trainers have strongly positive attitudes towards ICT and its use in teacher education. However, there were significant signs of insecurity; only 52% of staff felt that they would be able to keep up with future developments, and 41% felt that ICT skills should be taught by specialist lecturers. Although the majority of tutors (93%) indicated that the use of ICT gave insights into new learning environments and enriched and enhanced courses, for many it had not reduced the burden of their teaching or improved outputs: for around half the respondents its use had failed to improve the quality of the content of students' work and for two thirds it had not reduced the time for content coverage in their courses.

Kington et al. (2003) in a survey of the CfT (Computers for Teachers) scheme which enabled participating teachers to purchase a personal computer to increase their confidence and competence in using ICT in their teaching, reported that most teachers felt a substantial improvement in their confidence and competence in using ICT. Teachers suggested that they felt more equipped to deal with any problems which arose in the classroom while using ICT equipment. They were also more positive about using a computer to support their planning and administrative requirements. The majority of teachers involved in the CfT (Computers for Teachers) scheme reported increased interest in ICT as a result of having regular access or improved access to a computer. This survey shows that access increases positive attitudes towards ICT.

In general teachers' attitudes seems to influence their use of ICT. Several factors could affect teachers' attitudes such as home use, in-service training and access to ICT resources. All of these factors work together to change teachers attitudes to be more positive towards ICT use.

4.3.3 Linking internal and external factors

The following study shows how the external and the internal factors link together. Tearla (2003) conducted a case study research in a UK secondary school where almost all staff are now using ICT. This school was named by Ofsted as one of the "best schools in Britain". The researcher developed a whole school model which provides a useful visual summary of the finding (Figure 4.1).

The whole school characteristics and the nature of the implementation process are the subject of the two outer ellipses. The markers on each correspond to the particular points noted previously as emerging from the study. Actual ICT use is put at the centre of the model to highlight its importance. Given that it is the individual teacher who, in practice, uses (or doesn't use) ICT in a teaching and learning context, it has been directly linked to those issues which at an individual level are seen to be most influential in bringing about actual ICT use. There is no suggestion that the direct links to practice in the central section of the model are more or less influential than those in the surrounding ellipses.

Most of the studies presented in this section showed that there is interaction between the internal and the external factors, which means that to have a successful and active implementation if ICT there should be cooperation between teachers, leadership, training departments and policy makers.

Figure 4.1: ICT implementation model

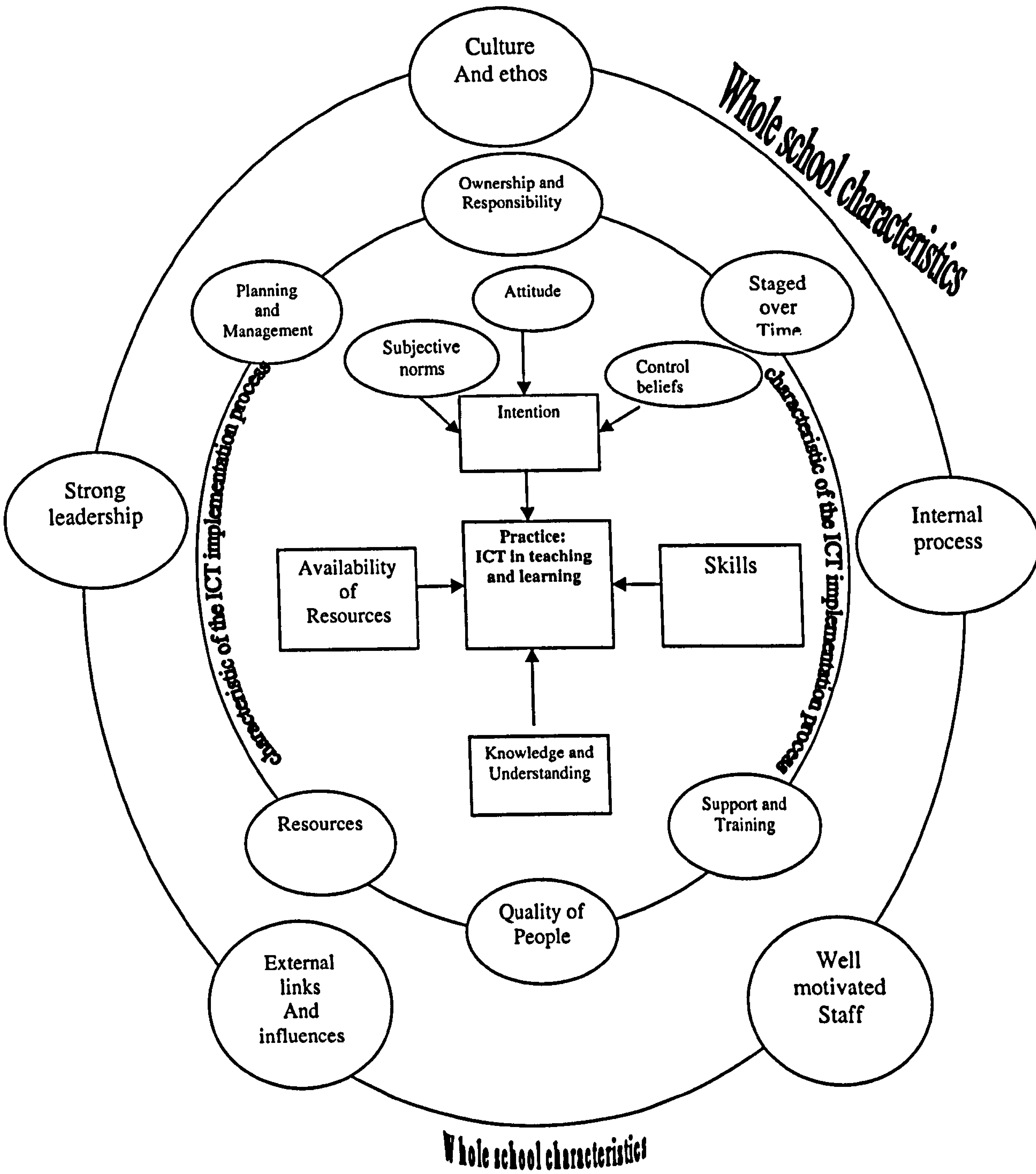


Figure 4.1: Adapted from Tearle, P. (2003)

In this section, we have seen some of the factors that act as barriers to the whole-hearted adoption of ICT in education. A selection of these has been examined, and the results of several studies in various countries have been presented to the reader. This allows us to proceed to an examination of some of the ways that teachers' professional development can be structured to overcome the barriers

4.4 Teachers' Professional Development

4.4.1 ICT and training needs

Lack of training has been cited in many studies as an external barrier to teachers' integration and using of ICT in the classroom (OTA, 1995; Robertson, 1996; Williams, 2000; BECTA, 2003). The studies showed that training played a major role in teachers' use of ICT; suitable training could enhance teachers' use, while on the other hand lack of training can hinder teachers from using ICT.

In the BECTA studies about the Computers for Teachers scheme (Kington et al., 2003), inquiry into the impact of participation in the scheme on training issues showed that for a number of teachers the in-service training they had received had been adequate. Some teachers with more advanced ICT skills indicated that the training had not always met their needs. Similar findings regarding teacher preparation were reported in a recent national survey of schools and colleges of education in the USA (US Department of Education, 1999). This survey found that only 67% of these institutions set a good example by integrating instructional technology in their own courses. Further, less than one-half of the kindergarten-grade 12 classrooms in which trainees carried out teaching practice placements were equipped with instructional technology. This study concluded that standalone courses in instructional technology were not sufficient to prepare future teachers to use instructional technology. Integration of technology applications within existing teacher preparation courses was most desirable and had a greater effect on use of technology in practice.

The National Centre for Education Statistics (Smerdon, et al., 2000) in a 1999 survey indicated that one-third of teachers reported feeling well prepared or very well prepared to use computers and the Internet for classroom instruction. For many instructional activities, teachers who reported feeling better prepared to use technology were generally more likely to use it than teachers who indicated that they felt unprepared. 93% of teachers cited independent learning most frequently as preparing them for technology use, followed by professional development activities (88%), and their colleagues (87%).

Teachers' training was recommended by the World Bank Institutes report (Hawkins. 2002) which stated that professional development of teachers sits at the heart of any successful technology and education programme.

These results indicated that most of the teachers felt that they had had insufficient training. UNESCO's (2003) report summarised three trends of training around the world from the basic level of training to the more advanced level:

Basic computer literacy, dealing with hardware and software/applications, not necessarily connected to teaching and learning.

Second level: Computer literacy specifically designed for teachers. Basic computer literacy remains as the main focus, but this time in relation with or in support of teaching and learning activities as shown in their practical exercises.

The advanced level: Contents that integrate the use of ICT and pedagogy; use of ICT in teaching specific subjects in the classrooms; the Internet as a pedagogical innovation used for collaborative activities; school and classroom management with troubleshooting techniques available.

The following studies demonstrate which training approaches can encourage teachers to use and integrate ICT into their teaching.

In Williams' (2000) survey, when teachers were asked about their priorities for developing their ICT skills and knowledge in relation to classroom practice, the responses were classified into four groups: technical skills and knowledge, application of ICT, management skills and knowledge related to ICT, and teaching ICT skills. When the teachers were asked to list aspects of training they considered useful, they identified the following characteristics: appropriate to classroom use; hands-on practical element; provides on-the-spot help; and provides opportunities to work and share ideas with other teachers. Williams et al. (2000) recommended that future training should:

- Be designed to increase familiarity with a wider range of ICT;
- Be focused on the types of ICT resources available to teachers in schools;
- Be flexible;
- Encourage teachers to reflect on, and make decisions about their own ICT development needs on an ongoing basis;
- Focus on ICT as a tool for lifelong learning for teachers as well as for pupils.

Dusick et al. (2000) carried out a qualitative study with 550 full and part time faculty at one urban California community college to explore the relationships among basic demographic variables, different attitudes toward computer use and subsequent use of computers for instruction. The findings noted that training must be geared to the skill level of the end-user. They distinguished between non-technology-using teachers and technology-using teachers. Users prefer training focused on improving skill level, while non users preferred short sessions focused on learning the benefits of computers in education. The study also found that competency and previous computer training courses were significant predictors of computer use for instruction.

Chin & Hortin (1993) in a survey aimed at developing in-service guidelines to train elementary teachers in the use of instructional technology found that teachers expressed a need for technological in-service training, and suggested release time to attend in-service training at their home schools. Group workshops were considered to be most useful. These elementary teachers did not think they could afford more than one hour of training each week. Hands-on is a must for any type of technological training. Computer software application, computer software evaluation, word processing, and data base skills were the topics most demanded for computer in-service training while videotaping skills was also regarded as an important topic to be included in technological training.

Teachers' training is not separate from the whole education. It should be linked to the curriculum. Roschelle et al. (2000) indicated that intensive and ongoing staff development that provides opportunities for modelling, practice, and reinforcement of technology use with curricula should be linked to curriculum goals and objectives from the onset of technology implementation efforts.

Another important point was raised by Ahern (2001) in order to achieve a successful integration of technology in relation to training: the lack of congruency between the available resources that are sometimes present in teacher preparation programmes and what is available in the schools. He argued that:

> More often than not these are not in place, either the college has better equipment than what is available in the local school or the reverse is true where the local school has superior hardware and software than that available at the college. Consequently, a teacher is either not prepared or is not equipped to correctly integrate technology into the classroom. More often than not they tend to avoid the attempt. This might be the reason why teachers often indicate that they want more training on integrating technology in their instruction. One solution is to concentrate on the effective design of technology integration and not simply to concentrate on the technology (Ahern, 2001: 137).

4.4.2 Effect of training

Butzin (2001) argued that there is a need for adequate and careful training so that teachers become aware of the range of uses and possible benefits of ICT. Training can positively enhance the integration of computers into instruction, while lack of training inhibits integration and teacher use of technologies.

Christensen (2002) made a quantitative comparative study of 82 elementary teachers and their students across three elementary schools in Texas to investigate the effects of technology integration education on elementary school teachers. The study found that needs-based technology integration training coupled with classroom use increases the chances that both teacher and student technology use will increase. Another survey, conducted by Jones (2001), shows that teachers with more technology training are more likely to use it in their classrooms than those with less training. In every category measured, training teachers how to integrate technology into the curriculum was more helpful than simply showing them how technology works. The researcher recommended that in spite of all of the training being implemented in College of Education certification coursework, there still appears to be a need for administrators and teachers to become more familiar with the instructional strategies necessary for integrating technology into classroom instruction.

Lee (1997) mentioned two reasons that would make in-service teachers feel anxious while learning to use computers and therefore make the training less useful and effective: negative attitude toward using new technology; and very limited prior experience in operating computers. These types of teachers may have doubts about whether or not they can learn the technology. Lee suggested that discussion, demonstrations, and clear guidelines from the instructor regarding the value and importance of using computer technology, and why, how, and when to use this technology would be very helpful. She pointed out that adult learners:

- are usually active learners; they want to participate in the learning process;
- enter new learning situations with rich life experiences;
- can often be considered as experts in their fields;
- prefer self-direction and are more capable of being self-reliant;
- are often value-driven, solution-driven, and problem-centred; they tend to favour hands-on activities, life-centred experiences, task-oriented and skill-seeking performance; and
- are often motivated by internal factors including self-esteem, recognition,

confidence, career satisfaction and overall life quality; they also tend to be motivated by external factors like better jobs, increased promotional opportunities, and higher salaries.

To have effective training, training programmes should be continuously updated. Wilson & Notar (2003) concluded that change is continuous and the coursework for training teachers must continue to change in response to the skills needed in the societal work place as well as in the development of standards and curricula that is implemented for teacher certification programmes. State agencies must produce the monies needed adequately to provide school programmes at all levels of education with updated hardware, software, and wiring capabilities to develop the necessary skills for increasing technology standards. The training of teacher certification candidates should expand to address not only development of teachers' skills in computer use but training should also include the development of teaching in a laboratory situation, perhaps with the utilization of computers. Should more classrooms receive the needed computer technology, new instructional skills will be needed for true learning to develop.

This section has presented the very positive results of much recent research. There is widespread agreement that in service training updates teachers' knowledge and prepares them to integrate ICT into their classrooms. To have effective training it should be updated, linked to curriculum objectives, and increase trainees' familiarity with a wider range of ICT.

4.5 The Impact of Teachers' Personal Characteristics on ICT Use

The researcher in the current study will explore the influence of environment variables, attitudes toward ICT, training needs and teachers' philosophies on the implementation and use of ICT in basic education in Oman. In addition to these variables some personal characteristics which vary between teachers have an effect on their use of ICT. The following section will deal, as an exemplar, with Gender.

4.5.1 Gender

The research literature differs with regard to gender as a factor in computer use. Hayden (1995) concluded that females tend to be more sensitive to how the technology will affect people, while males tend to view technology as a tool to help them accomplish a goal. Harrison et al, (1997) in their study to examine the differences between males and females in computer-related activities found that males in general may be more proficient than females in computing activities. Also Russell & Bradley (1997) found that male teachers reported significantly greater confidence with computers than did females and recommended teacher professional development should take into account the particular needs of female teachers.

In an earlier study, Shashaani (1993) carried out a survey of 1750 secondary school students using an instrument which measured five category variables, namely interest in computers, stereotyping, concept (perceived usefulness) of computers, computer confidence and perceived parents'/teachers' attitude towards computers. The results indicated that there are gender differences in computer attitudes, with male students having greater interest in computers, greater confidence in using them, and greater likelihood of seeing them as a masculine technology. Females reported fear of using computers and feeling helpless around them, yet showed equal competence to male students in using them. There was no difference in the perceptions of male and females as to the usefulness of computers. Perhaps the most interesting result of this study was the strong correlation between students' attitudes towards computers and their perception of the attitudes of their parents. It supports the hypothesis that the differences in attitude reflect gender-role socialisation.

A later study of 202 college students (Shashaani, 1997) showed similar results. Males were found to have greater enjoyment in using computers and greater confidence. There was agreement between males and females on gender equality on the use of computers, indicating little stereotyping amongst the students, and on the perceived usefulness of computers. There were significant correlations between the parents' perceived behaviour towards computers and male and female attitudes. For males, the father's view was positively correlated with enjoyment and confidence, and for females, both parents' views were negatively correlated with enjoyment and confidence. These results are supported by a study in the United Kingdom of 144 first year undergraduate students (Colley et al, 1994). Males were found to have lower anxiety, higher confidence and greater liking of computers than females.

Ruth (2000), in a study about the internet training at the Romanian Academy of Science, revealed that women are significantly more willing than men to attribute the Internet as being responsible for making them more open to new ideas and are also significantly less likely than men to use the World Wide Web in helping their students, although both men and women use the Web relatively rarely in teaching students.

Research findings that show that gender differences exist in computer acceptance. Young (2000) found significant gender differences in computer attitudes of 462 middle and high school students. The male domain scale showed that boys were more likely to have claimed computers as a male area. Moreover, the perceived usefulness of computers scale indicated that females reported finding the computers more useful for school and careers. Higher levels of confidence and, for males, the absence of negative teacher attitudes, were found to be associated with greater computer skills. In spite of encouragement of females by teachers, the manner in which males felt discouraged, and the girls' rejection of statements indicating that computers and technology were largely a male domain, boys were still more confident than the girls.

Jackson et al. (2001) found that females use e-mail more than males, and that males use the Web more than females. Women associate more negative effects with computer technology, are less familiar with the technology, and have less favourable attitudes and lower self-efficacy toward the Internet than men. Also, females reported more computer anxiety than did males, and males reported more computer self-efficacy than did females. Gender differences in computer attitudes indicated that females were less likely than males to believe in the importance of computer skills, to believe that using a computer may cause health problems, and to endorse gender and racial/ethnic stereotypes about computer skills. Females were somewhat more likely than males to believe that computers are taking over. There were no gender differences in e-mail or Web trust, e-mail or Web privacy, or success at Web searches.

Gender differences in demographic characteristics supported the importance of familiarity with computer technology to Internet use. Males were more likely to have had a home computer (86%) than were females (76%).

The research shows that males in general have more positive attitudes towards computer than females. Also, there are gender differences in the way computers are used. Females tend to use technology for communication activities, while men use the Internet for research. Although some studies show no gender difference, the majority shows that women still lag behind men when it comes to computing.

4.6 Summary

The chapter has presented the major models of ICT implementation, which moved from non-use level or avoidance to top-end level, which means that technology is perceived as a process, product, and tool to help students solve authentic problems related to an identified real-world problem or issue, where technology provides a seamless medium for information queries, problem solving, and/or product development, followed by studies of teachers' use of technology. Building on these studies, the research then moved to discuss the factors that influence the integration of ICT into teaching. Following a review of the literature, the barriers to such integration were classified as external (environmental) factors such as access, support and training, and internal (personal) factors such as time, attitudes, and teachers' beliefs. Once new technology concepts and skills are attained, teachers may have difficulty in transferring these skills into classroom practice due to such influencing factors as lack of access to resources and lack of technical support. For example, a teacher may know how to integrate computer technology into their writing class, but lack access to functioning computers or software targeted to grade-level needs. Likewise, computers that are malfunctioning and lying idle for long periods awaiting service may discourage their use once repaired.

Training is one of the main external factors; teacher training is an important issue in preparation for technology skills attainment, use, and integration. The discussion of teachers' professional development revealed that adequate training increases teachers' confidence with computers; however, much training is perceived as inadequate.

Teachers' attitudes toward new technology is classified by the research as an internal factor. For many people, using a computer system is a novel activity, and as such can induce anxiety. Some studies discussed in this chapter have shown that computer anxiety is negatively associated with ICT use. The investigations into the relationship between training and anxiety produced results indicating that useful training reduces anxiety.

A large number of studies have examined the associations between gender and computer use and attitudes. Many of them showed that attitudes were gender-related, but others did not.

It remains unclear how far gender differences in attitudes towards computers, and use of them, may be affected by socialization, for example parental attitudes or teacher encouragement.

Overall, the research reviewed suggests that use of ICT in the classroom may be affected in complex ways by a number of interacting factors. Review of previous research has enabled a number of variables to be identified as worthy of investigation in the present study. The next chapter explains how this investigation of computer use by teachers in Oman's Basic Education schools was carried out.

CHAPTER FIVE: RESEARCH METHODOLOGY

5.1 Introduction

This chapter aims to give a description of the procedures followed in this research in order to collect the data. Research designs provide many functions: they provide the researcher with a blueprint for studying social questions; dictate boundaries of research activity and enable the investigator to channel his energies in specific directions; and they enable the researcher to anticipate potential problems during the implementation stage (Black and Champion, 1976).

The chapter begins by setting out the research questions and rationale for the selection of the data collection methods. Then a detailed account is given of each method in turn, including the objective of using it, the development of the instruments involved, and the selection of the relevant sample. An explanation is then given of the implementation of the data collection process, and of the techniques used in the analysis of the data.

5.2 Research questions

This study aims to determine the extent to which the following factors predict ICT use by teachers in Basic Education Schools in classroom instruction: the demographic variables of the teachers, their attitudes toward using technology, environment barriers, training needs, and their philosophy and beliefs about educational issues. Therefore, five main questions are to be investigated, which are linked to the research objectives, as follows:

- To what extent do teachers use ICT in their teaching?
- What relationships exist between the demographic characteristics of selected teachers and ICT use in their teaching?
- To what extent do teachers perceive that barriers exist to ICT use in their teaching?
- What attitudes do teachers have toward using ICT in their teaching?
- What are the areas of ICT in which teachers feel that they need to receive training?
- What is the relationship between the teachers' philosophies and beliefs about progressive teaching methods and ICT use?
- Collectively, to what extent do the above variables predict ICT use in teaching?

5.3 Research Methods

Underlying the many different styles and methods of investigation there are two basic approaches to social research: quantitative and qualitative.

While often seen as mutually exclusive ways of carrying out social research in the past, these two approaches are increasingly seen as complementing each other (Devine & Heath, 1999). Indeed, as Borg et al. (2003) explained, both quantitative and qualitative approaches help researchers make important discoveries, especially when they are used in combination together in the same study, for example, a combination of questionnaires, observation and semi-structured interviews. There has been a great deal of debate about the relative merits of these two different approaches to social research (May 1997; Anderson & Arsenault, 1998 and Neuman, 2000). The strengths of quantitative research are seen as lying in its highly structured nature, its reliability and the representative nature of the data it provides, whereas the strengths of qualitative research are seen as lying in its investigative nature, its in-depth focus and the detailed complexity of the data it provides (Anderson et al., 1998).

Descriptive and analytic research are the most well known forms of quantitative and qualitative research used in the social sciences (Cohen et al. 2000). Borg et al. (2003) say that descriptive and analytic research, combining quantitative and qualitative research, is employed when the purpose of the study is to obtain a basic and detailed general description and analysis of a social phenomenon.

Descriptive research is designed to portray the characteristics of particular individuals, situations, groups and so on (in terms of behaviour, attitudes and dispositions to act) and to determine the frequency with which such behaviour or attitudes occur in the population being sampled, whereas analytical researches are concerned with testing hypotheses about the relationships between some variables in order to understand and explain a particular social phenomenon (Bulmer, 1990).

Descriptive and analytic research are often essential to provide a foundation to develop other more specific lines of investigation. This kind of research is considered important in the social sciences.

Choices of research methodology and particular methods are often influenced by context, objectives, number and kind of people who carry out the study, and the time and money available to the research (McNeill, 1990 and Bell, 1991). McNeill (1990) states that:

> In research terms, it has become perfectly acceptable to use a wide variety of techniques in one study, and to use different techniques for the study of topics (McNeill, 1990: 7).

He also believes that consistent findings from more than one data method increase the validity and credibility of research finding and decrease the risk of a biased result.

For this reason, although the main approach adopted was quantitative, this has been complemented with a limited amount of qualitative research in the form of interviews and classroom observations, because ICT is a new topic in Oman, which has not yet been tackled widely. Marshall and Rosman (1995) claim that the qualitative approach can be very useful in new areas of research.

In this study of ICT use in Basic Education schools in Oman, therefore, research techniques from both paradigms were used but quantitative research remained the main approach of this study, due to the need in Oman, for a large volume of basic data.

Because of the large size of the sample to be covered, the researcher decided to use a questionnaire to cover the sample and to triangulate with other methods such as interviews and classroom observations.

The researcher selected this combination of research methods because it was the most suitable approach for achieving the aim of this study, which was concerned with researching attitudes and practices, and because it was hoped to be able, to some extent, to generalise the results.

5.4 The Questionnaire

The questionnaire is an important method of research, a tool for data collection. The questionnaire has a job to do: its function is measurement. The questionnaire may go through several versions before being applied. Many weeks of planning, reading, design and exploratory pilot work will be needed before any sort of specification for a questionnaire can be determined, for the specification must follow directly from the operational statement of the issues to be investigated and from the research design that has been adopted (Oppenheim, 1996: 100).

The term "questionnaire" has been used in different ways. Some practitioners would reserve the term exclusively for self-administered and postal questionnaires, while others would include interview schedules (administered face-to-face or by telephone) (Zikmund, 2000). This variation in meaning is because there are several methods of carrying out a questionnaire, such as on-line, postal and personal. In addition, it is possible to carry out a questionnaire by using facsimile (fax) machines. Each of these methods has advantages and disadvantages (Blaxter, et al., 1998 ; Zikmund, 2000). According to De Vaus (2001), personal research tends to achieve higher response rates than mail questionnaires in general population samples, depending on the topic of the research. However, in research of specific, more homogeneous groups, mail research seems to be about as good as other techniques.

Nisbet and Entwistle (1970: 44) stated that the obvious advantage in using questionnaires rather than interviews is economy in cost, time and labour. They can be administered in a number of different ways, such as posting, verbal contact through telephone and face-to-face (Robson, 1996). This being so, the questionnaires in the current study were hand-delivered to each Educational Region (sampling will be dealt later on in this chapter). Someone in each region, a director or head of section, was asked to distribute and collect them for return and given clear instructions how to administer them. Such a method is thought to improve the response and return rates (Glastonbury and MacKean, 1991).

As Campbell, et al. (2004) said:

> "Questionnaires are very versatile data-gathering method; they are cheap, easy to administer, whether it be to three people or 300, and can be used to gather a great variety of data of both a qualitative and quantitative nature. Data collection is, of course, not the only function of questionnaire: they can serve to raise awareness of particular issues and make respondents feel valued and important elements of the decision-making process" (Campbell et al., 2004: 146).

Another merit of the questionnaire is that statistical tests can easily be used to make comparisons between different groups and populations. In addition, the result of a large scale study can be generalised to the wider population of the same sample. Questionnaires, however, do not allow for dialogue such as follow-up questions, probing, and for this reason they should be well worded and constructed; otherwise, ambiguity and lack of clarity may distort the response. As McNeill (1990) said:

> The wording of questions, especially closed questions and those asked in postal questionnaires, must be clear, precise, and unambiguous. The language used should be as simple as possible (McNeill, 1990: 27).

Moreover, Bell (1991) says that it is not enough to have a sufficient and full command of the language; constructing a questionnaire needs special skills. She says that:

> the world is full of well meaning people who believe that anyone who can write plain English and has a medium amount of common sense can produce a good questionnaire... though common sense and the ability to write plain English will help, that will not be sufficient. Care has to be taken in selecting question type, in question-writing, in the design, piloting, distribution and return of questionnaires (Bell, 1991: vii).

5.4.1 Adaptation of the questionnaire

The questionnaire used in this study was in part based on selected items from an instrument developed by Al-Rabiey (2002) for a study of the use of instructional technology by university teaching staff. The reason for choosing this was that it included most of the variables the researcher intended to study in this research. However, the original instrument was modified to tailor it more precisely to the objectives of this study, and to take account of the population being studied, namely Basic Education teachers. Therefore, some items which were related to university staff and environment were modified to be more relevant to schools and teachers.

For the other elements in the study which were not covered by Al-Rabiey (2002), the researcher reviewed previous research which dealt with teachers' training needs and their philosophies and beliefs, and tried to match suitable instruments to the objectives of the current research and to consider the type of information that was to be obtained from the questionnaire. The training needs scale was based on an instrument developed by Al-Joudi (2000), and the scale of teachers' philosophies was based on by Bennett's (1976) research on teaching styles. This study was interesting because it was conducted when education in the UK was moving from the traditional to a more progressive style.

During the questionnaire development, consideration of the content, structure, format and sequence of the questions was taken into account.

The first page was an introductory letter explaining the purpose of the study, thanking the respondents for their co-operation and assuring them that the information would be confidential.

The questionnaire in this study consists of six sections:

Section One: Background information

This section aims to elicit background information about the teachers. This information enables the researcher to construct the independent variables. The background information sought was:

- type of qualification;
- teaching area;
- location of the school;
- age;
- cycle (first grade1-4, second 5-10).

Section Two: Actual usage of ICT

The second section deals with the extent to which different types of technology are used by the teachers in their teaching.

Table 5.1: Actual use of ICT in basic education schools

No	Equipment	Twice a week	Once a week	Once a month	Once a term	Never
1	Educational Films					
2	Audiocassettes					
3	Overhead Projector					
4	Educational Slides					
5	Teleconferencing via Satellite					
6	Computer Display Projector					
7	Learning Packages					
8	Word Processing (e.g. Microsoft Word, Word Perfect)					
9	Spreadsheet (Microsoft Excel, Lotus)					
10	Presentation Program (e.g. Microsoft Power Point, Freelance Graphics)					
11	Computer-based assignment					
12	Internet for extra teaching materials					
13	CD-ROMs/Multimedia system					
14	Video Camera					
15	Scanner					
16	Printer					
17	Photocopier					
18	Maps, Pictures or Stickers					
19	Video Display Projector					
20	Whiteboard/Blackboard					
21	Teaching games					
22	Models					
23	Language Laboratory					

Teachers were asked to complete the following table, showing how often they used each method mentioned in their teaching. Twenty three modern and traditional items are included in this section, based on the Basic Education Guide (Ministry of Education, 2001). This section is based on the instrument used by Al-Rabiey (2002) to investigate the implementation of instructional technology in colleges of education in Oman.

The researcher added items 21-23 which were not listed in Al-Rabiey's questionnaire but are available in the basic education schools, because the current research deals with children's schools and tools such as teaching games, models, and language labs are used widely in the teaching of children.

The third section addresses factors that influence the actual use of technology in schools. Items 1-20 are based on a scale used by Al-Rabiey (2002) with changes in the wording of statements, to apply them to schools rather than the university environment. Items 21-23 were based on Williams' (2000) instrument.

The aim of adding items 21 and 22 was to confirm the lack of resources factor with some positive statements, while the last item was about support by colleagues, which was not included in Al-Rabiey's instrument.

This scale includes the factors recorded by studies in the Literature review (Chapter Four) as barriers to ICT use. This section deals with the environmental barriers such as access, resources, support and schools environment. Table 5.2 shows a mixture of positive and negative factors using a five point Likert scale, where (SA) is strongly agree, (A) Agree, (U) undecided, (D) Disagree and (SD) strongly disagree.

Table 5.2: Under-use factors of ICT

No	Statement	SA	A	U	D	SD
1	Limited access to ICT resources.					
2	Not enough computer software programming					
3	Lack of time in the computer laboratory timetable for using instructional technology.					
4	Lack of adequate technical support.					
5	Not enough funding to provide extra ICT equipment.					
6	Instructional technology is available when needed.					
7	Difficulty of moving items to and from classrooms.					
8	Lack of planning in school on use of instructional technology.					
9	Little encouragement and administrative support for classroom use of instructional technology.					
10	School is not fully aware how to use and operate items of instructional technology.					
11	Classrooms are suitable for the use of instructional technology.					
12	Lack of software programs written in Arabic.					
13	Good quality equipment.					
14	Students' lack of basic instructional technology skills.					
15	Not having enough information about the materials available.					
16	Large number of students in classroom.					
17	Enough resources that illustrate how to integrate instructional technology into the curriculum.					
18	Regular maintenance of the equipment.					
19	Lack of suitable software programs in the area I teach.					
20	Lack of established guidelines on instructional technology usage.					
21	There is a sufficient amount of technological equipment available in my school to aid and improve students learning.					
22	My school has added some very usable computer hardware for teachers to use in the last two years.					
23	New computer users in my school receive help from experienced personnel who know how to use computers.					

The fourth section aims to measure the teachers' attitudes toward using instructional technology in classrooms. Teachers were asked to complete the following table, showing their degree of agreement for each method mentioned in their teaching, using a five point Likert scale. Table 5.3 shows the mixture of negative and positive items to reduce respondents' tendency to agree with one column.

Table 5.3: Teachers' attitudes towards ICT use

No.	Statements	Direction
1	Instructional technology could help me with my teaching.	+
2	Teachers should continuously search for new ways to use instructional technology in the class room.	+
3	Teaching plans should include instructional technology every day.	+
4	The use of instructional technology improves the quality of students' learning.	+
5	I need additional knowledge and skills in the preparation and utilization of instructional technology.	-
6	A computer takes too long to master and produces too few results to be a worthwhile teaching tool.	-
7	I feel comfortable using technology in the classroom.	+
8	I am eager to apply computers and related technologies to facilitate emerging roles of the learner and myself.	-
9	I feel instructional technology isn't appropriate to my teaching.	-
10	I feel I should develop my skills to keep up to date with development in teaching.	+
11	I need to develop my skills and knowledge for the pupils' benefit.	+
12	I'm interested personally but developing my skills and knowledge in instructional technology isn't appropriate to my teaching.	-
13	I'm interested but training doesn't seem to be available.	-
14	I'm not that interested but I suppose I should be.	-
15	I'm interested but I do not have the time.	-
16	Instructional technology can be used to motivate students and enhance their learning experience.	+
17	I prefer using it on my own when no one is around to see me make mistakes.	-
18	I feel lost in the information age.	-
19	Instructional technology encourages pupils to work together collaboratively.	+
20	Instructional technology is difficult to use.	-
21	Instructional technology can save a lot of teaching time.	+
22	Instructional technology can be useful in almost all subject areas.	+
23	Instructional technology can be used to meet individual student needs.	+
24	I prefer to use the textbook instead of the new technology.	-
25	I consider it takes me a long time to prepare technology materials for teaching.	-
26	I find it easy to select appropriate instructional technology resource for my teaching.	+

In this section, the researcher tried to obtain as much information as possible about the different variables that affect the teacher's attitudes. Therefore it is constructed from three different sources. Items 1-8 are based on an instrument used by Chin (1993), in research on the perceptions of elementary teachers' use of technology, items 9-19 are from Williams' (1997) research about teachers' ICT skills and knowledge needs; and items 20-27 are from Al-Rabiey (2002). Responses are on a Likert scale of 1 to 5 (Strongly disagree to strongly agree).

The fifth section aims to collect data about in-service training. It is divided into two parts. The first is about the teachers' training background (See Appendix 1.A).

Table 5.4: Teachers' in-service training needs scale

No		4	3	2	1
1	To select appropriate teaching materials for a selected subject.				
2	Training in the selection and evaluation of teaching materials.				
3	To operate and use the instructional technology available in your school.				
4	To match teaching materials to learners' abilities.				
5	Knowing how to program in a computer language.				
6	Knowing how to get information in and out of a computer.				
7	Knowing how to select educational computer software.				
8	Learning about the history and the development of computers.				
9	Learning about the role of computers in society.				
10	Knowing how to use a computer as a high-interest drill and practice vehicle.				
11	Knowing how to use a computer as a means of teaching problem solving.				
12	Knowing how to use the computer to help with class housekeeping chores (i.e., attendance, student records).				
13	Knowing how to apply the computer to evaluate students' abilities.				
14	Knowing how to apply the computer to diagnose students' needs.				
15	Knowing how to use multimedia.				
16	Knowing how to use a spreadsheet.				
17	Knowing how to use word processing.				
18	Knowing how to use a database.				
19	Knowing how to use a computer for presentation.				
20	Knowing how to benefit from the internet.				
21	Knowing how to use educational software.				

The second part is about training needs (Table 5.4). Respondents were asked to identify their own perceptions of their training needs in the table above, using a four-point scale, where (1) is don't know, (2) no need, (3) some needs and (4) great needs. This section is based on a questionnaire by Al-Joudi (2000) about the computer training needs of the teachers and students at teacher colleges in Saudi Arabia. The researcher added the first four questions to study instructional technology needs in general.

The sixth section aims to identify the teachers' philosophies of education and their aims and opinions. This section is based on Bennett's (1976) research about teaching styles. It is divided into three parts.

The first part asks the teacher to rate the importance of some teaching aims, based on his/her view and opinion. In this part, the first statement in Bennett's questionnaire (preparing for academic work in secondary school) was omitted because the current study deals only with Basic Education, and not with secondary school.

Table 5.5: Teachers' opinions about educational aims

No.	Statement	Not important	Fairly Important	Important	Very Important	essential
1	An understanding of the world in which pupils live.					
2	The acquisition of basic skills in reading and number work.					
3	The development of pupils' creative abilities.					
4	The encouragement of self-expression.					
4	Helping pupils to co-operate with each other.					
5	The acceptance of normal standards of behaviour.					
6	The enjoyment of school.					
7	The promotion of a high level of academic attainment.					

The second part is about teachers' opinions on education issues. It uses a Likert Scale of 1 to 5 (Strongly Disagree to Strongly Agree). Again, this part excludes the first statement of Bennett's scale (Most pupils in upper junior school have sufficient maturity to choose a topic to study and carry it through), for the same reason. The second statement (most pupils in upper junior school feel more secure if told what to do and how to do it) is replaced by:

Most pupils feel more secure if told what to do and how to do it.

Table 5.6: Teachers' opinions about educational issues

No.	Statement	SD	D	U	A	SA
1	Most pupils feel more secure if told what to do and how to do it.					
2	'Creativity ' is an educational fad, which could soon die out.					
3	Firm discipline by the teacher leads, to good self discipline on the part of the pupil.					
4	The teacher should be well liked by the class.					
5	Children working in groups waste a lot of time arguing and 'messing about'.					
6	Pupils work better when motivated by marks or stars.					
7	Too little emphasis is placed on keeping order in the classroom nowadays.					
8	Teachers need to know the home background and personal circumstances of their pupils.					

The third part aims to explore opinions about Teaching Methods (traditional and progressive). This part of the questionnaire aims to explore teachers' philosophies and beliefs about the new methods of teaching in schools.

Table 5.7: Teachers' opinions about teaching methods

No	Statement	Traditional					Progressive				
		SD	D	U	A	SA	SD	D	U	A	SA
1	Could create discipline problems.										
2	Fails to bring the best out of bright pupils.										
3	Makes heavy demands on the teacher.										
4	Encourages responsibility and self-discipline.										
5	Teaches basic skills and concepts effectively.										
6	Encourages time wasting or daydreaming.										
7	Leaves many pupils unsure of what to do.										
8	Provides the right balance between teaching and individual work.										
9	Allows each child to develop his full potential.										
10	Teach pupils to think for themselves.										

In the analysis stage, this question was treated as two questions, one dealing with the degree of agreement with traditional education and the second with the degree of agreement with progressive education.

5.4.2 Validity of the questionnaire

May (1997) commented that a questionnaire and personal interview are instruments for measuring ideas and for testing hypotheses; therefore, the questions must not only reflect the survey's aims, but also must be understood by respondents in a clear and unambiguous way. Hence, before applying any test, it is necessary to ensure that it is a valid measurement tool: there is a need to check its validity.

The term **validity** is one that is frequently used in the world of research and measurement. "Validity tells us whether the question, item or score measures what it is supposed to measure" (Oppenheim, 1996: 144 -145). Neuman (2000) added that the validity of a survey is the degree of fit between a construct that a researcher uses to describe, theorise about, or analyse the social world and what actually occurs in the social world. It means truthfulness. It aims to make sure that survey items are clear and understandable, and the conceptual and operational definitions mesh with each other.

Chapelle & Jamieson (1991) explain validity by dividing it into two types, internal validity and external validity. Internal validity refers to the accurate attribution of observed results to the factors that were supposed to be responsible for these results. External validity denotes the applicability of research results to instructional and research contexts other than the one in which the research was carried out. Neuman (2000) added that both internal and external validity are important in experimental research. He added that internal validity is used to indicate whether there are possible errors or alternative explanations to account for the results, despite attempts to institute controls, while external validity is used to measure the ability to generalise findings from a specific sample to a wider population.

Although it is not possible to have absolute confidence about measurement of survey validity, some measures are more valid than others. There are many types of validity, such as face validity, content validity, criterion validity, concurrent validity, predictive validity, construct validity, convergent and discriminate validity (Al-Wafi, 1989 and Neuman 2000), and trustees' validity (Obidat et al., 1989). Each type of validity is tested in a different way. The most basic kind is **face validity**. This is a judgement by the scientific community that the indicator really measures the intended construct (Neuman, 2000). The researcher selected face validity to measure the validity of the survey instruments because it is the most common and the most suitable measure for this type of study.

To measure the validity of the survey used in this study and confirm the clarity of the items and their relevance to their scales and sections and to make sure that the questionnaire has high face validity, the following steps were undertaken:

First, the questionnaire was reviewed thoroughly by the researcher and her supervisor to check on the clarity of the questions and to ensure that the contents were accurately interpreted. Then, the items were also shown to 5 PhD students at the University of Hull to rate the appropriateness of the scales to the variable they purport to measure. A letter was given to these assessors, indicating the nature and the aim of the survey and telling them that they were not asked to respond to the items, but to judge whether the items met the necessary criteria. All questionnaires and interview schedules were collected personally. Around half an hour was spent with each person, face to face, to discuss all their notes, comments and their opinions. Their comments were considered and some of the questions and statements were modified accordingly.

These comments resulted in the following changes to the questionnaire, namely.

1. The question originally number 10, about school location, was moved to be second in the questionnaire after Q. 1 about the school name and the area because this was the logical order.

2. Q. 11 about the sex of the teachers was moved to be Q. 4, after nationality.

3. The question about age group was deleted, because the question about the date of birth asks for the same information.

4. In section 4, item no. 12 was deleted because it gives the same meaning as item no. 9.

5. In section 5, training needs, item 10 was deleted because it was confusing and not clear.

Timing of the questionnaire requires timing each question response within a questionnaire. This may lead to detecting potentially difficult questions. For example, questions that take longer to answer than others are quite likely to be too complicated and may need to be re-worded or broken down into separate parts. The average time taken to complete the questionnaires was 15 minutes.

The questionnaire was first written in English and then the researcher translated it into Arabic (Appendix 1.B). To ensure that colloquial terms and meanings were equivalent in both English and Arabic versions, the researcher gave both versions to an expert in Oman who is competent in translation from English into Arabic and vice versa. This ensured that the Arabic version of the questionnaire generated similar meanings to the English version. For section two about technology use where the items referred to computer resources such as excel, CD-ROMs and so on, the English terminology was added beside the translated Arabic expressions in order to prevent confusion because most of these applications are known in the Arabic-speaking community by their English names.

5.4.3 The Piloting of the Questionnaire

The pilot test is very important in research investigation because it helps the researcher to see how long respondents take to complete the questionnaire, and to locate any ambiguities. On this basis, researchers can remove any items which do not yield usable data, add items to fill any data gaps and reword unclear questions, in preparation for the main study.

Anderson & Arsenault (1998) explained that before carrying out the main study a pilot study is very important. It is a vital step for several reasons, such as to make sure that research methods are suitable for use in the main study, and that the research is significant. Borg et al. (2003) state that the pilot study provides additional knowledge that leads to improved research, such as:

- It provides ideas, approaches and clues not foreseen prior to the pilot study. Such ideas, approaches and clues greatly increase the chances of obtaining clear-cut findings in the main study.

- It reduces the number of treatment errors, because unforeseen problems revealed in the pilot study may be overcome in redesigning the main study.

- It permits one to get feedback that leads to important improvements in the main study.

Accordingly, the purpose of a pilot study is to ensure that there are no difficulties or weaknesses in completing the research methods in the main study.

As Hoinville & Jowell (1978: 90) point out: "The creation of a good questionnaire does not have to rely solely on the researcher's perspective. At some stage in the design process the questionnaire should be subjected to a field test." Even if initial fieldwork is possible, the questionnaire still needs to be piloted on a sub-sample before it reaches the full sample (May, 1997: 93). This technique gives the researcher a chance to revise the layout, question wording, and design to take account of any criticisms and problems. Therefore, piloting aims to see "how the research works and whether changes provide a means of catching and solving unforeseen problems in the administration of questionnaire, such as the phrasing and sequence of questions or its length. It may also indicate the need for additional questions or the elimination of others" (Judd, 1986: 162).

De Vaus (2001) states that once a questionnaire has been developed, each question must be evaluated, and the questionnaire as a whole needs to be evaluated. Individual items should be examined for:

- Variation: questions with low variation in their answers create serious problems at the data analysis stage.
- Meaning: ensuring that respondents understand the intended meaning of the question
- Redundancy: if two questions measure virtually the same thing, only one is needed in the final questionnaire.
- Scalability: ensuring that every set of questions is designed to form a scale or index.

- Non-response: the refusal of a large number of people to answer a particular question produces difficulties at the data analysis stage and can lead to serious reductions in sample size. The non-response might occur for various reasons. The question might be unclear, too intrusive, provide insufficient responses or appear to be too similar to previously answered questions.

- Acquiescent response set: questions that ask respondents to agree or disagree with a statement can suffer from the tendency of some people to agree with the statement, regardless of the question content.

According to De Vaus (2001), four things should be carefully checked to evaluate the questionnaire as a whole. They are:

- Flow: ensure that questions fit together and the transitions from one section to another are smooth.

- Question skips: where filter questions are used, it is important to ensure that the skip patterns do not lead to skipping more questions than was intended.

- Timing: it is helpful to test the time for each section, and how much is needed to complete the final questionnaire, to avoid the respondents' becoming bored.

- Respondent interest and attention; too long a questionnaire, particular sections or questions might lead to a particular loss of attention. Bored respondents will provide unconsidered and unreliable answers and produce high non-response to questions.

Mackay (1978) advises that,

> A pilot run of the first version of the questionnaire is a good idea. Even administered on a few, say five, individuals, it will indicate what

> questions have been poorly or ambiguously phrased and if any important information is missing (Mackay, 1978: 22).

Wiersma (2000) identified four benefits of the pilot run of research methods. It can:

1. Identify any misunderstandings, ambiguities, and useless or inadequate items.

2. Suggest additional items if needed.

3. Uncover difficulties with directions and instructions of items.

4. Exclude items that provide little or no information (Wiersma, 2000: 194).

5.4.3.1 The First Pilot Study

After the questionnaire was developed, a pilot study was conducted, to determine whether the method was reliable, and if any changes should be made in order to make it more effective in measuring what it was supposed to measure. Thus, both reliability and validity tests of the research method were implemented. The pilot study was conducted with 100 Basic Education teachers from four schools in Al-Batina region by post. The number of questionnaires returned was 90. Ten questionnaires were eliminated because respondents did not provide complete answers. Thus, the pilot study sample comprised 80 questionnaires.

5.4.3.2 The first pilot study descriptive statistics

This section presents a descriptive analysis of the data from the first pilot of the questionnaire.

Table 5.8: Distribution of respondents by age groups

Ages groups	Frequencies	Percent
21-25	32	40.0
26-30	44	55.0
31-35	3	3.8
36-40	1	1.3
Total	80	100.0

It can be seen that 95% of the sample were 30 years old or under, while 5.1 % were above 30 years.

Table 5.9 shows the teachers' qualifications. It can be seen from the table that one third of the teachers had a university degree in education (32.5%), teachers with other university degrees constituted 13.8%, and 40% had a diploma after secondary school. Just two teachers had higher degrees such as Higher Diploma or Masters degree.

Table 5.9: Teachers' educational qualifications

Degree	Frequencies	Percent
Masters degree	1	1.3
Higher Diploma	1	1.3
University educational degree	26	32.5
University degree	11	13.8
Diploma after secondary school	32	40.0
Teacher's diploma (secondary level)	3	3.8
Secondary school	5	6.3
Less than secondary level	1	1.3
Total	80	100.0

This very low percentage suggested that the question should be reviewed for the main administration of the questionnaire. If the percentages were still low, the researcher would categorise the qualifications again.

Table 5.10 shows teachers' distribution according to teaching subjects.

Table 5.10: Respondents' teaching subjects

Subject	frequency	Percent
Arabic & Islamic studies	20	25.0
Maths & Science	21	26.3
English	12	15.0
LRC	27	33.8
Total	80	100.0

Section two: Use of technology

This scale in the questionnaire was meant to examine the frequencies of teachers' use of technology items. Teachers were asked to say how often they used the item of technology mentioned. The scale ranked the use into five choices: twice a week, once a week, once a month, once and a term and never.

Table 5.11: Frequency of Teachers' Use of Technology

No	Equipment	Twice a week	Once a week	Once a month	Once a term	Never
1	Educational Films	20.0	26.3	17.5	15.0	21.3
2	Audiocassettes	42.5	20.0	10.0	1.3	26.3
3	Overhead Projector	27.5	15.0	12.5	7.5	37.5
4	Educational Slides	18.8	18.8	20.0	3.8	38.8
5	Educational TV	18.8	20.0	23.8	10.0	27.5
6	Computer Display Projector	35.0	13.8	12.5	7.5	31.3
7	Learning Packages	15.0	23.8	11.3	7.5	42.5
8	Word Processing (e.g. Microsoft Word, Word Perfect)	15.0	17.5	5.0	2.5	58.8
9	Spreadsheet (Microsoft Excel, Lotus)	7.5	6.3	8.8	10.0	67.5
10	Presentation Program (e.g. Microsoft Power Point, Freelance Graphics)	12.5	13.8	17.5	8.8	47.5
11	Computer-based assignment	5.0	11.3	3.8	3.8	75.7
12	Internet for extra teaching materials	5.0	11.3	3.8	3.8	75.0
13	CD-ROMs/Multimedia system	15.0	7.5	10.0	10.0	57.5
14	Video Camera	7.5	3.8	7.5	1.3	80.0
15	Scanner	17.5	13.8	12.5	3.8	52.5
16	Printer	43.8	11.3	6.3	3.8	35.0
17	Photocopier	50.0	3.8	5.0	3.8	37.5
18	Maps, Pictures or Stickers	41.3	18.8	7.5	5.0	27.5
19	Video Display Projector	7.5	6.3	3.8	3.8	78.8
20	Whiteboard/Blackboard	60.0	8.8	7.5	5.0	18.8
21	Teaching games	25.0	26.3	13.8	6.3	28.8
22	Models	42.5	16.3	8.8	5.0	27.5
23	Language Laboratory	1.3	1.3	1.3	1.3	95.0

It can be seen from the table that most of the ICT items were reported never to be used by a high percentage of the teachers. From the teachers' comments, the scale was somewhat confusing for some items. Therefore, the scale was changed to: often, sometimes, rarely, never. Items 3 (Educational Slides), 6 (Computer Display Projector), 19 (Video Display Projector) and 23 (Language Laboratory) were deleted because such tools are not used widely in Basic Education schools, or caused some confusion with other items among teachers.

Section three: Under-use factors

This section presents the frequencies given as percentages, of teachers' responses on the factors that hinder their use of technology.

From Table 5.12 their responses, teachers seemed to agree on the effect of most of the factors included in the questions.

In this section, all items were clear, and the teachers agreed in their comments that these factors really represented the problems that affected their use of new technology in schools. Teachers tended to agree or strongly agree with most of the factors. When the teachers were asked to comment if they would like to add any more factors which they thought affected their use of technology, they responded that the question represented all the factors that they had experienced or heard about from other teachers.

Table 5.12: Teachers' responses to the factors of under use of instructional technology (%)

No	Statement	SD	D	U	A	SA
1	Limited access to Instructional technology.	2.5	25.0	7.5	33.8	31.3
2	Not enough computer software programming.	1.3	28.8	5.0	33.8	31.3
3	Lack of time in the computer laboratory timetable for using instructional technology.	1.3	16.3	11.3	20.0	51.3
4	Lack of adequate technical support.	1.3	17.5	12.5	37.5	31.3
5	Not enough funding to provide extra instructional technology equipment.	3.8	11.3	11.3	30.0	43.8
6	Instructional technology is available when needed.	8.8	32.5	18.8	35.0	5.0
7	Difficulty of moving instructional technology items to and from classrooms.	3.8	25.0	11.3	31.3	28.8
8	Lack of planning in school on use of instructional technology.	2.5	16.3	20.0	33.8	27.5
9	Little encouragement and administrative support for classroom use of instructional technology.	6.3	27.5	16.3	30.0	20.0
10	School is not fully aware how to use and operate items of instructional technology.	2.5	22.5	10.0	47.5	17.5
11	Classrooms are suitable for the use of instructional technology.	6.3	21.3	11.3	43.8	17.5
12	Lack of software programs written in Arabic.	5.0	26.3	15.0	32.5	21.3
13	Good quality equipment.	5.0	25.0	8.8	41.3	20.0
14	Students' lack of basic instructional technology skills.	1.3	10.0	10.0	38.8	40.0
15	Not having enough information about the materials available.	5.0	16.3	13.8	41.3	23.8
16	Large number of students in classroom.	12.5	26.3	10.0	26.3	25.0
17	Enough resources that illustrate how to integrate instructional technology into the curriculum.	3.8	26.3	8.8	47.5	13.8
18	Regular Maintenance to the equipment.	6.3	27.5	12.5	32.5	21.3
19	Lack of suitable software programs in the area I teach.	12.5	10	8.8	35.0	33.8
20	Lack of established guidelines on instructional technology usage.	6.3	12.5	8.8	51.3	21.3
21	There is a sufficient amount of technological equipment available in my school to aid and improve students learning.	2.5	30.0	12.5	41.3	13.8
22	My school has added some very usable computer hardware for teachers to use in the last two years.	16.3	28.8	15.0	27.5	11.3
23	New computer users in my school receive help from experienced personnel who know who to use computers.	2.5	13.8	5.0	48.8	28.8

Section Four: Teachers' attitudes. Table 5.13 shows that teachers' attitudes toward using technology were in general positive. The respondents did not feel that there was any confusion in the items. They commented that the statements were clear.

Table 5.13: Teachers' attitudes towards using instructional technology

No.	Statements	SD	D	U	A	SA
1	Instructional technology could help me with my teaching.	0.0	1.3	2.5	30.0	66.3
2	Teachers should continuously search for new ways to use instructional technology in the class room.	1.3	7.5	3.8	31.3	56.3
3	Teaching plans should include instructional technology every day.	1.3	2.5	1.3	43.8	51.3
4	The use of instructional technology improves the quality of students learning.	2.5	2.5	33.8	61.3	100.
5	I need additional knowledge and skills in the preparation and utilization of instructional technology.	0.0	1.3	6.3	35.0	57.5
6	A computer takes too long to master and produces too few results to be a worthwhile teaching tool.	30.0	41.3	11.3	8.8	8.8
7	I feel comfortable using technology in the classroom.	0.0	3.8	7.5	52.5	36.3
8	I am eager to apply computers and related technologies to facilitate emerging roles of the learner and myself.	50.0	36.3	3.8	7.5	2.5
9	I feel instructional technology isn't appropriate to my teaching.	42.5	42.5	6.3	6.3	2.5
10	I feel I should develop my skills to keep up to date with development in teaching.	0.0	5.0	5.0	27.5	62.5
11	I need to develop my skills and knowledge for the pupils' benefit.	0.0	3.8	3.8	40.0	52.5
12	I'm interested personally but developing my skills and knowledge in instructional technology isn't appropriate to my teaching.	20.0	41.3	12.5	20.0	5.0
13	I'm interested but training doesn't seem to be available.	5.0	20.0	13.8	36.3	25.0
14	I'm not that interested but I suppose I should be.	15.0	32.5	15.0	25.0	12.5
15	I'm interested but I do not have the time.	11.3	22.5	12.5	33.8	20.0
16	Instructional technology can be used to motivate students and enhance their learning experience.	0.0	3.8	2.5	38.8	55.0
17	I prefer using it on my own when no one is around to see me make mistakes.	16.3	48.8	13.8	6.3	15.0
18	I feel lost in the information age.	23.8	43.8	11.3	12.5	8.8
19	Instructional technology encourages pupils to work together collaboratively.	0	10.0	1.3	52.5	36.3
20	Instructional technology is difficult to use.	7.5	51.3	6.3	25.0	10.0
21	Instructional technology can save a lot of teaching time.	12.5	5.0	10.0	43.8	28.8
22	Instructional technology can be useful in almost all subject areas.	5.0	1.3	13.8	42.5	37.5
23	Instructional technology can be used to meet individual student needs.	0	6.3	2.5	60.0	31.3
24	I prefer to use the textbook instead of the new technology.	15.0	58.8	16.3	7.5	2.5
25	I consider it takes me a long time to prepare technology materials for teaching.	7.5	30.0	10.0	32.5	20.0
26	I find it easy to select appropriate instructional technology resource for my teaching.	10.0	22.5	11.3	42.5	13.8

Section Five: Teachers' training needs

The scale for training needs is: I do not know (1); no need (2); some need (3); and great need (4).

Table 5.14: Teachers' training needs

No		1	2	3	4
1	To select appropriate teaching materials for a selected subject.	12.5	12.5	37.5	33.8
2	Training in the selection and evaluation of teaching materials.	6.3	15.0	45.0	30.0
3	To operate and use the instructional technology available in your school.	5.0	8.8	35.0	46.3
4	To match teaching materials to learners' abilities.	2.5	18.8	45.0	30.0
5	Knowing how to program in a computer language.	1.3	5.0	15.0	75.0
6	Knowing how to get information in and out of a computer.	0.0	21.3	28.8	46.3
7	Knowing how to select and use educational computer software.	0.0	8.8	37.5	50.0
8	Learning about the history and the development of computers.	16.3	25.0	38.8	16.3
9	Learning about the role of computers in society.	3.8	28.8	40.0	23.8
10	Knowing how to use a computer as a high-interest drill and practice vehicle.	18.8	27.5	50.0	96.
11	Knowing how to use a computer as a means of teaching problem solving.	10.0	33.8	51.3	1.3
12	Knowing how to use the computer to help with class housekeeping chores (i.e., attendance, student records).	0.0	12.5	37.5	46.3
13	Knowing how to apply the computer to evaluate students' abilities.	1.3	11.3	41.3	42.5
14	Knowing how to apply the computer to diagnose students' needs.	8.8	13.8	30.0	43.8
15	Knowing how to use multimedia.	10.0	3.8	28.8	53.8
16	Knowing how to use a spreadsheet.	11.3	13.8	21.3	50.0
17	Knowing how to use word processing.	8.8	16.3	22.5	48.8
18	Knowing how to use a database.	1.3	13.8	28.8	52.5
19	Knowing how to use a computer for presentation.	2.5	10.0	25.0	58.8
20	Knowing how to benefit from the internet.	2.5	11.3	26.3	56.3
21	Knowing how to use educational software.	6.3	11.3	30.0	48.8

Table 5.14 shows the percentage of the degree of training needs in some general and specific areas. It was decided to delete four items (2, 9, 10, and 21) from this section, because of repetition or the ambiguity of some words. Item 2 had the same meaning as item 1 for the teachers, item 9 was found to be vague in meaning and teachers did not understand item 10. Item 21 about training in software use in general was redundant as the issue was covered more precisely in other items.

Section Six: Teachers' beliefs and philosophies

Table 5.15 shows teachers' responses given as percentages, to the importance of the educational aims presented in the question, which were a mixture of traditional and more progressive aims.

Table 5.15: Teachers' responses to the educational aims

No.	Statement	Not important	Fairly Important	Important	Very Important	essential
1	An understanding of the world in which pupils live.	0.0	27.5	26.3	25.0	21.3
2	The acquisition of basic skills in reading and number work.	5.0	17.5	26.3	38.8	12.5
3	The development of pupils' creative abilities.	0.0	17.5	30.0	41.3	11.3
4	The encouragement of self-expression.	2.5	20.0	30.0	36.3	11.3
5	Helping pupils to co-operate with each other.	0.0	23.8	27.5	42.5	6.3
6	The acceptance of normal standards of behaviour.	0.0	37.5	7.5	36.3	18.8
7	The enjoyment of school.	2.5	12.5	33.8	28.8	22.5
8	The promotion of a high level of academic attainment.	2.5	13.8	30.0	25.0	28.8

The percentages in Table 5.16 show that teachers were not very positive towards new educational methods. The second statement, "Creativity is an educational fad, which could soon die out" attracted the agreement of 77.5% of the respondents, while the statement "Too little emphasis is placed on keeping order in the classroom nowadays" attracted 57.6%.

The educational issues question was really a problem in this stage because it recorded very low reliability and many teachers had many comments about some statements. This necessitated much thinking and revision. The researcher's reaction to this problem was to change some statements in the Arabic version and use words more familiar to the teachers in their own language. Moreover, because this part of the questionnaire was considered to be very important, as there were no researches to study the effect of teachers' philosophy on their use of ICT in the Arab world and especially in Oman, the researcher decided to add another series of questions to give more details about teachers' beliefs and philosophies.

Table 5.16: Teachers response to the educational issues

No.	Statement	SA	A	U	D	SD
1	Most pupils feel more secure if told what to do and how to do it.	2.5	5.0	3.8	72.5	15.0
2	Creativity' is an educational fad, which could soon die out.	32.5	45.0	12.5	8.8	98.0
3	Firm discipline by the teacher leads to good self discipline on the part of the pupil.	3.8	2.5	7.5	60.0	23.0
4	The teacher should be well liked by the class.	3.8	2.5	2.5	53.8	36.3
5	Children working in group' waste a lot of time arguing and 'messing about'.	11.3	46.3	23.8	17.5	1.3
6	Pupils work better when motivated by marks or stars.	1.3	6.3	5.0	75.0	11.3
7	Too little emphasis is placed on keeping order in the classroom nowadays.	13.8	43.8	10.0	25.0	6.3
8	Teachers need to know the home background and personal circumstances of their pupils.	2.5	2.5	6.3	68.8	18.8

The new series of questions in the last section was adopted from a study called Teaching, Learning, and Computing, which was conducted by the Centre for Research and Information Technology and Organisations (Becker & Ravitz, 1999).

In the paired comparison question, eight pairs of philosophical positions were presented; one expressed the contrast in the role of the teacher as facilitator of student learning as opposed to explainer of material to students. The second pair is a comparison between the roles of the teacher as facilitator or academic instructor.

The third comparison was between the idea that curriculum content coverage was more important than "encouraging sense-making" among students and the reverse, and the fourth comparison was between whether it is more useful for students to learn many different ideas and skills even if their understanding, for now is limited, or to master a few complex ideas and skills well.

Table 5.17: Description of philosophy section

	Constructivist perspective		Traditional Transmission Perspective
a.	I mainly see my role as facilitator.	☐	I see my role as an academic instructor.
b.	I try to provide opportunities and resources for my students to discover or construct concepts for themselves.	☐	I think students really will not learn the subject unless the teacher goes over the material in a structured way; it is my job to explain, to show students how to do the work, and to assign specific practice.
c.	The most important part of instruction is that to encourage "sense-making" or thinking among students. Content is secondary.	☐	The most important part of instruction is the content of the curriculum.
d.	It is useful for students to become familiar with many different ideas and skills even if their understanding, for now, is limited.	☐	It is better for students to master a few complex ideas and skills well, and to learn what deep understanding is all about.
e.	Students will take more initiative to learn when they feel free to talk together and move around the room during class.	☐	I think a quiet classroom is generally needed for effective learning.
f.	It is a good idea to have all sorts of activities going on in the classroom.	☐	It is more practical to give the whole class the same assignment, one that has clear directions, and one that can be done in short intervals that match students' attention spans and the daily class schedule.
g.	I prefer the students to lead a discussion and the questions to come from the students themselves.	☐	I prefer to lead a whole-class discussion, asking questions that the students could answer quickly.
h.	Students gain more knowledge from discovery learning, it is meaningful to raise questions and let the students discuss the problem among themselves in small groups.	☐	Teachers know a lot more than students do; they should not let students muddle around when they can just explain the answers directly.

The fifth comparison was between effective learning environments. The sixth pair contrasted a teaching approach where multiple activities were going on in class at the same time, activities suggestive of complex project work and a fair amount of latitude for students, as opposed to a classroom where everyone was working on the same assignment. One with "clear directions' and that can be done in short intervals that match students' attention spans and the daily class schedule. The seventh pair contrasted two discussion styles in the classroom, and the eighth was about different learning styles.

Following the pilot, the coding for items 3, 5, and 7 was reversed to make all the statements in the same order, i.e. the constructivist statements on the left side and the traditional statements on the right side.

The above discussion shows that there were some changes in the questionnaire based on the careful study of the results of the first pilot. Therefore, a further pilot study was conducted to test the new changes.

5.4.3.3 The second pilot study

Any change in the questionnaire needs to be piloted again. Therefore, a second pilot study was carried out to test these changes. The questionnaires were again distributed to 60 teachers. The questionnaires were sent by post to Oman and attached with a page for further comments or suggestions. The teachers were satisfied with the new version of the questionnaire.

The final version of the questionnaire after the first pilot study and the second pilot is presented in Appendix (1.A).

5.4.4 Reliability of the Basic Education Teachers' Questionnaire

Neuman (2000: 164) mentioned that "reliability means consistency". It means that the same results will be obtained when the same measure is repeated or recurs under identical or very similar conditions. Oppenheim (1996: 144) emphasised that "reliability refers to the purity and consistency of a measure, to repeatability, to the probability of obtaining the same result again if the measure were to be duplicated". Hence, the reliability of a measuring instrument is the degree of consistency with which it measures whatever it is measuring.

Accordingly, measurement of reliability is a relevant test for measuring the level of similarity in the answers of the sub-sample. There are several ways of testing for reliability such as 'test re-test', 'alternative forms' and 'internal consistency'. The most suitable type for the current study was internal consistency. There are several methods for testing internal consistency, such as the split-half (subdivided test), the Kuder-Richardson method of rational equivalence, Analysis of Variance Procedure and Cronbach's Alpha Coefficient. Each method is used with a specific type of data according to the aims of study. The researcher used Cronbach's Alpha Coefficient because it was the most suitable method of estimating the internal consistency of the current study.

Regarding what constitutes an acceptable standard of reliability, Borg (1981) states that:

> Correlations below 0.35 show only very slight relationship between variables and have limited meaning in exploratory relationship, whereas a correlation within the range 0.35 and 0.65 shows a strong enough relationship between variables and is statistically significant beyond the one percent level (Borg, 1981: 218 – 219).

The data obtained from administering the questionnaire to 100 teachers in Al-Batinah region in Oman in the first pilot study and the data from the second pilot study were used to determine whether the questionnaire has reliability under this definition by using Cronbach's Alpha coefficient.

For section two, the "Teachers' use of Technology" scale, it was found there was a high level of similarity in the answers of the sub-sample that was tested, and the Cronbach's Coefficient Alpha for this part of the questionnaire (No. of Cases = 79 and No. of Items =23) was 0.82 in each pilot study. This value was acceptable and indicated statistically reliable scale. Therefore, this scale was used in the main study.

For Section Three, "Factors That influence the use of instructional technology", the Cronbach's Coefficient Alpha (No. of Cases = 79 and No. of Items =23) was 0.76 in the first pilot study and 0.78 in the second. For Section Four, "Teachers' view of Technology", the Cronbach's Coefficient Alpha (No. of Cases = 78 and No. of Items =26) was 0.77 in the first pilot and 0.76 in the second. This value was acceptable and indicated a statistically reliable scale.

For Section Five, "Instructional Technology Training", it was found there was a high level of similarity in the answers of the sub-sample that was tested, and the Cronbach's Coefficient Alpha for this part of the questionnaire (No. of Cases =80 and No. of Items =21) in each pilot study was 0.87.

For the last section, "Teachers' views and opinion about educational issues", the item total correlations for items 7, 3 and 2 in the subscale were low and therefore they were removed, resulting in an improvement of reliability. In the second pilot Alpha for aims was 0.80, for educational issues 0.81 and for progressive methods 0.69.

The following table summarises the reliability for each section in the questionnaire

Table 5.18: Reliability of the scales for the first and second pilot study

No	Section of the Questionnaire	Alpha 1	Alpha 2
1	Teachers' use of Technology	.82	.82
2	Factors that influence the use of ICT	.76	.78
3	Teachers' view of Technology	.77	.76
4	Instructional Technology Training	.87	.87
5	Aims	.79	.80
6	Issues	.43	.81
7	Traditional and progressive	.28	
8	New section about progressive methods in second pilot		.69

5.4.5 The Questionnaire Sample

A sample is a segment of the population selected according to a specific method for the purposes of research in a specific domain in order to represent the population as a whole and enable researchers to generalise the obtained results on this population (Verma & Mallick, 1999).

There are two main types of samples: non-probability and probability samples. Non-probability samples include those in which cases are selected for their availability. In this type, the probability of each case in a population being selected as part of the potential sample is not known and it is not clear how results can be generalised to a wider population, especially according to statistically legitimate inferences. The selection of cases in this type is arbitrary and relies on the personal judgement of the researcher. In contrast, in **probability samples**, the probability of each case in the population being selected as part of the potential sample is known and is usually equal for all cases and it is clear how results can be generalised to a wider population (Zikmund, 2000). In order to select a scientific sample it is necessary first to:

- identify a suitable sampling frame or list of all cases in the population to be sampled based on research questions or objectives;
- decide on a suitable sample size, taking into consideration the population size. "Large samples give more reliable results than small samples. However samples less than 1 percent of a population can be reliable with a credible sampling procedure" (Kotler, 2001: 69);
- select the most appropriate sampling method (to obtain a representative sample a probability sample of a population should be drawn) and select the required sample;
- check that the sample is representative of the population. (Rose & Sullivan, 1996 and Kotler, 2001).

The purpose of this research was to study the computer awareness of the teachers of basic education in Oman. It also investigated teachers' ideas about the strengths and weaknesses concerning the introduction of ICT in Basic Education schools in Oman, and finally, in order to support the implementation and development of new technologies in the Omani educational system, the study covered all regions in Oman. These are the capital Muscat, Al-Batina, Al-Sharqiya, Al-Dhahira, Al-Dakhliya, Al-Wusta, Dhofar, and Musandam.

Lists of names of schools in each region were used as the sample frames in this study. A sampling frame is a listing of the research population from which a sample is to be drawn (Babbie, 1975, Hoinville and Jowell, 1978). If the sampling frame is to fulfil its purpose it must meet a number of criteria. It must be sufficiently accurate, free from omissions and duplications and up to date (Murthy and Roy, 1983). The following table shows the number of schools and teachers in each government area in Oman according to the statistical book 2001/2002.

Table 5.19: Distribution of basic education schools and teachers by region in the academic year 2001/2002

The Region	No. of schools			No. of teachers		
	F	M	Total	F	M	Total
Muscat	23	5	28	820	233	1053
Al-Batina	44	11	55	1653	553	2206
Al_Sharqiya	29	11	40	1046	493	1539
Al-Dhahira	17	3	20	556	108	664
Al-Dakhliya	20	5	25	788	208	996
Al-Wusta	4	0	4	21	57	78
Dhofar	18	3	21	495	171	666
Musandam	5	2	7	113	72	185
Total			200			7387

Source: Ministry of Education (2002)

The size of the sample chosen is important, to make it representative of the whole population, so that comparisons can be made between the groups and inferences drawn. Borg et al. (2003) mentioned that it is important in planning a research project based on the research method to determine the size of the sample necessary to attain the objectives of this research.

Making a decision about the sample size is an important consideration facing a researcher. The question is how large a sample should be to conduct a certain piece of research. According to Cohen et al. (2000), there is no clear-cut answer. The 'correct' sample size depends on the purpose of the study and the nature of the target population. However, some writers offer guidelines on deciding an appropriate sample. The general rule is 'the larger the sample size, the more accurate will be the estimation'. Leedy (1997) referring to *Determining Sample Size for Research Activities* by Krejcie and Morgan (1970), summarised the determination of the sample size under five points:

1. The larger the population size, the smaller the percentage of the population needed to get a representative sample.
2. For a smaller population, N< 100, there is little point in sampling: research the entire population.
3. If the population sample is around 500 50% of the population should be sampled.
4. If the population is around 1,500 20% should be sampled.
5. Beyond a certain point (about N= 5000), the population size is almost irrelevant and a sample size of 400 will be adequate.

There are different ways in which probability samples may be selected, such as simple random sampling, systematic sampling, stratified sampling, multistage sampling and cluster sampling. The purest and the most basic form upon which most simple inferential statistics are based is **the simple random sample**, in which every case in the population has a known and equal chance of selection for the sample (Bryman & Cramer, 2001).

The sampling strategy employed was to sample 10% of the total number of teachers (7387) from all regions in Oman, using the schools in each region, including all subjects. It was decided to choose 20 of the 200 basic schools in Oman using the stratified sample method, as shown in the following table.

Table5.20: Sampling frame of schools according to region

Region	Population		Sample	
	N	%	N	%
Muscat	28	14	2.8 ~3	14
Al-Batina	55	27.5	5.5~6	27.5
Al-Sharqiya	40	20	4	20
Al-Dhahira	20	10	2	10
Al-Dakhliya	25	12.5	2.5~2	12.5
Al-Wusta	4	2	.4~0	2
Dhofar	21	10.5	2.1~2	10.5
Musandam	7	3.5	.7~1	3.5
Total	200	100%	20	100%

According to De Vaus (2001) stratified sampling is designed to produce a more representative and thus more accurate sample. To use this method, first the relevant stratifying variable is determined. The stratifying variable is the characteristic used to ensure correct representation in the sample. Having selected this variable, the sampling frame is ordered into groups according to the category (or strata) of the stratifying variable and then using systematic sampling to select the appropriate proportion of people within each strata.

In this research, the researcher decided to take the region as the stratifying variable, so the sample would represent all the regions in Oman. This method of sampling gives a greater degree of representation and decreases the probable sampling error than would occur with a simple random sample of the same size (Babbie, 1975: 156).

5.4.6 The Main Administration of the Questionnaire

In the implementation of the main study, the researcher visited the school to introduce herself to the head teacher and the teachers and explain the aims of the study, then made arrangements for the observation schedule (See section 5.6.2) in the school. In the next visit after the observed lesson, the researcher interviewed (5.5.5) the teacher directly, because the observation and the interview are related to each other. Finally, the researcher gave the teachers the questionnaire, and returned later to collect it. The observation checklist, the interview and the questionnaire were given the same code to identify each teacher, which helped to relate the responses.

5.4.7 Method of Analysis

The data collected were analysed using the statistical software package SPSS (version 10). The use of descriptive statistics allows the researcher to manage and describe the data more efficiently (Babbie, 1990). Descriptive statistics were used to organize, summarize, and describe observations. Descriptive analyses were employed to determine the frequencies, means, and standard deviation of the dependent and independent variables.

Descriptive analyses, the t-test, one-way Analysis of Variance (ANOVA), correlation and regression analyses were used. The t-test was employed to determine if the means of two sets of scores were significantly different from each other. One-way ANOVA was employed to determine whether several sets of scores had different means. Correlation and multiple regression analysis were employed to determine the relationships among the dependent variables and the independent variables and to determine the strongest predictors of ICT use. The probability level for all tests of statistical significance for the study was set at $p < 0.05$.

(1) **The t-test:** This test is used to determine if the means of two groups differ statistically. The t-test is calculated by comparing the difference between the two means with the standard error of the difference in the means of the different groups (Bryman and Cramer, 1997, p. 142). If the difference in the means of the two groups is close to zero, it is more likely that this difference is due to chance.

(b) **One-way analysis of variance:** To compare the means of three or more groups, such as teachers' use of ICT according to their qualifications, age groups, it is necessary to compute a one-way analysis of variance. The test is often termed an F -test, in which an estimate of the between-groups variance (or mean square) is compared with an estimate of the within-groups variance (or mean square) by dividing the former by the latter (Bryman and Cramer, 1997: 146). The total amount of variance in the dependent variable (in this study teachers' use of ICT) is often due to the independent variables (barriers, training needs, teachers' attitudes towards ICT and teachers' philosophies in education) and that which is due to other factors. The variance that is due to the independent factors is referred to as explained variance, whereas the variance that is caused by other factors is described as error or residual variance. If the explained variance (between groups) is considerably larger than the error or (residual) variance (within groups), then the F-test will be higher, which implies that the difference between the means is unlikely to be due to chance.

(c) **Factor analysis** was used to classify the scales in the sections of the teachers' questionnaire. The method was principal components factor analysis with a varimax rotation as the default. The factor analysis provided a listing of factors with an eigenvalue above 1.0. An eigenvalue of 1.0 or greater indicated that the factor possessed at least as much total variance as was contained in a single item. Based on the factor extraction data, eigenvalue, scree plot and explained variance, the researcher can decide which factors to include in the regression analysis.

(d) **Regression analysis**: Regression analysis, in the form of multiple regression, is regarded as the most widely used and powerful tool for summarizing the relationship between variables and for prediction of the dependent variable (Bryman and Cramer, 1997: 256). In the computation of the multiple-regression equation, a procedure called stepwise, the most commonly used method in testing regression, (Bryman and Cramer, 1997: 267) was employed to decide the sequence of the entry of variables into the equation. It is a combination of forward and backward selection.

(e) **Non-parametric tests**: From the variety of non-parametric tests available, the researcher decided to use the chi-square test. The chi-square test is widely used in conjunction with contingency tables (cross tabulation) which contain a cell for each combination of categories of the two variables. It is used to test statistical significance, meaning that it allows the researcher to ascertain the probability that the observed relationship between the two variables may have arisen by chance.

The test is calculated by comparing the observed frequencies in each cell in a contingency table with those that would occur if there were no relationship between the two variables (Bryman and Cramer, 1997: 168).

5.5 The Interview

The second main method of research was the interview, which was derived from the research questionnaire, following the same frame as the questionnaire and generating new data, which would complement the questionnaire data. The point about generating new data is particularly relevant in establishing validity and reliability, according to the principle of triangulation.

Kerlinger (1986) says that the interview can supplement other methods, such as the questionnaire, and go deeper into the motivations and attitudes of respondents and their reasons for responding as they do in order to collect more detailed data. In other words, the interview can be used in conjunction with other methods in a research undertaking, like a questionnaire, in order to collect more detailed data. The purpose behind that is to validate other methods and to go deeper into the motivations of the sample group.

Therefore interviews were used in this study to validate the questionnaire findings on the one hand and to go deeper into the motivations and views of the sample group, to collect other data on the other hand. There are several advantages in the use of the interview as a research method. These advantages include:

- Many persons are willing and therefore provide data more readily and of greater validity in an interview than by filling in a questionnaire.
- The interviewer can answer questions from the interviewee and can put him or her at ease. This can build up a positive climate for both co-operation and truthfulness.
- The interview provides an opportunity to question certain areas under investigation more thoroughly and allows for a greater depth of response.
- The interview is flexible and adaptable to the individual situation.
- Experience has generally been that the response rate of using interviews is good.

In contrast, there are a number of potential disadvantages attached to the use of the interview. These disadvantages include:

- Researchers need a long period of time to gather data from a large number of respondents simultaneously by means of the interview method. So, the researcher, in the current study, interviewed a small number of respondents (Basic Education teachers) and used the questionnaire with a large number of respondents (teachers).
- Interview data can easily become biased and misleading if the person being interviewed is aware of the perspective of the interviewer. Therefore, researchers should take care when designing the schedule or dealing with participants to reduce bias as far as possible.

- Some interviewees do not like to be taped, because they may be shy, have cultural objections to having their voice recorded, or they may not want their comments on the record, particularly those in more senior positions. This problem can be overcome, however, by being sensitive to the interviewees' wishes and always carrying a notebook in case taping is refused (Oppenheim, 1996, and Cohen, et al. 2000).

Accordingly, the interview method was used to collect data relating to the research objectives, to supplement the questionnaire, in order to avoid the disadvantages of using a questionnaire alone, and to avoid the disadvantages of using an interview alone.

5.5.1 Interview Format

There are several types of interview, such as structured interview, semi-structured interview, unstructured interview, and focus groups. As Campbell, et al. (2004) said:

> There are many different types of interviews, running from highly structured, formal interviews to informal conversations ... You must choose the form to suit your purpose after carefully considering what style and approach to data collection you wish to pursue (Campbell, 2004: 98).

The basic differences between types of interviews are the amount of structure and the number of people involved.

Borg et al. (2003) outlined three major types of interviews: key informant interview, survey interviews and group interviews. They defined key informant interviews as

"collecting data from individuals who have special knowledge or perceptions that would not otherwise be available to the researcher" (Borg et al., 2003: 306). Because these individuals, as claimed by Borg et al. (2003) are usually few in number, the interview is a popular way to assess their views and opinions.

The structured interview is the easiest type of interview. It relies upon the use of a questionnaire as the data collection method. In this type, each interviewee is asked the same questions in the same way so that any differences between answers are then assumed to be real ones and not the result of the interview situation itself (May, 1997). This type of interview involves a series of closed form questions that either have yes-no answers or can be answered by selecting from among a set of short-answer choices (Borg et al., 1996). So the structured interview relies primarily upon the use of a questionnaire as the data collection method.

Semi-structured interviews are said to allow interviewees to answer more on their own terms than the structured interview permits, but still provide a greater degree of structure than the focused interview and unstructured interview.

This aids comparability (May, 1997). Semi-structured interviewing involves asking a series of structured questions and then probing more deeply using open form questions to obtain additional information (Borg et al., 1996). Reasons for conducting this type of interview include a concern with the meaning that individual respondents give to concepts, events and so on, and for exploration of issues that are too complex or too sensitive to be investigated by quantitative approaches. Involvement in interviewing is a reminder of the importance and influence of the researcher in the research, and face-to-face interviewing makes more evident the "power" relationships within the research. The type of interview selected will to some extent depend on the nature of the topic and what exactly the researcher wishes to find out and also the contractual conditions. Blaxter et al. (1998) say that interviews may take place face to face (for example, at the interviewee's or interviewer's home or place of work or on another selected place), or at a distance, such as over the telephone.

5.5.2 Interview Questions

A semi-structured interview schedule was developed for teachers in Basic Education schools. This interview schedule consisted of 8 main questions. Statements concerning the purpose of the interview as well as information on the researcher's curriculum vitae could be considered as having been included through the initial discussions for the arrangement of the interview date and time. This interview schedule was translated into Arabic. The construction of the interview had many stages. During December 2002, the questionnaire was piloted with 100 teachers who gave constructive comments. The interview was also piloted with colleagues and with officials of the Ministry of Education in Oman. The questions are grouped under five main categories:

a) Questions about personal details (age, experience,...);

b) Questions about the environment factors affect the use of instructional technology.

c) Questions about teachers' attitudes generally in education and specifically about the use of computers (frequency and individual patterns of computer use, views on teaching with ICT, beliefs for the implementation and development of ICT at primary schools [integrated or subject, which class to start], support from administration, dangers of new technology and precautions).

The interviews were intended to follow the observations, on the same day. Therefore, the schedule was designed to allow comment on the observed lesson and to explore further the teachers' use of ICT and the factors that affect its use. The interview consisted of six sections:

Section One: Background information.

Section Two: Factors affecting the use of technology: this section includes questions about training, the availability of materials in school, the ability of the students, and other factors that encourage or hinder the use of ICT.

Section Three: Teachers' beliefs about ICT: this section explores the teachers' beliefs and attitudes toward using the new technology in teaching, and teachers' thoughts with regards to traditional teaching as opposed to teaching with technology.

Section Four: Teachers' opinions about educational issues: this section aims to discover the teacher's philosophy in education, and his or her attitudes toward the new education reforms in Oman. (For interview questions see Appendix 1.C).

5.5.3 Validity of the Interview

To measure the validity of the interview used in this study and confirm clarity of the items and their relevance to their scales and sections, the following steps were undertaken:

- Copies of the interview schedule were distributed to four Ph.D. students in Hull University, who were interviewed after they had reviewed it. Around half an hour was spent with each person, face to face, to discuss all their notes, comments and their opinions.

- Two copies of the interview schedule were given to two colleagues in Hull (one a Basic Education teacher, and the other a supervisor of English language from the Ministry of Education in Oman), and the researcher piloted the interview with them.

- Using a messenger chat-room, the researcher piloted the interview with three friends from the Ministry of Education in Oman to test the length of the interview. After that, the researcher phoned the teachers to clarify some points about the questions.

- A letter was given to these assessors indicating the nature and the aim of the survey and telling them that they were not asked to respond to the items, but to judge whether the items met the necessary criteria.

A number of items of the personal interview questions were changed and a few were removed according to the assessors' recommendations. In addition, most items were rearranged in a new sequence.

The interview checklist was developed in English, and it was then necessary to translate the questions into Arabic. The interview schedule was translated by the researcher. After this, consultation was held with four Ph.D. students in Hull University. This group was asked to comment on the wording, style and presentation of the interview schedule, and their comments and suggestions were taken into account to produce an amended translation.

5.5.4 The Interview Sample

The interview sample was selected randomly from 6 schools of the questionnaire sample. In each school, the researcher interviewed teachers of different subjects: Arabic & Islamic studies, Maths & Science, English, and LRC teachers. Although the sample was selected randomly, the teachers were free to agree or refuse to participate in the interviews. Just two cases refused to be recorded on digital camera in the observations which were made of the same sample of teachers; therefore the researcher decided to replace them with other teachers. One recorded interview was not completed because of technical problems and so was excluded from the sample, and there was no time to replace it with another teacher. Therefore, the total number of the interview sample was 23 interviews.

5.5.5 Conduct of Interviews

Punch (1998) provides a general checklist for managing the interview:

- the interview schedule: preparation for the interview;
- establishing rapport: beginning the interview;
- communication and listening skills;
- asking questions (sequence and types of questions);
- closing the interview.

In approaching people for interviews the researcher set out clearly the aims of the research, the issues to be discussed, an estimation of how long the interview would be likely to take, and asked for their preference regarding date and starting time. The place for conducting the interviews was the teacher's own territory such as school labs, head's office (alone), and classrooms. Interviews took place after school, or during planning periods.

Audio-taping and transcription. All participant interviews were audio-taped with the participant's permission. Since responses to interview questions were often lengthy, it was initially not possible accurately to reduce responses to writing. Additionally, it was important to record the verbatim narrative in order to provide answers to some of the research questions.

While the intent was to place the tape recorder out of the way to increase the conversational feel of the interview, it was necessary, due to noise levels in classroom settings, to place the recorder either directly in front of or directly to the side of the participant. All audiotapes were transcribed as soon as possible after the interview session.

The interview began with a general conversation about classroom arrangement, students and other more personal comments in order to make the participant more relaxed during the interview and establish a conversational tone.

During the interviews, silence or repeating back to the interviewees their own statements as questions were used to encourage them to elaborate on what they were saying and to encourage rich, detailed anecdotes. Care was taken to avoid unfinished or mumbled questions and the researcher tried to monitor her own gestures, facial expressions and general body language, as these can convey particular meanings to interviewees, encouraging them to talk, or accidentally signalling boredom (Burgess, 1984). Prompts like 'what', 'how', 'why' and 'when' were used in order to encourage participants to complete their thoughts and to express themselves without directing the questions. The researcher shared experiences and exchanged ideas and information with research participants, without, however, expressing her own views and experiences in such a way that interviewees would feel unable to declare contrary opinions. Towards the end of the interview as a 'warm-down', a more relaxed or light-hearted question was asked so that each interview ended in a positive way.

5.5.6 Analysis of Interview Data

The steps of analysing interview data as outlined by Rossman and Rallis (1998), are (1) organizing the data, (2) data familiarization, (3) category and theme generation, (4) data coding, (5) searching for alternative explanations, and (6) presenting the data.

Organization was accomplished through the labelling of each interview tape by district, name of participant, data of interview, and the starting and ending times of the interview. Separate tapes were used for each interview. Where interviews lasted longer than the tape's time limits, multiple tapes were used and duplicate labels were made for subsequent tapes. Additionally, multiple tapes were labelled "tape 1 of n," where n represents the total number of tapes in the set, to ensure proper order in transcription. All field notes and classroom observation notes were kept in spiral-bound notebooks. One notebook was dedicated to each district.

Raw data from audio-taped interviews were transcribed into computer files. Each transcribed file followed the same set format so that all would be uniform for analysis. In addition, handwritten field notes and classroom observation notes were transcribed into computer files. The computer files were organized by level as well as by district or case.

In order to become familiar with the transcribed data, hard copy transcripts were compared to the relevant audiotape to check for accuracy prior to analysis. Any discrepancy was noted and the electronic transcription was corrected and resaved to both disk and hard drive. Hard copy transcriptions were then reread twice more. The purpose of the first reading was for general review and to attempt to understand the interview away from the interview and transcription setting. The second reading was for the purpose of identifying broad themes, categories, and concepts that emerged from the data.

Category and theme generation was accomplished during the last full reading of the transcripts by looking for “recurring ideas, themes, perspectives, and descriptions” (Rossman & Rallis, 1998: 179).

According to Burns (2000), it was not until the early 1980s that qualitative researchers discovered that the computer could assist them in working with their data. The event that really changed the situation was the advent of small personal user-friendly desk computers, instead of impersonal mainframes. This led to a change in the dominant paradigm of computer use from computers as 'number crunchers' to computers as devices for the intelligent management of data, incorporating storage and retrieval facilities, which in turn led to the PC becoming of assistance to qualitative research.

The central task in qualitative research – understanding the meaning of communication and behaviour – cannot be computerised as a mechanical task, but there are many mechanical tasks involved in interpretive analysis. Huge amounts of unstructured data such as interview transcripts, field notes, personal documents, etc., need to be managed and organised, in addition to the numerous codings, notes, memos, and marginal comments made as the researcher wades through the material. Another important aspect of qualitative research is pulling together interview data, textual material, etc., that have ‘something' in common. Qualitative researchers used to cut up file notes and transcripts, and code them into separate manila folders. Unfortunately, this mechanical method dislocated the removed section of text from its original context. The advantage of the computer is that it does not decontextualise the text, which can be copied into files as a form of an electronic concordance, making it possible to restore the original context of the segment electronically, allowing for the coding system to be changed if necessary, and permitting networks and hierarchies of codes, as well as quantitative attributes such as frequency counts within codes. All this makes qualitative theory building an easier task, with a network of codes acting as the representation of an emerging theory or hypothesis. Most recent computer programs in this area allow such networks to be graphically displayed. Some examples of software for qualitative analysis are ATLAS/ti, Hyper RESEARCH Version, text Smart by SPSS, TEXTOPAC PC, Max Version, Code-a-text and NUD*IST.

This research used ATLAS software instead of using manual coding and quotations for the interview data, which saved time and gave better results and more useful outputs. After saving the transcript of each interview as a Word file, it was transferred to ATLAS. ATLAS/ti is extremely useful for text interpretation, text management and theory building. It is the program preferred if a researcher wishes to construct linkages between any elements of the qualitative database – for example, text segments and memos. It is a very flexible tool for constructing any kind of network.

The design of the user interface is such that most of the analysis is conducted on-screen. Consequently, a wide variety of functions to support this style of working is offered (Burns, 2000).

Data Familiarisation (Informal data analysis): This step is meant to furnish the analyst with a broad picture of the data collected before starting formal analysis. As a strategy to gain an overview of the gathered material, the researcher wrote notes after each interview, recording any non-verbal cues and jotting down general ideas before listening to the tape. The next step was to listen to the interview from the tape twice before starting to English transcribes for each interview because it is the language of

Atlas. Taking the advice of Miles and Humberman (1994), Dey (1993), and Ritchie and Spencer (1994), after transcribing, the researcher read the interview several times listing key ideas and recurrent themes. A final step during the familiarisation procedures was to judge the data collected in an interview and to note what needed more exploration in the light of the research aims. In short, familiarisation "involves immersion in the data", listening to tape, reading transcripts, and noting recurrent ideas. As Ritchie and Spencer (1994) observe:

> During the familiarisation stage, the analyst is not only gaining an overview of the richness, depth, and diversity of the data, but also beginning the process of abstraction and conceptualisation. While reviewing the material, the analyst will be making notes, recording the range of responses to questions posed by the researchers themselves, jotting down recurrent themes and issues which emerge as important to respondents themselves (Ritchie and Spencer, 1994: 179).

Data Organisation (Formal Analysis): Data organisation is believed to facilitate intensive analysis, and without organising the collected data, of course, analysis will be chaotic. Therefore, in order to make the data manageable and by the help of word-processing, all the interview transcripts were accumulated on one file. This step permitted a whole picture of the accumulated data, since this step was meant to form a database for the qualitative interview data (Merriam, 1988). The second step in organising the data was to classify them according to the main interview questions, which were related to the main research questions. (The interview schedules are in Appendix One). Dey (1993: 40) claims that "without classifying the data, we have no way of knowing what it is that we are analysing." The next step in organising the data was to create a file for each interview question, using the facility of cut-and-paste in the word-processor. This was an accumulation of the data for one issue in its own file labelled according to the main issue of that question. The final step was to omit redundant and irrelevant information, performing minor editing, bearing in mind Marshall and Rossman's warning (1995: 113) that "careful attention to how data are being reduced is necessary throughout the research endeavour."

Content Analysis: The above classification increased the researcher's awareness of each issue. By thoroughly reading all the participants' views on a particular issue, it was possible to extract the recurrent themes and to create patterns and categories, as the process of generating categories involved noting regularities in the answers (Marshall and Rossman, 1995). The approach was not to provide a prior set of categories or patterns but to use the "indigenous" ones which were created and expressed by the subjects where possible and to construct categories as part of the analysing process where necessary; this is an 'inductive' approach. Qualitative researchers are warned against using predetermined categories either while they are collecting or analysing data (Marshall and Rossman, 1995 and Merriam, 1988).

According to Marshall and Rossman (1995: 114) the categories which emerge should have the attributes of "internal convergence and external divergence that is, the categories should be internally consistent but distinct from one another." In this study, the categories, as noted above, emerged from the data and were well defined. In order to examine the categories which emerged, an attempt was made to work back and forth between the data looking for points which fitted no particular category. In addition, alternative categories were created and tested against the initial ones, a strategy which revealed that the initial categories were suitable ones.

Thematic creation: The final strategy in this qualitative analysis was to create a thematic issue that is collecting related categories of issues under one theme which would be tackled during the construction of the thesis and be related to the research aims. Categorisation and thematic creation are the most challenging part of data analysis. In this stage, the ATLAS software was used for coding for the questions. It was possible to categorise teachers' responses under the following coding: teachers' use of ICT; teachers' attitudes towards new technology; teachers' training needs; and teachers' attitudes toward new reform. Using the quotation procedures in ATLAS, all quotations under one theme were saved in a separate file which was then printed out (see Appendix 1.E).

5.6 Observations

The principal disadvantages of questionnaire and interview techniques are that individuals tend to bias the information they offer about themselves (Borg et al, 2003). This problem can be solved by using the observational method for collecting data (Kerlinger, 1986). As Campbell, et al. (2004) said:

> "One approach to practitioner research is informal participant observation. Recording what as you see in teaching or meeting or other educational events can provide evidence as to what is happening" (Campbell et al., 2004: 93-94).

Moreover, this technique can overcome the limitations of the self-report method when sometimes they feel that cannot accurately recall events and aspects of their behaviour in which the researcher is interested (Cohen et al., 2000). Observation can be used in case study, historical, clinical, and situational analysis. It allows for direct on-site observation, freedom of access, intensity, quantitative and qualitative data, sampling of data and anthropological research. Extended observation can give a longitudinal perspective not found in most educational research. The technique may also lead to new insights and hypotheses, solidly grounded information obtained in a naturalistic setting, and the observer is less likely to overlook features that do not fit his or her expectations and objectives (Delamont, 1993).

The observational technique may have some disadvantages such as the difficulty in quantifying and interpreting its results. The records may also be long and difficult to quantify and interpret. Pre-conceived ideas may affect the findings. Complex behaviour and subjectivity may limit the value of getting objective data. A change of behaviour or situation may also affect the technical method and the researcher's presence may lead to changing the situation being observed. This is in addition to the effect of the observer on the observed, the observer's bias, the rating errors such as the "error of leniency" or that of "central tendency" or "the error effect" and the possibility of contamination (Borg et al., 2003; Cohen et al. 2000). However, all research techniques have both advantages and disadvantages: using techniques in combination helps to make complementary use of the strengths of each method and to overcome their limitations.

5.6.1 Observation Objectives

Classroom observation was aimed at describing the following points in the classroom:

- Background information
- Classroom environment: this was aimed at telling the researcher about the environmental factors that influence the use of instructional technology in the classroom.
- Classroom organisation: this showed the teacher's methods in organising the students' seating in the classroom, the students' freedom to move and talk during the class, etc.
- Evaluation of Teaching Strategy: This part was aimed at evaluating the role of the teacher and the students in the classroom. This would show the teacher's

teaching methods and the type of teacher (progressive or traditional) present in each case.

- The role of technology: showed how the teachers and the students used instructional technology in the classroom.

- The teacher's teaching method.

5.6.2 Conduct of Observations

The researcher used descriptive as well as evaluative variables in this study. In order to conduct live classroom observation, an observation check-list was prepared, as recommended by Mouly (1978):

> A major prerequisite to the implementation of classroom observation is the development of an adequate schedule for recording these observations. The task is that of identifying the range of teacher and/or pupil behaviours relevant to the purpose of the study, constructing items to be used in this context, and developing a checklist for quick tabulation (Mouly, 1978: 222).

The check-list (see Appendix E) was prepared to:

- obtain information about the learning environment, such as seating configuration, temperature, availability of curtains or blinds, and availability of projection screens;

- obtain information about the ease of bringing equipment to the classroom or moving students to the LRC room;

- obtain information about teachers' use of technology;

The researcher arranged the classroom observation visits to be made on the same days as the related interviews at the sample schools. The visits included the following subjects: Arabic, Computers, English, Mathematics and Science. Observations were conducted with the observer sitting in the class making notes on the check-list which had been prepared. The check-list was combined with recording by Digital Video Camera. Taping was mainly focused on small group or whole class activities involving using ICT and probe ware. Videotaping assisted the researcher in studying the complexity of social discourse and meaning negotiation and how those processes related to the culture of the classroom. Because videotaping inherently focuses on certain activities in the classroom, other activities are omitted. Therefore, the researcher took field notes to augment videotaping. The researcher transcribed the videotapes verbatim and coded the documents soon after taping.

During the visits, the teachers as well as the students participated in normal classroom activities so that the researcher was able to observe the learning process freely. On each visit the researcher tried to attend different classes and different subjects in order to gain as wide a view as possible of the different teachers and their teaching strategies. The check-list (Appendix 1.D) enabled the observer to complete a rapid analysis by ticking the various items rather than writing notes the whole time.

In order to understand better how teachers integrated technology into their classroom environment, during classroom observations, notes about the observations were kept. These notes included records of classroom layout, use of technical terminology by teachers, interaction between teachers and students relative to their use of technology, types of technology available for use in the classroom, number and types of computer hardware available for student and teacher use, types of applications available to students (e.g., word processing, database, spreadsheet, etc.) and types of applications used during instruction. Recording these observations assisted with the analysis by providing detail about teachers' use of and integration of technology that would not be reflected during interviews. In most instances, the observation was from an out-of-the-way location within the classroom and arrival at each observation was timed so that interference with classroom process was minimal. Early arrival also provided an opportunity to observe the types and varieties of technology available to the students and teacher. However, in three cases, the classroom teacher indicated that movement within the classroom was encouraged in order to "show off" what students were doing with the technology.

A notebook was used to record classroom observations. Class beginning times, ending times, teacher name, class grade level, and subject were recorded. Class layout, any observable computer technology, and student seating arrangement were noted. Class instruction and student interaction with teacher and computer technologies, when available, were noted rapidly in chronological fashion. Teacher interactions about, and with, computer technology were also noted. These interactions included such items as appropriate or inappropriate definition of software and hardware terms, technical difficulties encountered, and approaches to integration, when available.

In addition to notes about the observations, personal reflections were added to the field notes at the end of the day. This provided a guide for additional follow-up questions and assisted in helping make sense of the data collected.

5.7 Using Triangulation to Establish Validity and Reliability

The problems associated with qualitative research such as observation and interviewing concern generalisation of the findings, reliability and validity. Reliability refers to the potential replication of a given study by other researchers and the extent to which independent researchers can come to sufficiently similar conclusions from the data and theory used, while validity refers to the extent to which the research methods actually gather what they are intended to gather. One of the often-recommended ways of enhancing the reliability and validity of qualitative research is by using triangulation.

Triangulation also has a positive effect on the validity of the research: "Triangulation between methods, as we have seen, involves the use of more than one method in the pursuit of a given objective. As a check on validity, the between methods approach embraces the notion of convergence between independent measures of the same objective" (Cohen et al., 2000: 281).

Overall, in this research multiple methods are used i.e. research questionnaire, interview and observation. The interaction between the three synoptic areas of my research (i.e. knowledge, skills and attitudes) gives grounds to use triangulation in an effective way. Triangulating multiple sources of data through multiple data collection and interpretation techniques and a range of theoretical constructs helps to minimise researcher bias, and, thus, contributes to the internal validity of the study. Triangular techniques are particularly appropriate to this study because of the complex nature of the phenomena under investigation.

The techniques of questionnaire, interview and observation complement each other and to a certain extent corroborate each other. "Triangulation techniques in the social sciences attempt to map out, or explain more fully, the richness and complexity of human behaviour by studying it from more than one standpoint and, in doing so by making use of both quantitative and qualitative data" (Cohen and Manion, 2000: 233).

5.8 Legal and Ethical Consideration of the Study

Researchers, when they carry out study, enter into personal and moral relationships with those they study, therefore they should be aware that they have responsibility for the confidentiality of their data and for the use to which their research may be put. The researcher was aware of the related legal and ethical issues considering the nature of the Omani society. Following the rolls of the British Educational Research Association (BERA, 2000) the researcher tried her utmost to make the following issues clarified to the participating teachers:

- To explain in a comprehensive and meaningful way the aims and objectives of this research and that is undertaken as individual study for a PhD degree funded by the researcher for an academic purpose.
- Teachers were aware of their right to refuse participation whenever and for whatever reasons they wish, this point made them feel free and gave them the confidence that this research is not for the use of Ministries.
- The researcher used data-gathering device such as tape recorders and video cameras for the benefits of the study, therefore she was keen to convince the teachers that the data will be treated confidentially and it will be used for the purpose of the study, because of the nature of the Omani society as Islamic and Arabic culture and the majority of the sample were females it was a very sensitive point in the study, but because the researcher career background was related to the profession of teaching before starting this study helped a lot because the participation looked to her as a colleague not as an administrative or supervisor and that provided them an opportunity to participate in the process as

mentioned above with trust, willingness, confidence and sense of co-ordination and mutual assistance.

5.9 Summary

This chapter has outlined the range of research methods used for the study. Decisions related to data collection and analysis have been made based on their suitability to supply answers to the research questions.

The chapter has explained the research methodology for the present study. It began by explaining the research objective and its importance. Then it stated the research approach, both quantitative and qualitative. Then, the research instruments and the study sample (sampling frame, sample size and sampling technique) were described. The first instrument used is a questionnaire. The administration of this instrument for the main study was described in the chapter. The second instrument is a semi-structured interview. The third instrument is classroom observation. Finally, this chapter explained the data analysis tools. The collected data will be presented in the next chapter.

CHAPTER SIX: DATA ANALYSIS

PART ONE

6.1 Introduction

This study aims to determine the extent to which the following factors predict ICT use by teachers in Basic Education Schools in classroom instruction: the demographic variables of the teachers; their attitudes toward using technology; environment barriers; training needs; and teachers' philosophies and beliefs about educational issues. In this and the following chapter, the researcher presents and analyses the results from a multidimensional survey of Basic Education Teachers held in Oman. The findings were based on the data collected from a survey of 743 teachers.

The study of teachers was conducted in three parts:

- A survey of basic Education teachers provided basic data on the current levels of ICT use in schools, teachers' attitudes, training needs and their philosophies and beliefs;

- A number of interviews provided a more in-depth understanding of these issues and the contextual factors that influence teachers' responses to ICT;

- Classroom observation gave more understanding of the environment that teachers work in.

Depending on the research questions, the analysis of the main instrument of the study – the questionnaire, which will be supported by the other instruments (interview, classroom observation) – is divided into three parts:

Part One: This part of the analysis presents the frequencies and percentages of teachers' personal background variables. Then a more detailed description is presented of the basic elements of the study: use of technology, environmental barriers, training needs, teachers' attitudes towards technology, and teachers' philosophies. In each case, the reliability of the relevant scale is discussed followed by factor analysis to reduce the data and gain deeper understanding. Then, the reliability coefficient for each subscale is given, and the distributions and frequencies are presented.

Part Two: The second part of the analysis explores the differences between the teachers' use of and attitudes towards ICT, based on background variables, using t-tests and one-way ANOVA tests.

Part Three: This part explores the predictors of ICT use, using stepwise regression analysis, which summarises the association between ICT use and the other elements in the study, so that conclusions can be drawn on the status of ICT use in the Basic Education Schools in Oman and the factors that influence this use.

This chapter contains the first part of the analysis. It describes the use of technology in Basic Education schools and describes the multidimensional factors (demographics, attitudes, barriers, training needs, and philosophy), whereas the next chapter, containing parts two and three, will examine the association between these factors and ICT use, to determine the predictors of ICT use.

6.2 Respondents' Background Characteristics

To support the debate about teachers' ICT use, this section aims to establish some basic information about teachers' personal and professional characteristics. This section reports the data gathered from section 1 of the Basic Education teachers' questionnaire on the background of 743 respondents, drawn randomly from the eight regions in Oman.

6.2.1 Response Rate

Questionnaires were distributed to 838 teachers from all the regions in Oman. Completed valid questionnaires were received from 743 teachers, a response rate of 88.6%. The response rate by region is displayed in Table 6.1.

Table 6.1: Response rate from each region

Region	Sample	Returned	Response Rate
Muscat	117	111	94.87%
Batina	230	226	95.21%
Sharqiya	168	140	83.33%
Dakhliya	105	96	84.76%
Dhahira	84	70	83.33%
Dhofar	88	65	73.86%
Wusta	17	13	76.47%
Musandam	29	22	75.86%.
Total	838	743	88.66

It can be seen from Table 6.1 that the Batina region had the highest response rate (95.21%), while Dhofar had the lowest rate (73.86%), presumably because the questionnaires to that region were sent by post.

6.2.2 Demographic characteristics of teachers

The survey asked the teachers to provide personal information about themselves on a number of demographic characteristics: school cycle, age, sex, subject, qualification, and work experience, both in general and in Basic Education. The researcher chose these characteristics following on a literature review which indicated that those background variables had an impact on teachers' use of technology. This will be explained in more detail in the analysis output.

6.2.2.1 Cycle

Table 6.2 represents the distribution of teachers by school cycle. The first cycle schools started in the academic year 1998/1999 with grades 1-4. The second cycle then started from the academic year 2001/2002, with grades 5-10. When this research was conducted in 2002/2003, the Basic Education Schools had started year 6 in the new reform.

Table 6.2: Distribution of respondents by school cycle

School cycle	F	%
First	562	75.6
Second	181	24.4
Total	743	100.0 □

6.2.2.2 Age

Table 6.3 represents the distribution of respondents by age groups. In the original questionnaire, the respondents were asked to give their date of birth to allow the researcher to choose the most suitable age intervals according to the age distribution. The table shows that almost half the sample (348, 46.8%) were aged 26-30 years. The age range was between 22 and 46; the largest group was in the age group 25-35. Most of the teachers were under 40 years old, since formal education in Oman started in 1970, (see Chapter 3, p. 14). In addition, most teachers, after spending some time in the teaching field, can transfer to the administration or the supervision field.

Table 6.3: Distribution of respondents by age group

age group	F	%
<=25	138	18.6
26-30	348	46.8
>=31	257	34.6
Total	743	100.0 □

6.2.2.3 Sex

Table 6.4 shows that 675 (90.8%) of the respondents were female and 68 (9.2%) were male. The reason for that is that almost all teachers in the first cycle of Basic Education are females, because of government policy, based on the assumption that this will make the learners feel secure psychologically at this early stage (Ministry of Education, 2001).

Table 6.4: Distribution of respondents by sex

Sex	N	%
Male	68	9.2
Female	675	90.8
Total	743	100.0 □

6.2.2.4 Subject

Table 6.5 sets out the distribution of the teachers by teaching subject. The largest number of teachers, 358 (48.2%), were in Arabic and Islamic Studies, which is expected because this group teach more than one subject a day to the same class, therefore they are the largest population in each school. The next largest group was teachers of maths and science, followed by those of English language, and LRC (Learning Resource Centre) teachers: 32.4%, 15.7% and 6.5 % respectively.

Table 6.5: Distribution of the sample of teachers by subject

Subject	N	%
Arabic and Islamic studies	358	48.2
Math and Science	241	32.4
English Language	96	12.9
LRC	48	6.5
Total	743	100.0 □

The lowest was the LRC teachers, because in each school there are just two teachers for the LRC for the whole school; each class has one lesson per week using the computer with the LRC teacher. LRC teachers cooperate with other subject teachers to present the subject to the students using computer software. As one LRC teacher describes her duties:

> We cooperate with the field teachers. We have a teaching plan for all subjects. Therefore we organise with them; when they start to give the lesson, we start at the same time. It's like a practical part. (Teacher #5)

6.2.2.5 Qualification

Table 6.6 shows the teachers' distribution according to qualification. Two thirds of the teachers had a diploma after secondary school or lower (62.3%), which was the common qualification for primary teachers until 1998. Most teachers with a university degree or higher (37.7%) are teachers in the second cycle (Grades 5-10).

Table 6.6: Distribution of respondents by qualification

Qualification	N	%
University degree or higher	280	37.7
Diploma after secondary school or lower	463	62.3
Total□	743 □	100.0 □

From the year 1998 the Education Colleges in Oman started a new programme to teach teachers for the Basic Education schools to graduate level. Those teachers started to teach from the year 2001, especially in the second cycle which started in the same year.

6.2.2.6 Job experience

As regards experience in the Basic Education schools, Table 6.7 shows that the range was between 1 to 5 years, since Basic Education started in 1998. About a third of the teachers had one year's experience (34.7%), and almost another third had two years (31.4%). The number of teachers decreased with successive experience categories. This is to be expected, reflecting the gradual phasing-in of Basic Education schools each year.

Table 6.7: Distribution of respondents by experience (Basic Education)

Years	N	%
1 year	258	34.7
2 years	233	31.4
3 years or more	252	33.9
Total.	743	100.0 □

6.2.3 Using Computers at Home

Table 6.8 shows that 65.9% of teachers reported having and using a computer available at home. This means that around two thirds of teachers had access to computers at home.

Table 6.8: Respondent distribution by computers use at home

Home use	N	%
Yes	490	65.9
No	253	34.1
Total	743	100.0

6.2.4 Training in Instructional Technology Use

Table 6.9 shows that around two thirds of teachers had not received any training in the technology use.

Table 6.9: Previous training

Previous training	N	%
Yes	246	33.1
No	497	66.9
Total	743	100.0

It can be seen that the level of training was low. This result is consistent with Al-Rashid (2002) who found that over half the teachers in Saudi Arabia primary school had not received any ICT training.

6.3 ICT Use by Teachers

Section two of the questionnaire sought to find out the extent to which teachers made use of instructional technology in their work. 17 items of technology were listed and respondents were asked to indicate on a scale how often they used each of the items in the previous academic year (2002/2003). The scale had 4 points: often, sometimes, rarely, or never. For analysis the scale was coded as follows: 'often' (1), 'sometimes' (2), 'rarely' (3), and 'never' (4).

6.3.1 Reliability of technology use scale

Table 6.10 shows that Cronbach's Alpha for teachers' use of instructional technology section was 0.797, which can be regarded as showing a good level of internal consistency for the purpose of this study.

Table 6.10: Reliability of technology use scale

Item	Item total correlation	Alpha if item deleted	Reliability of the scale
Educational Films	.3009	.7982	0.802
Audiocassettes	.0058	.8195	
Overhead Projector	.2617	.8010	
Educational TV	.4083	.7915	
Learning Packages	.5880	.7789	
Word Processing	.5818	.7797	
Spreadsheet	.5132	.7865	
Presentation Program	.5808	.7787	
Internet	.3898	.7930	
CD-ROMs	.5723	.7806	
Video Camera	.5011	.7790	
Scanner	.6139	.7769	
Printer	.5264	.7820	
Photocopier	.4128	.7918	
Maps, Pictures or Stickers	.1570	.8067	
Teaching games	.1800	.8061	
Models	.1764	.8045	

Inter-item total correlations for this component ranged from 0.15 to 0.61 and therefore all items were retained in the analysis. The calculated Alpha (.802) for the use scale was acceptable.

6.3.2 Use of ICT

Table 2.A.1 in Appendix 2sets out the frequencies with which teachers reported using the 17 listed items of instructional technology.

Examination of the scale of teachers' usage of the items has so far concentrated on the extreme frequencies (never, often). Aggregation of the responses in the first two usage categories (often and sometimes) sheds further interesting light (Table 6.11).

Table 6.11: Frequency of teachers' use of technology

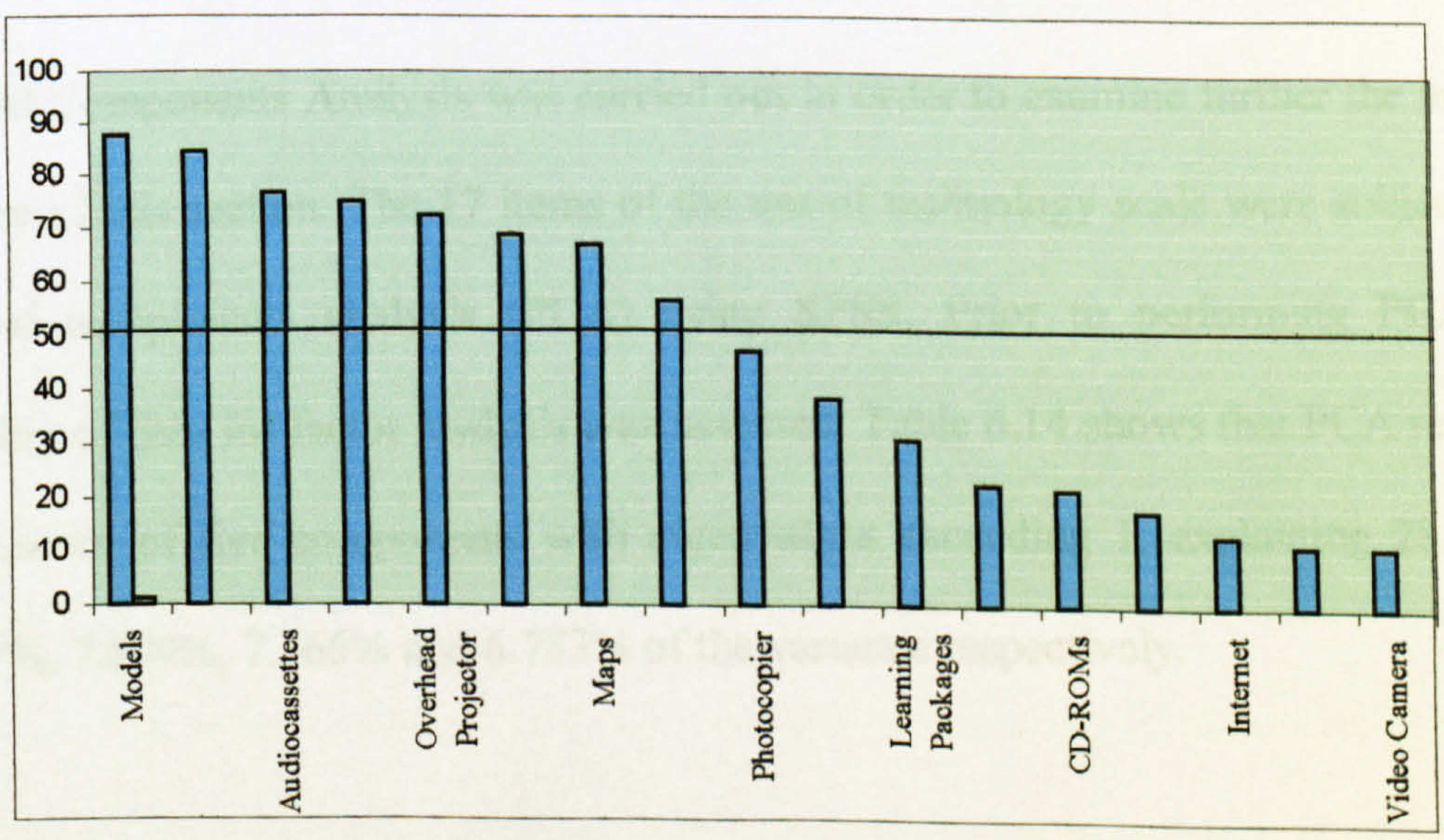
Items \ Frequency	Use %	Do not Use %
Models	87.62	12.38
Teaching games	84.56	15.44
Audiocassettes	76.74	23.26
Educational Films	74.83	25.17
Overhead Projector	72.28	27.72
Educational TV	68.66	31.26
Maps	66.76	33.24
Presentation P.	56.41	43.49
Photocopier	46.8	53.12
Printer	38.16	61.71
Learning Packages	30.64	69.24
Word Processing	22.39	77.52
CD-ROMs	21.59	78.22
Scanner	17.83	82.01
Internet	13.23	86.53
Spreadsheet	11.56	88.24
Video Camera	11.28	88.56
Average	47.14	52.77

Examination of items reported by teachers as being used during the academic year shows that Models (87.62%) and Teaching Games (84.56%) were the most used. Other highly used items are Audiocassettes (76.74%), Educational Films (74.83%) and Overhead Projector (72.28%). As can be seen from Table 6.11, the least frequently used items were: Word-Processing, CD-ROMs, Scanner, the Internet, Spreadsheet and Video Camera.

From these data, it would seem that teachers remained heavily reliant, in their teaching, on the traditional items of instructional technology; computer and computer software seem to be never used by most of the teachers.

Table 6.11 and Figure 6.1 shows that the least used items are all related to ICT use, which means that teachers' use of ICT is still very low, suggesting that teachers still feel more comfortable using the traditional teaching aids.

Figure 6.1: Use of technology in teaching



This result is consistent with the study carried out by Natal (1997) in a Florida public school, which found that 62% of the sample (teachers) reported hardly ever using computers for teaching, 14% reported using them once or twice a month, 13% once or twice a week, and only 11% once or twice a day. In addition, Williams et al. (2000) investigated the ICT skills and knowledge needs of teachers working in Scotland, and found that most primary teachers were a long way from making daily or weekly use of ICT in a full range of professional contexts; the study showed that teachers were still in the early stages of ICT development. This result was also supported by Al-Rashid (2002) in his study in Saudi Arabia; he found that the percentage of teachers using ICT was low.

6.3.3 Factor analysis for use of technology

Factor analysis is a "data reduction" technique. It takes a large set of variables and looks for a way that the data may be reduced or summarised using a smaller set of factors or components (Pallant, 2003).

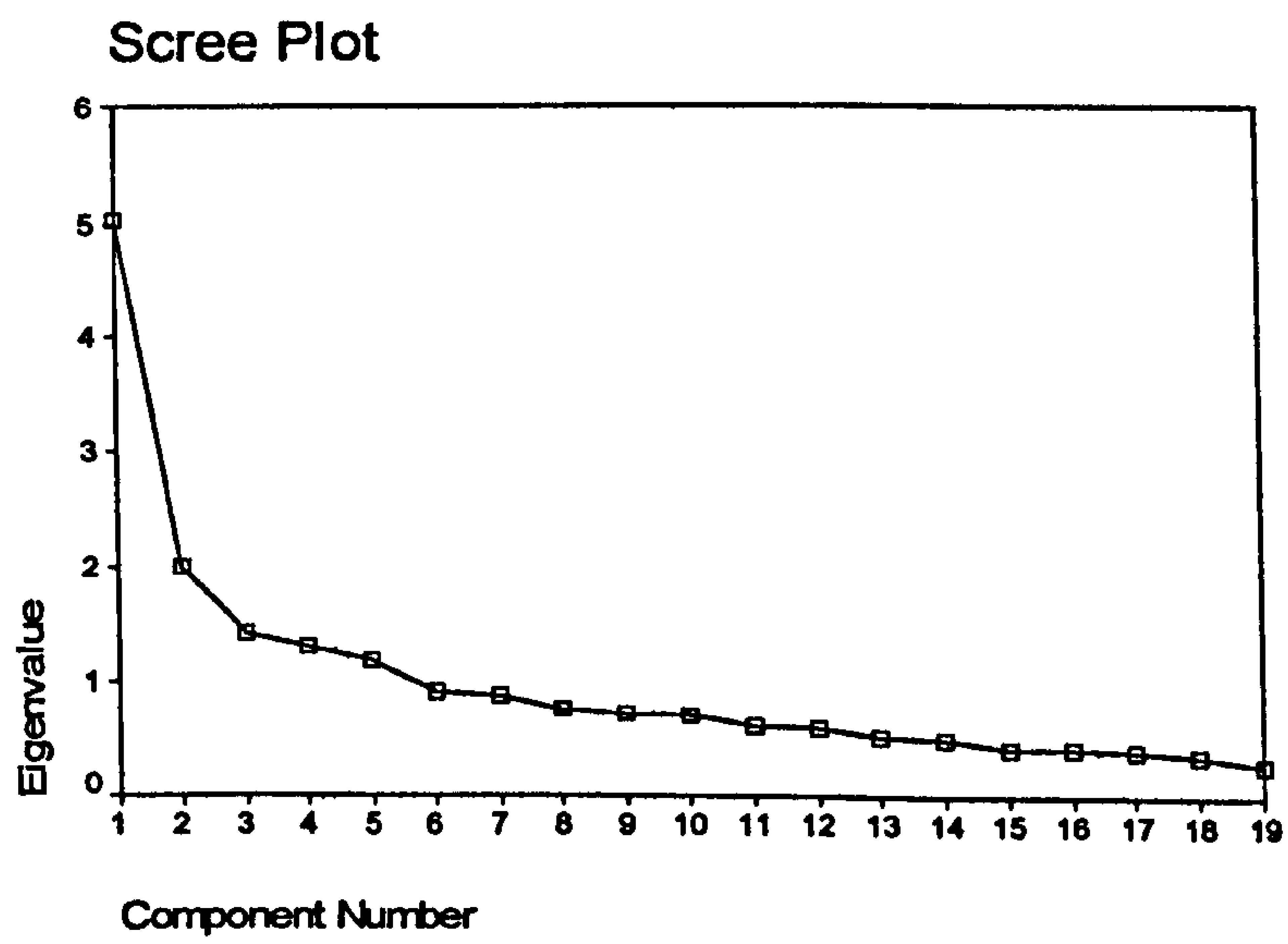
Principal Components Analysis was carried out in order to examine further the internal structure of this section. The 17 items of the use of technology scale were subjected to principal components analysis (PCA) using SPSS. Prior to performing PCA, the suitability of data for factor analysis was assessed. Table 6.14 shows that PCA revealed the presence of five components with eigenvalues exceeding 1, explaining 28.848%, 11.487%, 7.809%, 7.166% and 6.783% of the variance respectively.

Table 6.12: Total variance explained (Initial Eigenvalues)

FACTORS	Total	% of Variance	Cumulative %
1	4.904	28.848	28.848
2	1.953	11.487	40.335
3	1.328	7.809	48.144
4	1.218	7.166	55.311
5	1.153	6.783	62.094

An inspection of the Scree plot revealed a clear break after the second component

Figure 6.2: Scree plot for use of technology scale



A principal factor analysis was performed to extract five factors. This was followed by a varimax rotation to generate orthogonal factors. When this technique was run automatically by SPSS program, it produced five factors. In factor analysis, selection of the number of factors is based on the selection of the number of theoretical processes underlying a research area; the researcher can partially confirm a hypothesized factor structure by asking if the theoretical number of factors adequately fits the data (Tabachnick et al., 2001). Depending on the result of the eigenvalue and the Scree plot it was decided to retain two components for further investigation. To aid the interpretation of these components, Varimax rotation was performed. The rotated solution presented in Table 6.13 revealed the presence of a simple structure, with both components showing a number of strong loadings, and all variables loading substantially on only one component.

Table 6.13: Factor loading for use of technology scale after Varimax rotation.

		Component	
		ICT	Traditional media
Modern technology	Scanner	.792	
	Presentation Program	.775	
	Word Processing	.739	
	CD-Rooms/Multimedia system	.729	
	Learning Packages	.705	
	Spreadsheet	.691	
	Printer	.688	
	Video Camera	.580	
	Internet for extra teaching materials	.538	
	Photocopier	.452	
Traditional Media	Educational TV		.672
	Educational Films		.591
	Overhead Projector		.566
	Models		.519
	Teaching games		.453
	Maps, Pictures or Stickers		.440
	Audiocassettes		.419

The two factors solution explained a total of 40.335% of the variance, the ICT items loading strongly on component 1, and traditional media items loading strongly on component 2. The results of this analysis support the treatment of the ICT items and the traditional media items as separate scales.

The first factor contains the least used items and this factor will be used in the regression analysis to explore which factors predict ICT , and the second factor will be used to explore the predictors of using Traditional Media use by Basic Education teachers. The factor scores were calculated within the SPSS program, all resulting in scores with a mean of zero, factor scores are standardized, and these scores are used in the following analysis.

6.3.4 Reliability coefficients of the use of technology sub-scales

The reliability of the ICT and Traditional media use subscales, was tested using Cronbach's Alpha. The coefficients for each subscale are shown in Tables 6.14 and 6.15.

Table 6.14. Reliability for factor one (ICT use)

Items	Corrected Item-Total Correlation	Alpha if Item Deleted	Alpha
SCANNER	.7192	.8431	
POWERPNT	.6823	.8458	
WORD	.6368	.8501	
CDROM	.6430	.8498	.8672
LERNPACK	.6171	.8516	
EXCEL	.5786	.8558	
PRINTER	.6416	.8505	
VCAMERA	.5101	.8605	
INTERNET	.4537	.8637	
PHOTOCOP	.4232	.8719	

Table 6.15. Reliability for factor two (Traditional Media)

Items	Corrected Item-Total Correlation	Alpha if Item Deleted	Alpha
EDUFILM	.3767	.5164	
OVERHEAD	.3223	.5361	
SATELLIT	.4510	.4899	
AUDIO	.2001	.5864	.588
MAPS	.2483	.5624	
GAMES	.2589	.5596	
MODELS	.2796	.5521	

6.3.5 Descriptive response

Table 6.16 shows teachers' response to the use of technology items, As indicated earlier in the chapter, responses were on a 4 point scale, (1 for often use, 2 for sometimes, 3 for rarely and 4 for never). Thus, a mean score above 2.5 denotes less use, while a mean score below 2.5 means higher use.

Table 6.16: Descriptive analysis for use of technology factors

Factors		Often	Some Times	Rarely	Never	Mean response	Std. Deviation
Factor One: ICT use	Video Camera	1.4	9.9	14.7	73.8	1.391	.719
	Internet	3.3	9.9	12.5	74.0	1.426	.803
	Spreadsheet	2.5	9.0	15.7	72.5	1.427	.772
	Word Processing	6.9	10.8	16.7	65.3	1.608	.949
	Scanner	6.9	14.6	11.4	66.8	1.634	.984
	CD-ROMs/	4.6	17.8	15.7	61.8	1.661	.932
	Presentation Program	8.3	22.2	15.7	53.5	1.859	1.036
	Learning Packages	8.9	29.2	29.7	31.9	2.159	.976
	Printer	24.6	22.1	10.7	42.4	2.311	1.241
	Photocopier	43.2	23.2	7.5	25.6	2.856	1.227
Average			27.93		71.79	1.833	
Factor Two: Traditional Media	Educational TV	7.8	48.5	24	19.4	2.453	.894
	Educational Films	21.3	47.2	19.3	11.9	2.778	.919
	Overhead Projector	33.6	41.1	13.8	11.4	2.974	.965
	Teaching games	35	41.5	12.2	11.0	3.009	.952
	Audiocassettes	43.1	29.0	14.2	13.5	3.012	1.062
	Maps, Pictures	45.0	30.4	7.9	7.5	3.322	.902
	Models	51.4	36.1	8.3	4.0	3.349	.795
Average			73		25.48571	2.985	

Table 6.16 shows that teachers' mean scores for use of ICT item was under 2.5 for all the items except photocopier, which could be used as a traditional item, while almost all the traditional items had mean scores above 2.5, which means a high use of the

traditional items. On average, only 27.93% of teachers reported using ICT at least once a week (sometimes), while 71.79% did not make use of ICT. This result is consistent with the finding of Norris et al. (2003) in the Snapshot survey in U.S. They reported that 14% of U.S. K-12 teachers made no use at all of no-internet computer technology for instructional purposes, and nearly half used it with their students less than 15 minutes per week and only 18% reported using it more than 45 minutes per week. Use of the internet was even less; fully two-thirds of respondents made minimal or no use (<15 minutes per week) of Internet technologies with their students.

Jaber et al. (1999) in a survey conducted in U.S. reported that 67% of K-12 teachers in Virginia used computers for instructional purposes, 24% did not use computers and 6% did not have computers available for them to use.

Figure 6.3: Mean scores for ICT

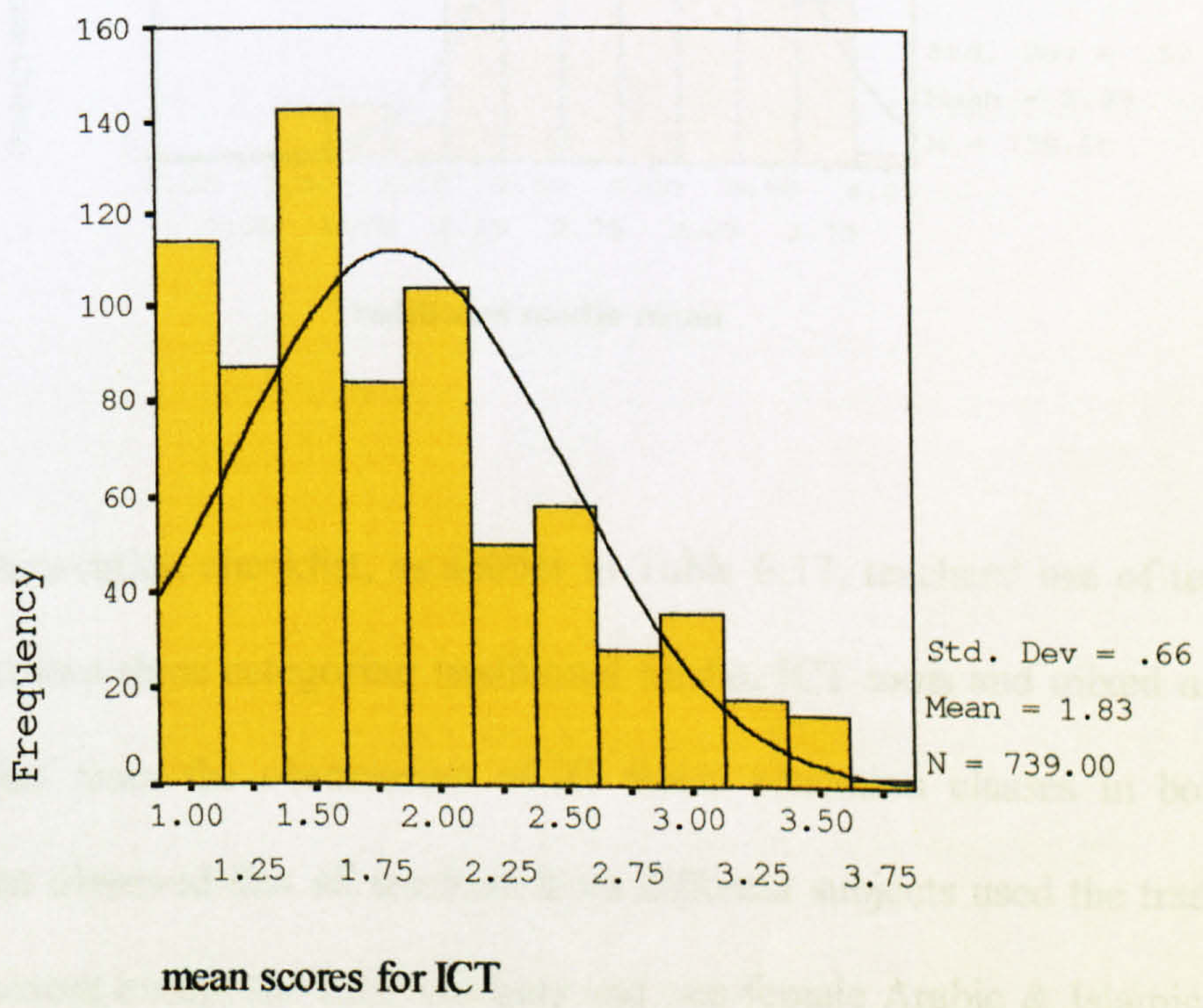
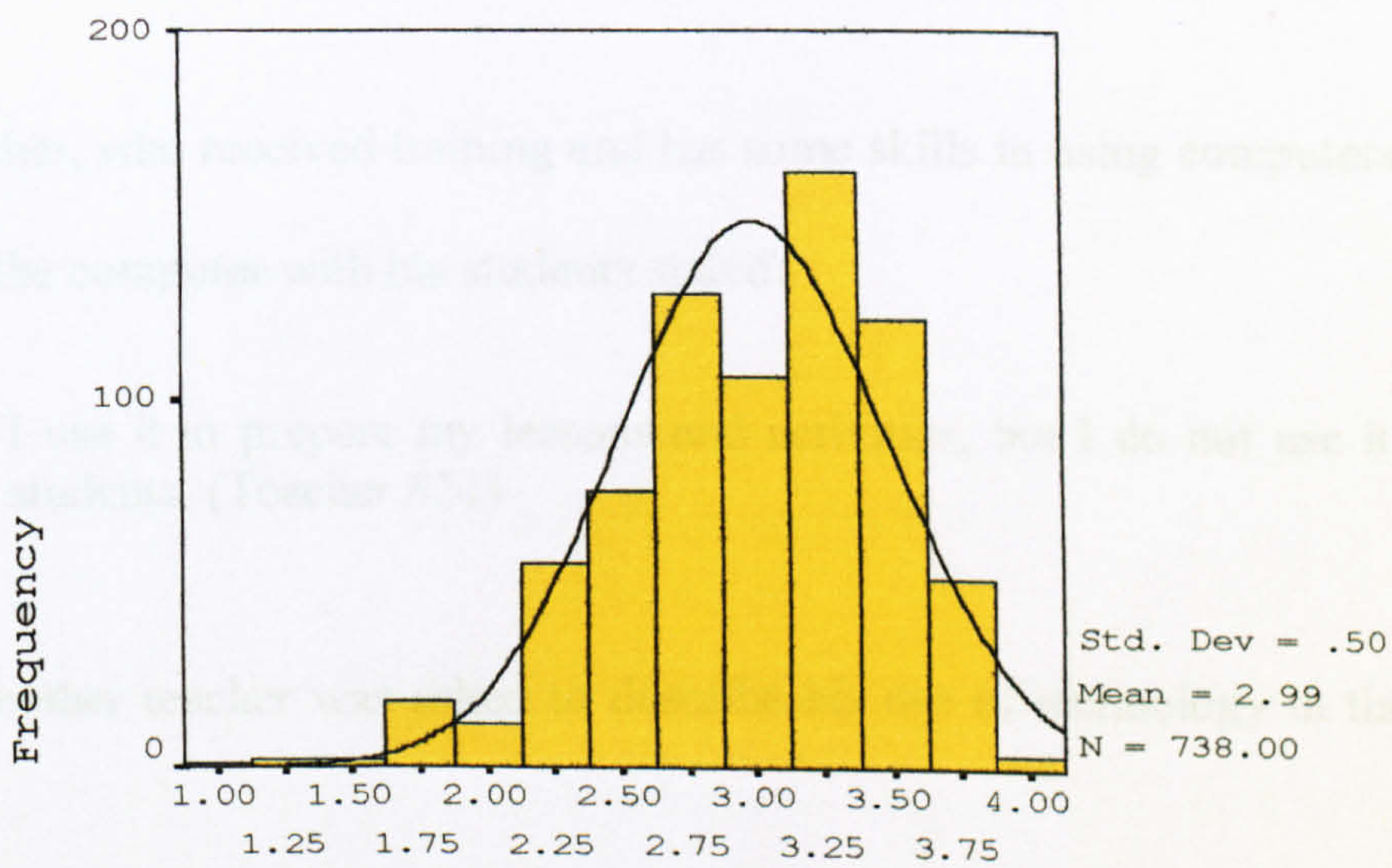


Figure 6.3 shows that the factor scores for ICT use with a mean of zero and standard deviation of 1 shows a positive skew (0.93) to the left, which means that scores are clustered to the left at the low values. In contrast, the traditional media histogram (Figure 6.4) shows negative skewness to the right, which means higher use of the traditional media.

Figure 6.4: Traditional media mean



Traditional media mean

In the observation checklist, as shown in Table 6.17, teachers' use of technology was classified into three categories: traditional media, ICT tools and mixed use. Table 6.17 shows that from the observation of 23 Basic education classes in both cycles, the researcher observed that all teachers from different subjects used the traditional aids in the classroom except the LRC teachers and one female Arabic & Islamic teacher in the second cycle who presented a lesson in the LRC room. This teacher was described by the LRC teacher who said:

> This teacher is very active, she is new graduate but she has a lot of knowledge and skills in using computer. We encourage other teachers to be present in LRC room when she presents new lessons with her students.

Table 6.17: Descriptive analysis for use of technology by teachers in the observation sample

	N	%
Traditional Media	18	78.3
ICT Tools only	2	8.7
Mixed	3	13.0
Total	23	100.0 □

One teacher, who received training and has some skills in using computers, when asked if he used the computer with his students stated:

> I use it to prepare my lessons and activities, but I do not use it with students. (Teacher #21)

When another teacher was asked to describe his use of technology in the classroom, he said:

> I started to use materials every day, we did not use most of these items of equipment before in general education. It helped me a lot and saved a lot of time. One day I hope to use the computer as much as I use these materials now. (Teacher #18)

On the other hand, there were some teachers who did use ICT; they felt that they benefited from the new technology. One of those teachers stated that:

> I regularly use the computer to prepare for my classes. I use the Internet to find information on the subjects that I am teaching. I also use the word processor and the draw program to make materials and handouts for my students. (Teacher #23)

It was noticeable from the observation that teachers used the traditional media to help them in their traditional practice of teaching, for example they used the audiocassette to make the whole class repeat after them or used the overhead projector to read the lesson to the class and let them also read it.

6.4 Factors in the Under-use of ICT

This section of the questionnaire contains a list of 23 statements putting forward possible factors in the under use of instructional technology in Oman's Basic Education schools. Using a five-point Likert scale, the teachers were asked to indicate their degree of agreement with each statement. The responses to this question are intended to answer the second research question, which asked: What are the main factors in the under-use of instructional technology in Basic Education schools?

6.4.1 Reliability of the Under-use Factors Scale

Table 6.18 shows that the under-use factors scale contains 23 items and the Cronbach's Alpha is 0.769. Inter-item total correlation ranged between 0.08 and 0.54. The calculated Alpha for the under-use scale was acceptable.

Table 6.18: Reliability of under-use factors

item	Item total correlation	Alpha if item deleted	Alpha
Limited access	.2857	.7635	.769
Not enough software	.4338	.7545	
Lack of time	.3642	.7592	
Lack of technical support	.5117	.7514	
Not enough funding	.5279	.7504	
I T is not available	.5426	.7491	
Difficulty of moving	.3407	.7600	
Lack of planning	.5287	.7483	
Little administrative support	.4436	.7533	
School not aware how to use ICT	.4279	.7543	
Classrooms are suitable	.2335	.7668	
Lack of Arabic software	.2741	.7640	
Good quality equipment	.3940	.7568	
Students' lack of skills	.2749	.7645	
Lack of information about the materials available	.2881	.7632	
Large number of students	.3127	.7618	
Enough illustrate	.0883	.7771	
Regular Maintenance	.1675	.7704	
Lack of software in teaching area	.1588	.7714	
Lack of established guidelines	.1088	.7748	
Sufficient amount equipment	.2554	.7655	
Usable computer hardware added recently	.2062	.7705	
New computer users receive help	.2290	.7669	

6.4.2 Teachers' response to the under-use factors

Table 2.A.2 (Appendix 2) presents the basic results from the responses made to 23 statements proposing factors that might affect teachers' use of instructional technology. Examination of the 'Strongly Agree' column shows that items 2, 3, 4, 5, 6, 7, 14 and 19 met with relatively strong endorsement by the sample. In the 'disagree' direction, the 'Strongly Disagree' column shows that items 11, 13, 17, 18, 21, 22, and 23 met with a relatively strong rejection by the sample.

Table 6.19: Teachers' responses to the factors of under-use of instructional technology

	Agreement %	Middle position %	Disagreement %
Lack of time	86.4	3.9	9.6
Lack of technical support	82.6	6.1	11.2
Not enough funding	78.1	9.4	12.4
Lack of software in teaching area	74.0	9.7	16.0
I T is not available	73.4	10.1	16.0
Students' lack of skills	73.2	9.7	16.5
Difficulty of moving	72.1	7.3	20.4
Not enough software	71.7	9.3	18.8
Lack of established guidelines	70.9	10.2	18.6
Limited access	64.3	4.2	31.4
School not aware how to use ICT	61.9	9.3	28.7
Lack of information about the materials available	58.0	12.1	29.3
Large number of students	56.0	6.7	37.0
Add very usable computer hardware	49.2	5.7	44.8
Lack of planning	49.1	17.6	33.1
Classrooms are suitable	43.7	9.0	46.7
Lack of Arabic software	39.7	18.8	41.2
sufficient amount of equipment	39.7	9.2	50.9
Little administrative support	38.6	16.8	44.0
Enough illustrate	37.7	10.9	51.1
Regular Maintenance	33.4	14.8	51.5
Good quality equipment	29.0	13.6	56.9
New computer users receive help	20.0	12.7	67.1
Average	58.30	10.20	31.19

Table 6.19 shows that 58.30% of the respondents selected one of the two 'agree' options as their answer to each item, 10.20% opted for the 'undecided' option, and 31.19% for one of the 'disagree' options. This would suggest that the respondents were more inclined to agree that the proposed factors were relevant to the situation in Basic Education schools, than they were to disagree.

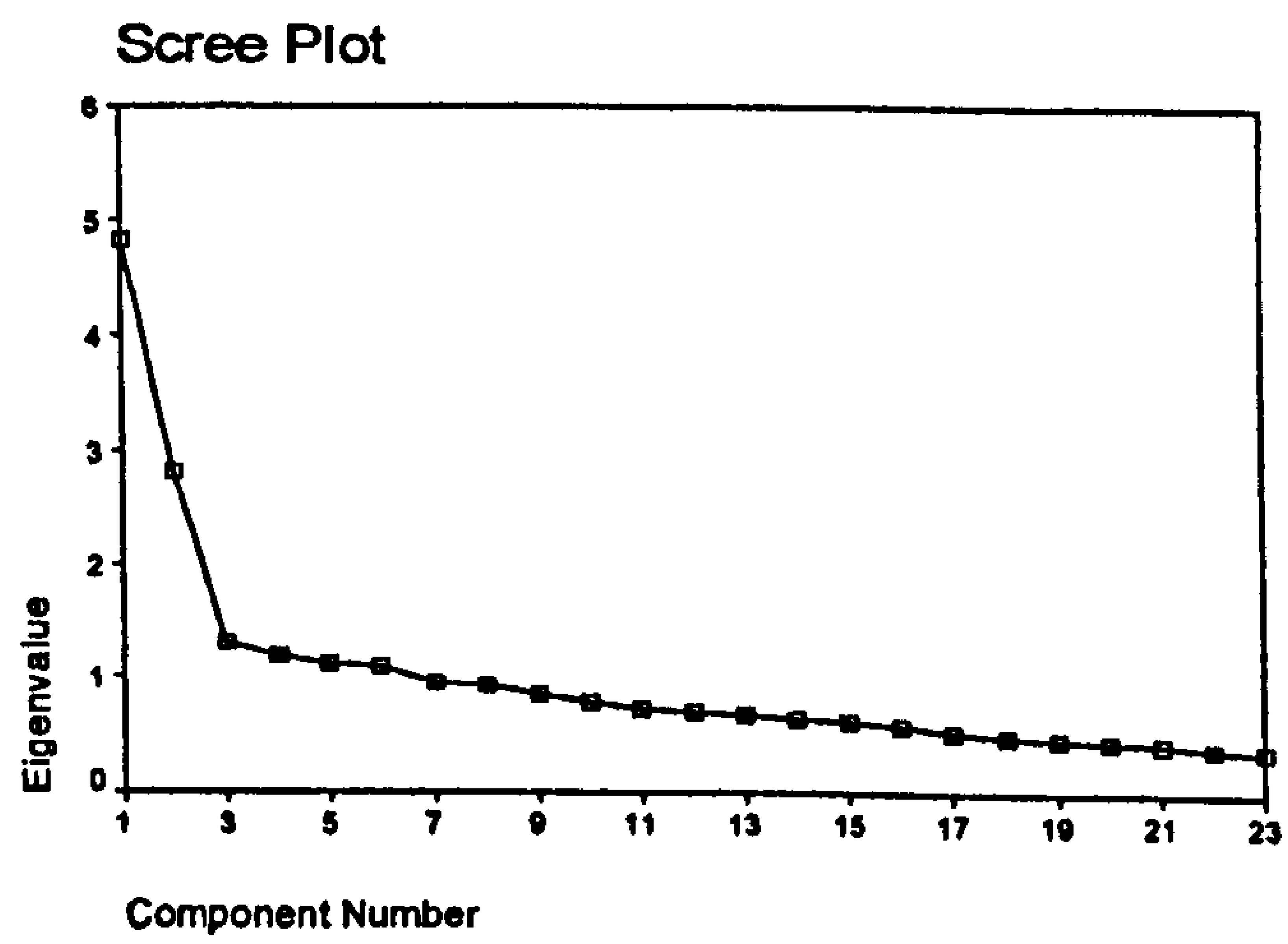
Regarding the coding of the questionnaire data, the response scores were 'strongly disagree' (1), 'disagree' (2), 'undecided' (3), 'agree' (4), and 'strongly' agree (5). Therefore, the higher the mean response value for any item, the greater the agreement that the particular under-use factor was influential. All factors had means of 2.895 or above, indicating that, overall, teachers' opinion was skewed well towards the 'agree' end of the spectrum.

It can be seen from Table 6.19 that over half of the sample (86.4%) agreed that lack of time was the main reason in under-use of instructional technology.

6.4.3 Factor analysis for under use factors

To examine the internal structure of the under-use variables, a factor analysis was carried out on all items. A Principal Components Analysis was performed to determine the number of factors. The Scree plot is shown in Figure 6.5.

Figure 6.5: Scree plot for under-use variables



A Principal Factor Analysis was carried out using Varimax Rotation. Table 6.21 shows the factor loadings for the three factors. The percentage of variance explained by these factors is 53.75 and the lowest loading value is 0.46. Each factor includes a number of items, which can be grouped under one main reason or theme.

Table 6.20. Total variance explained (Initial Eigenvalues)

FACTORS	Total	% of Variance	Cumulative %
1	4.828	20.991	20.991
2	2.815	12.239	33.231
3	1.301	5.655	38.886
4	1.201	5.223	44.109
5	1.124	4.887	48.996
6	1.095	4.763	53.759

Factor one: This factor has an eigenvalue of 4.828 representing 20.991 of the total variance. In this factor there are nine items with a loading of above 0.40. The items under this factor come under one theme, which is Lack of Support.

Factor two: This factor has an eigenvalue of 2.815 representing 12.239% of the total variance. This factor consists of five items with a loading of above 0.56. These factors are included within one factor and may be considered under one theme, which is Lack of Resources.

Factor three: The eigenvalue for this factor is 1.301, accounting for 5.655% of the total variance. There are seven items in this factor with a loading above 0.5. The items under this factor can be classified under one main theme, which is Positive Technical Environment.

Table 6.21: Rotated component matrix (under use factors)

Factor	Items	Component 1	Component 2	Component 3
Lack of support	Schools are not fully aware how to use and operate items of instructional technology.	.655		
	Not having enough information about the materials available.	.645		
	Lack of established guidelines on instructional technology usage.	.614		
	Little encouragement and administrative support for classroom use of instructional technology.	.596		
	Lack of planning in school on use of instructional technology.	.579		
	Students' lack of basic instructional technology skills.	.509		
	Lack of software programs written in Arabic.	.509		
	Lack of adequate technical support.	.459		
	Lack of suitable software programs in the area I teach.	.402		
Lack of resource	Not enough computer software programming.		.705	
	Not enough funding to provide extra instructional technology equipment.		.698	
	Limited access to Instructional technology.		.631	
	Instructional technology is not available when needed.		.626	
	Lack of time in the computer laboratory timetable for using instructional technology.		.569	
Positive technical environment	My school has added some very usable computer hardware for teachers to use in the last two years.			.749
	There is a sufficient amount of technological equipment available in my school to aid and improve students' learning.			.672
	Enough resources that illustrate how to integrate instructional technology into the curriculum.			.614
	Regular Maintenance to the equipment.			.614
	Good quality equipment.			.570
	New computer users in my school receive help from experienced personnel who know who to use computers.			.548
	Classrooms are suitable for the use of instructional technology.			.452

6.4.4 Reliability coefficients of the under-use sub-scales

The reliability of the three sub-scales produced by the factor analysis was tested, using Cronbach's Alpha. The reliability coefficients for 'Lack of Support' 'Lack of Resources' and 'Positive Technical Environment' were 0.78, 0.72, and 0.72 respectively, as shown in Tables 6.22, 6.23 and 6.24. These values indicate a high level of reliability.

Table 6.22: Reliability for factor one (Lack of Support)

Items	Item-total Correlation	Alpha if Item Deleted	Alpha
Schools are not fully aware how to use and operate items of instructional technology.	.5428	.7428	.777
Not having enough information about the materials available.	.5222	.7458	
Lack of established guidelines on instructional technology usage.	.4454	.7578	
Little encouragement and administrative support for classroom use of instructional technology.	.3848	.7675	
Lack of planning in school on use of instructional technology.	.3733	.7672	
Students' lack of basic instructional technology skills.	.3721	.7674	
Lack of software programmes written in Arabic.	.4364	.7588	
Lack of adequate technical support.	.5025	.7491	
Lack of suitable software programmes in the area I teach.	.5549	.7405	

Table 6.23: Reliability for factor two (Lack of Resources)

	Item-Total Correlation	Alpha if Item Deleted	Alpha
Not enough computer software programming.	.5283	.6560	.7224
Not enough funding to provide extra instructional technology equipment.	.5854	.6373	
Limited access to Instructional technology.	.3851	.7209	
Instructional technology is not available when needed.	.5393	.6536	
Lack of time in the computer laboratory timetable for using instructional technology.	.3983	.7058	

Table 6.24: Reliability for factor three (Positive Environment)

Items	Item- Total Correlation	Alpha if Item Deleted	
My school has added some very usable computer hardware for teachers to use in the last two years.	.5550	.6595	.724
There is a sufficient amount of technological equipment available in my school to aid and improve students learning.	.5139	.6734	
Enough resources that illustrate how to integrate instructional technology into the curriculum.	.4562	.6876	
Regular Maintenance to the equipment.	.4441	.6903	
Good quality equipment.	.4153	.6972	
New computer users in my school receive help from experienced personnel who know who to use computers.	.3399	.7137	
Classrooms are suitable for the use of instructional technology.	.3287	.7187	

6.4.5 Descriptive response for under-use subscales

The results (Table 6.25) indicated that lack of time and availability and accessibility are the main reasons that inhibit the use of technology.

One teacher attributed her not using the computer in her teaching to lack of time as she said:

> It is very important, but we do not have enough time to take the students to the LRC room. It is usually busy and I should arrange with them two weeks in advance, I know how important the computer is in students' learning and I know how to use it but unfortunately, the time, the availability, they are all difficulties. We have a large amount of curriculum. Usually, once in a term I have the class in the LRC room. (Teacher #6)

Lack of experience in using the new technology and lack of knowledge is also considered as a factor of under-use of ICT. One teacher said:

> I do not have enough experience in using computers. I want to use computers. The supervisor asked me to use PowerPoint in some lessons, but I do not know how. (teacher#10)

From observation, the researcher noticed that breakdown was a problem and a factor in under-use. One teacher stated:

> The materials are available but the equipment's quality is very bad and it always breaks down. Also it is old style. Sometimes we borrow some new equipment from other schools.(Teacher # 9)

Table 6.25: Descriptive analysis of the mean and the standard deviation for the factors

		Mean	Std. D
Factor One Lack of Support	Little encouragement and administrative support.	3.0217	1.23
	Lack of software programmes written in Arabic.	3.0553	1.26
	Lack of planning in school on use of instructional technology.	3.2561	1.19
	Not having enough information about the materials available.	3.4303	1.17
	Schools are not fully aware how to use and operate items of instructional technology.	3.5243	1.24
	Lack of established guidelines on instructional technology usage.	3.7544	1.09
	Lack of suitable software programmes in the area I teach.	3.8826	1.08
	Students' lack of basic instructional technology skills.	3.8931	1.08
	Lack of adequate technical support.	4.1739	1.02
Average		**3.554**	
Factor Two Lack of Resources	Limited access to Instructional technology.	3.4987	1.26
	Not enough computer software programming.	3.8381	1.15
	Instructional technology is not available when needed.	3.8728	1.06
	Not enough funding to provide extra instructional technology equipment.	4.0485	1.03
	Lack of time in the computer laboratory timetable for using instructional technology.	4.3248	1.03
Average		**3.916**	
Positive Technical Environment	My school has added some very usable computer hardware for teachers to use in the last two years.	2.8959	1.51
	There is a sufficient amount of technological equipment available in my school to aid and improve students learning.	3.0636	1.35
	Enough resources that illustrate how to integrate instructional technology into the curriculum.	3.1700	1.28
	Regular Maintenance to the equipment.	3.2176	1.25
	Good quality equipment.	3.2297	1.27
	New computer users in my school receive help from experienced personnel who know who to use computers.	3.4046	1.18
	Classrooms are suitable for the use of instructional technology.	3.6599	1.22
Average		**3.234**	

From the observation results no computers were available in the regular classrooms. The researcher observed that in LRC lessons each computer was shared by two or three students working together; from observation each school has around 15 PCs in its LRC room for students and teachers use. One teacher explains that they do not have enough computers for a whole class to use:

> We do not have enough software in the LRC room. We have 15 PCs; usually we do not take the whole class together because we do not have 30 PCs. Therefore, me and my colleague here divide the class into two groups, one using the computer and the other group doing some activities related to the lesson if possible, but she is not here today. Therefore I took the whole class and two or three students worked on each computer. (Teacher #5) (See Appendix 2.B)

A similar result was obtained in Al-Rabiey's study (2002) from which this scale was taken; the main reasons reported by teachers to be under-use factors were lack of time in the lab timetable, and lack of suitable software programs in the areas they taught.

The present study results are also consistent with those of The National Centre for Educational Statistics (2000), which identified barriers that teachers reported to using computers in the classroom. Lack of time was reported to be the main under-use factor, which included lack of release time to learn how to use computers, and lack of time in the class schedule; the next major reason was not having enough computers (78%). In addition, Williams et al. (2000) summarised the factors seen by teachers as inhibiting use of ICT. Lack of availability was the main reason given by primary teachers for non-use. This was identified to be not the only reason but tends to override all other factors in determining use. Also they found that ongoing support concerns many teachers; nearly 80% of primary teachers rely on their colleagues to help them keep up-to-date, which is clearly an important source of support.

Norris et al. (2003) investigated the relationship between the availability and use of computers and concluded that teachers cannot employ educational technology to which they have minimal or no access. When two-thirds of teachers report having no more than one computer for an entire classroom of students, it is unsurprising to discover that 44% of respondents report that they use the computer in the classroom for less than 15 minutes per week (Norris et al., 2003).

In Oman, Basic Education school teachers do not have computers in the classroom for students' and teachers' use. From observation, on average, they have around 15 computers in the LRC room for the whole school; these are available only when the

LRC teachers do not have a class in the room. As most of the teachers said, this was the main problem in using computers. This result indicates that the type of access is an issue, because teachers found signing up for the use of a lab cumbersome and inconvenient. Therefore, it is not surprising that they recorded very low use of ICT for the reasons of time and availability.

The National Centre For Education Statistics (2000) in a survey on teachers' use of computers and the internet reported the barriers to the use of computers and the internet for instruction were: not enough computers (78%), lack of release time for teachers to learn how to use computers and the internet (82%), and lack of time in the schedule for students to use computer computers in class (80%).

Norris et al. (2003) in the Snapshot Survey of demographics, educator attitudes, classroom practices, and technology access attempted to identify systematically the factors that most strongly influence the curricular use of computer technology and Internet resources in K-12 classrooms. The survey found that classrooms are actually a very long way from being "wired". Although it is true that only a tiny fraction, less than 2% of teachers, have no technology access at all, it is equally true that 26% of teachers work in what can only be described as technology-poor environments (no more than one classroom computer and no better than sporadic lab access) and only 21% teach in technology-rich environments (more than 10 classroom computers or regular lab access more than twice a week).

Jaber et al. (1999) indicated that access influences instructional activity and frequency of use, at least in some instructional activities; 67% of those who had access at home or school used computers for instruction. Seven instructional activities, tutorials, remediation/acceleration, drill and practice, recreational and educational games, enrichment activities, information access via CD-ROMs, and problem-solving produced a significant chi-square relationship between computer access, the instructional activity, and frequency of use. Therefore he concluded that classroom access to computers is a key factor to using computers instructionally.

BECTA (2003) in its survey about the barriers to the use of ICT presented the following factors to be the main barriers: lack of confidence, lack of access to quality resources, lack of time, lack of effective training, technical problems and lack of personal access.

6.5 Teachers' Training Needs

The relevant section of the questionnaire consisted of 17 suggested training needs. Respondents were asked to indicate the degree of need for each item, using a 4-point scale: 'great need', 'some need', 'do not need', and 'do not know'.

6.5.1 Reliability of the training needs scale

Table 6.26 shows that this subscale has a high total reliability (0.904), which indicates that the subscale has very high internal consistency. Inter-item total correlations ranged from .38 to .66 and therefore this subscale is adequately reliable.

Table 6.26: Reliability for training needs items

	Item total Correlation	Alpha if item deleted	Alpha
To select appropriate teaching materials for a selected subject.	.3884	.9039	
To operate and use the instructional technology available in your school.	.5120	9005	
To match teaching materials to learners' abilities.	.4545	.9023	
Knowing how to program in a computer language.	.4888	.9011	
Knowing how to get information in and out of a computer.	.5935	.8979	.9042
Knowing how to select educational computer software.	.6134	.8974	
Learning about the history and the development of computers.	.4753	.9019	
Knowing how to use a computer as a means of teaching problem solving.	.6186	.8975	
Knowing how to use the computer to help with class housekeeping chores (i.e., attendance, student records).	.5724	.8986	
Knowing how to apply the computer to evaluate students' abilities.	.5894	.8982	
Knowing how to apply the computer to diagnose students' needs.	.5931	.8980	
Knowing how to use a multimedia.	.6032	.8976	
Knowing how to use a spreadsheet.	.6193	.8970	
Knowing how to use a word processing.	.6846	.8947	
Knowing how to use a database.	.5815	.8985	
Knowing how to use a computer for presentation.	.6691	.8954	
Knowing how to benefit from the internet.	.5882	.8981	

6.5.2 Teachers' responses to the training needs scale

Table 6.27 presents the frequencies for each area of training where teachers were asked to report their need for training ('Great need', 'some need', 'No need' and 'I do not know', if the respondent had no idea about his/her needs in the training area) (See frequencies table for Training Needs in Appendix 2.A.3).

Table 6.27: Teachers' training needs frequency (%)

	Needs	No Need	I do not Know
To operate and use the instructional technology available in your school.	91.5	7.9	0.5
Knowing how to use a computer as a means of teaching problem solving.	90.9	7.0	1.9
Knowing how to program in a computer language.	90.7	6.2	3.1
To select appropriate teaching materials for a selected subject.	88.9	8.7	2.3
Knowing how to apply the computer to evaluate students' abilities.	88.8	8.3	2.8
Knowing how to apply the computer to diagnose students' needs.	88.6	8.2	3.2
Knowing how to select educational computer software.	87.5	10.1	2.3
To match teaching materials to learners' abilities.	85.7	10.2	4.0
Knowing how to benefit from the internet.	85.6	10.9	3.5
Knowing how to use multimedia.	85.2	8.1	6.7
Knowing how to use the computer to help with class housekeeping chores (i.e., attendance, student record).	84.8	11.6	3.4
Knowing how to use computer for presentation.	82.0	14.5	3.5
Knowing how to use database.	82.0	9.8	8.2
Knowing how to get information in and out of a computer.	81.4	16.6	2.0
Knowing how to use spreadsheet.	79.1	15.7	5.1
Knowing how to use word processing.	78.2	15.9	5.8
Learning about the history and the development of computers.	60.5	34.9	4.4

*G.N: Great Need, S.N: Some Need, N.N: NO Need, D.K: Do not know.

As the table in Appendix 2.A.3 shows, the areas in which teachers most felt they needed training were: Knowing how to program in a computer language. (66.2%); Knowing how to operate and use the instructional technology available in your school (60.7%), Knowing how to benefit from the internet (60%), Knowing how to use a computer as a means of teaching problem solving (57.7%), Knowing how to select educational computer software. (56.9%), and Knowing how to get information in and out of a computer (55.6%).

The findings are compared with those from the original instrument by Al-Joudi (2000) in Table 6.28, and the pattern of responses is similar. Most of the teachers felt that they needed more training in using technology; over 79.1% in the present study and over 82.9% in Al-Joudi's study.

Both results show that teachers felt less need for training in learning about the history and the development of computers and this may indicate that teachers want to learn about computers from a practical point of view; they want to use them to support their teaching, therefore, they are not too interested in learning about the history.

Table 6.28: present study training needs and Al-Joudi results

Statement	The Present finding		Al-Joudi Finding	
	need	n.need	need	n.need
Knowing how to program in a computer language.	90.7	6.2	89.8	4.8
Knowing how to benefit from the internet.	85.6	10.9	89.8	9.5
Knowing how to use a computer as a means of teaching problem solving.	90.9	7.0	84.6	10.9
Knowing how to select educational computer software.	87.5	10.1	88.3	11.0
Knowing how to get information in and out of a computer.	81.4	16.6	85.6	13.7
Knowing how to use a computer for presentation.	82.0	14.5	85.8	10.4
Knowing how to use the computer to help with class housekeeping chores (i.e., attendance, student records).	84.8	11.6	87.7	10.9
Knowing how to use a multimedia.	85.2	8.1	82.8	9.6
Knowing how to apply the computer to evaluate students' abilities.	88.8	8.3	85.1	12.9
Knowing how to use a database.	82.0	9.8	84.2	10.9
Knowing how to apply the computer to diagnose students' needs.	88.6	8.2	73.8	19.2
Knowing how to use word processing.	78.2	15.9	86.3	8.2
Knowing how to use a spreadsheet.	79.1	15.7	85.7	10.9
Learning about the history and the development of computers.	60.5	34.9	53.4	43.8

Most teachers wanted training for 13 areas of training listed in the table; around half of the teachers reported a great need for training, and around a quarter to a third expressed some need for training for all items. Williams et al. (2000) found that primary teachers felt they needed to develop technical skills and knowledge, particularly in the contexts of classroom management, professional development and personal use.

Al-Rashid (2002) also found that a high level of disagreement was recorded for the no need items, which means that most Saudi teachers wanted training.

The fourth option in the scale ('I do not know') was excluded for all 17 items and counted as a missing value in the subsequent analysis.

6.5.3 Factor analysis for training needs

The training need scale included 17 items. Factor analysis was used to reduce these items. Principal Components Analysis was performed.

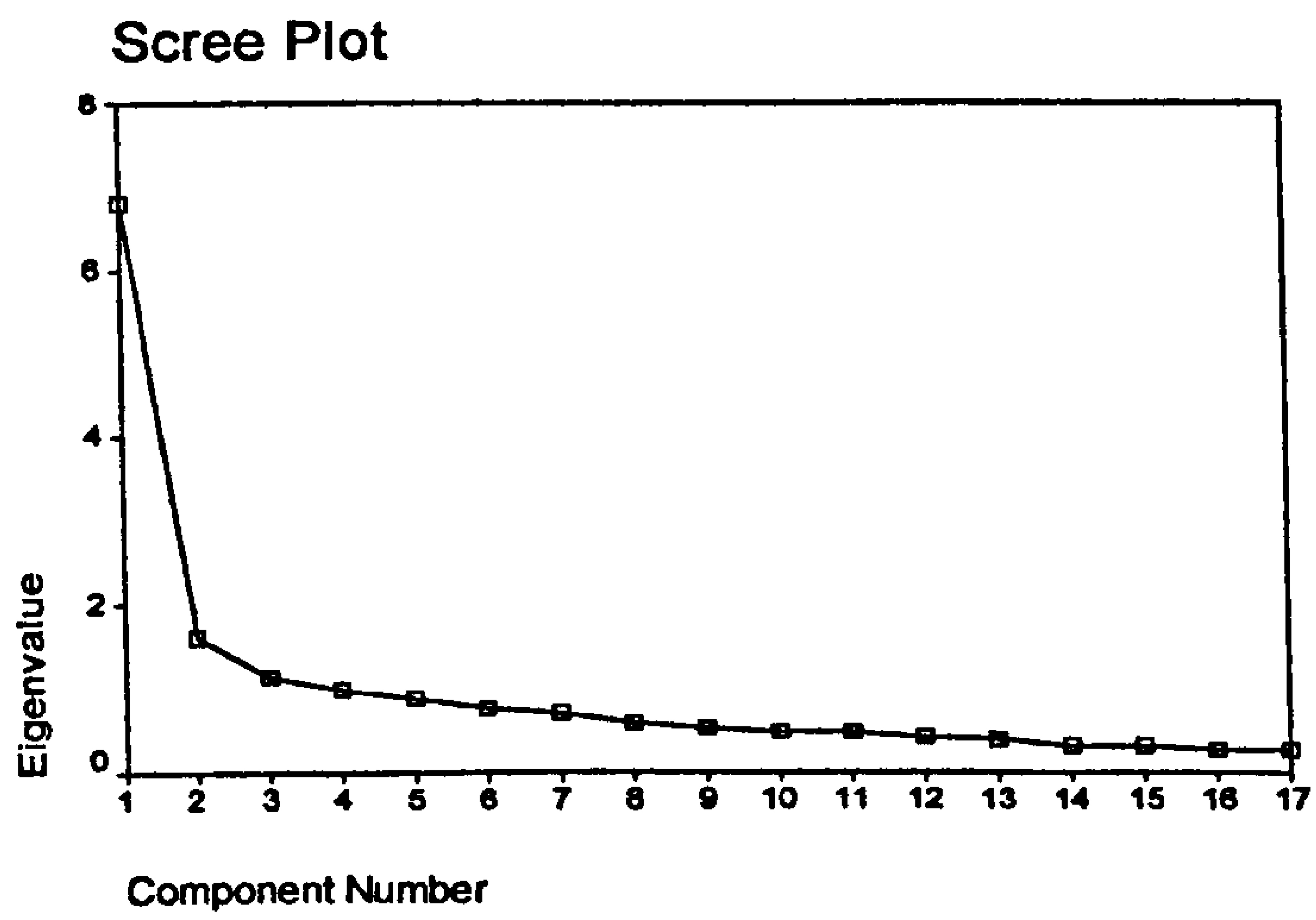
Table 6.29 shows that the three factors together explained 56.159% of the variance, the largest individual share of variance being for the first factor, specific needs (40.018%).

Table 6.29: Total variance explained (Initial Eigenvalues)

Factors	Total	% of variance	Cumulative %
1	6.803	40.018	40.018
2	1.611	9.479	49.497
3	1.133	6.662	56.159

The scree plot is shown in Figure 6.6, and suggests three factors.

Figure 6.6: Scree plot for training needs factors



The rotated components matrix for the three factors and the loadings on each factor are shown in Table 6.30 with the items sorted by size. The table indicates three factors: specific training needs, general needs, and training to support using technology in classroom activities.

Factor one, specific training needs, consists of six items with a loading of above 0.5. Factor two consists of six items with a loading of above 0.36. The items under this factor come under one theme, general training needs in ICT.

In the third factor, there are five items with a loading of above 0.49. These items are included within one factor and may be considered under one theme, which is Technology support for classroom activities needs.

Table 6.30: Rotated Component Matrix for training needs factors

		F1	F2	F3
Specific needs	Knowing how to use a database.	.810		
	Knowing how to use a multimedia.	.744		
	Knowing how to use word processing.	.741		
	Knowing how to use a spreadsheet.	.716		
	Knowing how to use a computer for presentation.	.599		
	Knowing how to benefit from the internet.	.544		
General needs	Knowing how to get information in and out of a computer.		.857	
	Knowing how to select educational computer software		.785	
	To operate and use the instructional technology available in your school.		.637	
	Knowing how to program in a computer language.		.589	
	Knowing how to use a computer as a means of teaching problem solving.		.527	
	Learning about the history and the development of computers.		.367	
Technology support classroom	Training in the selection and evaluation of teaching materials.			.677
	Knowing how to apply the computer to evaluate students' abilities.			.665
	Knowing how to apply the computer to diagnose students' needs.			.635
	Knowing how to use the computer to help with class housekeeping chores.			.503
	To match teaching materials to learners' abilities.			.491

6.5.4 Reliability coefficients of training needs sub-scales

The reliability of the three subscales was tested, using Cronbach's Alpha (Tables 31, 32 and 33). The reliability coefficients for Specific needs, General needs and Classroom needs were 0.862, 0.810 and 0.739 respectively. All are high values.

Table 6.31: Reliability for factor one (Specific needs)

	Item-Total Correlation	Alpha if Item Deleted	Alpha
Knowing how to use a database.	.6957	.8310	.862
Knowing how to use multimedia.	.6274	.8435	
Knowing how to use word processing.	.7222	.8259	
Knowing how to use a spreadsheet.	.6631	.8371	
Knowing how to use a computer for presentation.	.6531	.8390	
Knowing how to benefit from the internet.	.5639	.8540	

Table 6.32: Reliability for factor two (General Needs)

Items	Item-Total Correlation	Alpha if Item Deleted	Alpha
Knowing how to get information in and out of a computer.	.7000	.7492	
Knowing how to select educational computer software.	.6961	.7520	
To operate and use the instructional technology available in your school.	.5087	.7939	.810
Knowing how to program in a computer language.	.5291	.7896	
Knowing how to use a computer as a means of teaching problem solving.	.5952	.7761	
Learning about the history and the development of computers.	.4293	.8174	

Table 6.33: Reliability for factor three (Classroom Needs)

Items	Item-Total Correlation	Alpha if Item Deleted	Alpha
Training in the selection and evaluation of teaching materials.	.3943	.7322	
Knowing how to apply the computer to evaluate students' abilities.	.6137	.6523	.739
Knowing how to apply the computer to diagnose students' needs.	.5804	.6647	
Knowing how to use the computer to help with class housekeeping chores.	.5237	.6861	
To match teaching materials to learners' abilities.	.4116	.7291	

6.5.5 Descriptive analysis for training needs subscales

As mentioned before, the scale for training needs is 'no need' (1), 'some need' (2) and 'Great need' (3). The fourth scale, 'I do not know', was excluded when the result was produced. Teachers show high level of needs for training: all average values were above 2 in all training areas (Table 6.34).

Table 6.34: Descriptive analysis of training needs subscales

		Mean	Std. D
F1 Specific Needs	Knowing how to use a spreadsheet.	2.196	.883
	Knowing how to use word processing.	2.203	.910
	Knowing how to use a database.	2.262	.940
	Knowing how to use multimedia.	2.323	.886
	Knowing how to use a computer for presentation.	2.333	.850
	Knowing how to benefit from the internet.	2.421	.820
Average		2.289	
F2 General Needs	Learning about the history and the development of computers.	1.835	.880
	Knowing how to get information in and out of a computer.	2.349	.825
	Knowing how to select educational computer software.	2.423	.764
	Knowing how to use a computer as a means of teaching problem solving.	2.470	.709
	To operate and use the instructional technology available in your school.	2.516	.664
	Knowing how to program in a computer language.	2.538	.747
Average		2.355	
F3 Classroom Needs	To match teaching materials to learners' abilities.	2.292	.809
	Knowing how to use the computer to help with class housekeeping chores.	2.361	.816
	Knowing how to apply the computer to diagnose students' needs.	2.378	.770
	Knowing how to apply the computer to evaluate students' abilities.	2.394	.759
	Training in the selection and evaluation of teaching materials.	2.401	.743
Average		2.365	

Usually subject teachers received short training at the beginning of their service in Basic Education for two weeks. Only LRC teachers received training in ICT. This lack of training was described by a science teacher, who stated that:

> Four years ago I received training in teaching methods, in the beginning of the Basic Education, and since then I have not received any. I did not receive any training in using instructional technology or computers. I feel that I need a lot of training. Each day we see a lot of developments around us in the world and we hear about new methods of teaching but if you do not receive training, how can you employ it in your job? Our senior teacher has received a lot of training and she tries to transfer this experience to us, but it is not like when you learn directly. (Teacher #7)

When a subject teacher was asked, "What is the most important thing for new teachers to do to cope with the change?" she said:

> I think they should have training, they should ask for help from those how know. I feel sorry that I cannot use computers with my students but I'm thinking of starting to learn about it. (Teacher # 9)

LRC teachers are the most likely group to receive training. One of them described what they need for further training:

> During the study year, we have different training on different media. It is suitable but still we need more training and there is a plan to give us training in the technical maintenance of the equipment.(Teacher #1)

Williams et al (2000) concluded, from the evidence of their study about training needs, that these needs should be built into plans for future training. They indicated that it should be focused on the type of ICT resources available to teachers in school: training in the use of ICT resources before they are available to teachers on a day-to-day basis will result in demotivation and wasted effort. Also it should be designed to increase a familiarity with a wide range of ICT.

6.6 Attitudes Towards Instructional Technology

This section of the teacher's' questionnaire contained a list of 26 statements. Respondents were asked to indicate their degree of agreement with each, using a 5-point Likert scale. These items aim to address the following research question: What are teachers' attitudes towards the use of instructional technology in teaching?

6.6.1 Reliability of Attitude Scale

This scale has a reasonable total reliability (0.69), which indicates that the subscale has good internal consistency. Table 6.35 shows that inter-item total correlations ranged from .05 to .39 and therefore this subscale is adequately reliable.

Table 6.35: Reliability for attitudes scale

Statement	Items total C.	Alpha if item deleted	Alpha
Instructional technology could help me with my teaching.	.1138	.6901	0.69
Teachers should continuously search for new ways to use instructional technology in the class room.	.0439	.6943	
Teaching plan should include instructional technology every day.	.0542	.6937	
The use of instructional technology improves the quality of students' learning.	.1434	.6885	
I need additional knowledge and skills in the preparation and utilization of instructional technology.	.2937	.6789	
A computer takes too long to master and produces too few results to be a worthwhile teaching tool.	.2497	.6815	
I feel comfortable using technology in the classroom.	.0959	.6931	
I am eager to apply computers and related technologies to facilitate emerging roles of the learner and myself.	.2932	.6779	
I feel instructional technology is not appropriate to my teaching.	.2428	.6817	
I feel I should develop my skills to keep up to date with development in teaching.	.2945	.6783	
I need to develop my skills and knowledge for the pupils' benefit.	.2599	.6813	
I'm interested personally but developing my skills and knowledge in instructional technology isn't appropriate to my teaching.	.3132	.6749	
I'm interested but training doesn't seem to be available.	.3119	.6755	
I'm not that interested but I suppose I should be.	.2129	.6858	
I'm interested but I do not have the time.	.3051	.6757	
Instructional technology can be used to motivate students and enhance their learning experience.	.1779	.6866	
I prefer using it on my own when no one is around to see me make mistakes.	.3919	.6675	
I feel lost in the information age.	.2935	.6770	
Instructional technology encourages pupils to work together collaboratively.	.2407	.6824	
Instructional technology is difficult to use.	.3513	.6721	
Instructional technology can save a lot of teaching time.	.2643	.6800	
Instructional technology can be useful in almost all subject areas.	.2487	.6817	
Instructional technology can be used to meet individual student needs.	.1995	.6851	
I prefer to use the textbook instead of the new technology.	.2325	.6827	
I consider it takes me a long time to prepare technology materials for teaching.	.1533	.6902	
I find it easy to select appropriate instructional technology resource for my teaching.	.2015	.6862	

6.6.2 Teachers' attitudes towards ICT

The data from this section were scored as follows: 'strongly agree' responses were scored as 1, 'agree' as 2, 'undecided' as 3, 'disagree' as 4, and 'strongly disagree' as 5 (frequency table in Appendix 2.A.4).

Table 6.36: Teachers attitudes toward using instructional technology

STATEMENTS	A	U	D.A
The use of instructional technology improves the quality of students' learning.	96.9	1.9	1
Teaching plan should include instructional technology every day.	95.7	0.8	3.5
Instructional technology could help me with my teaching	95.5	2.7	1.9
Teachers should continuously search for new ways to use instructional technology in the class room	94.6	3.2	2.1
I need to develop my skills and knowledge for the pupils' benefit.	94.2	1.6	4.1
Instructional technology can be used to motivate students and enhance their learning experience.	91.5	3	4.4
I feel I should develop my skills to keep up to date with development in teaching	90.7	3.4	5.7
I need additional knowledge and skills in the preparation and utilization of instructional technology.	90.3	5.5	4.1
Instructional technology encourages pupils to work together collaboratively.	89.1	5.5	5.3
Instructional technology can be useful in almost all subject areas.	87.3	6.3	49.1
I feel comfortable using technology in the classroom.	87.2	5.7	7.1
Instructional technology can be used to meet individual student needs.	86.7	6.7	5.9
Instructional technology can save a lot of teaching time.	76.9	10.9	12.2
I'm interested but training doesn't seem to be available.	75.8	9	15.1
I'm interested but I do not have the time.	72.4	6.9	20.7
I consider it takes me a long time to prepare technology materials for teaching.	54.4	10.9	32.7
I find it easy to select appropriate instructional technology resource for my teaching	46	10	42
I'm not that interested but I suppose I should be.	34.5	12.4	53.1
I'm interested personally but developing my skills and knowledge in instructional technology isn't appropriate to my teaching.	30.3	16.3	53.1
I feel lost in the information age.	29.7	18	51
I prefer to use the textbook instead of the new technology.	29.1	12.8	58.1
Instructional technology is difficult to use.	27.6	13.5	59
A computer takes too long to master and produces too few results to be a worthwhile teaching tool.	24.3	10.2	65.4
I prefer using it on my own when no one is around to see me make mistakes	17.9	10.8	71.3
I feel instructional technology is not appropriate to my teaching.	10.6	8.3	80.9
I am eager to apply computers and related technologies to facilitate emerging roles of the learner and myself.	6.2	5.8	87.9

A(Strongly agree+Agree), U(undecided) and D.A(disagree+strongly disagree).

The lower score means that the teachers tend to agree with the items, while higher ones means that they tended more to disagree. Table 6.36 shows the percentages of teachers' responses to the attitudes toward ICT statements. Teachers tended to agree with the positive statements; therefore teachers' attitudes could be described in general as positive toward ICT.

Researchers at the Field Research Corporation (1995) surveyed 1,000 elementary teachers in the United States and determined that most teachers surveyed had favourable attitudes toward computers. In more detail, the survey found that 94% agreed that computer technology is a powerful motivator for getting today's students more interested in their class work and assignments, 76% disagreed that computers are not helpful as a teaching aid, 59% agreed that teachers who integrate PCs into the classroom are considered more successful, and 61% agreed that students in their classes are ready to use computers.

The interviews show that in general teachers have positive attitudes toward new technology, and have strong beliefs of the benefit of using computers to the students.

6.6.3 Factor analysis

Table 6.37 shows how many components (factors) to extract. We need to look at the total explained variance and consider the components that have eigenvalues of 1 or more. In the following table, only the first eight components recorded eigenvalues above 1. These eight components explain 56.189 % of the variance.

Table 6.37: Initial eigenvalues of attitudes scale

Factors	Eigenvalues	% of Variance	% of cumulative
1	3.672	14.122	14.122
2	3.168	12.184	26.307
3	1.921	7.388	33.694
4	1.364	5.247	38.942
5	1.217	4.681	43.622
6	1.167	4.490	48.112
7	1.091	4.196	52.308
8	1.009	3.881	56.189

The Scree Plot, presented in Fig. 6.7 provides a summary of the factors extracted. After the third factor, the slope of the line changes. Therefore the researcher decided to consider only the first three factors.

Figure 6.7: Scree plot for attitudes factor analysis

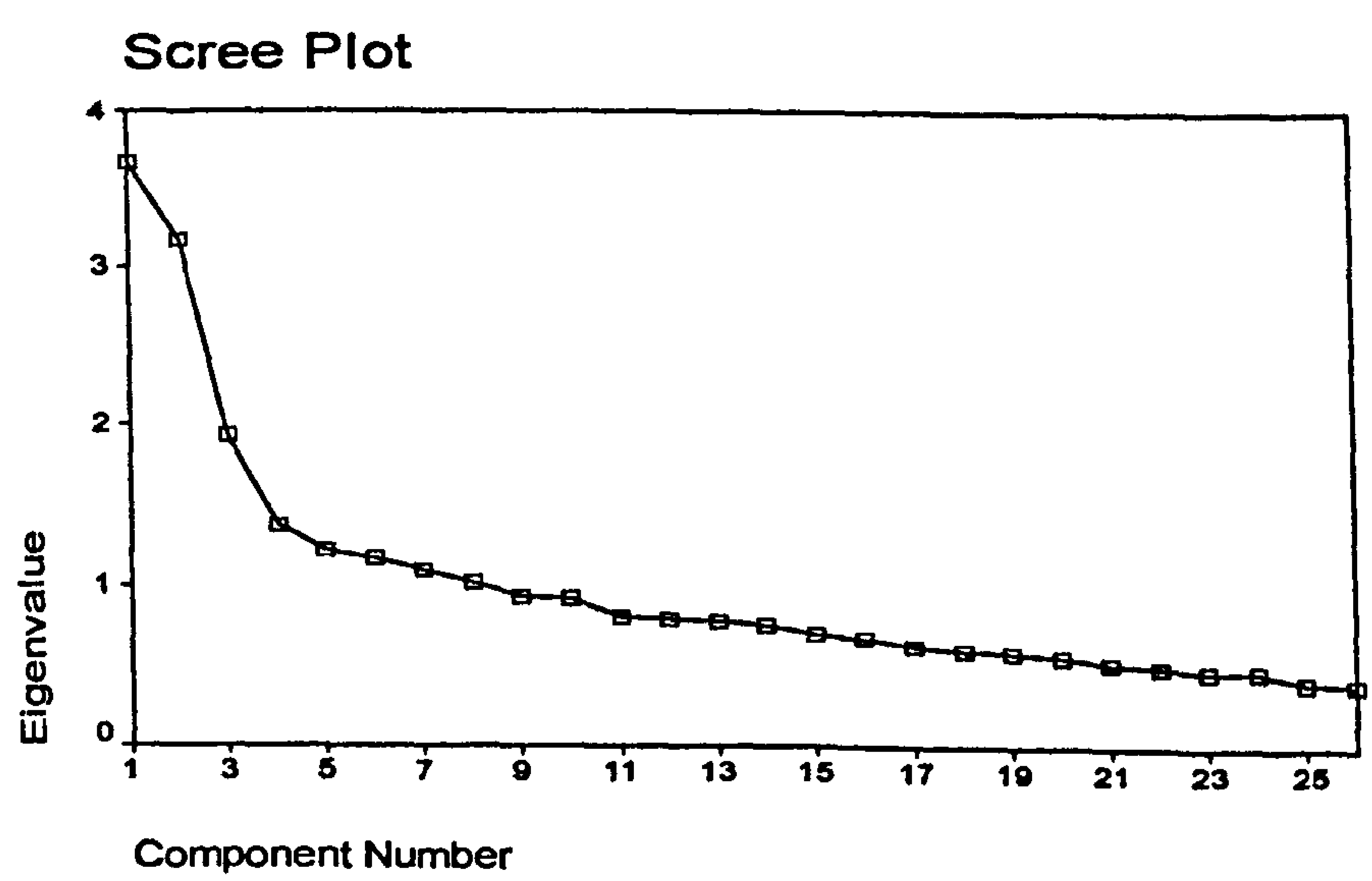


Table 6.38 is the rotated component matrix, which shows the loadings of each of the variables on the three factors.

Table 6.38: Rotated components Matrix for attitudes items

	Statement	Component 1	Component 2	Component 3
Anxiety	I feel instructional technology isn't appropriate to my teaching.	.682		
	I'm interested personally but developing my skills and knowledge in instructional technology isn't appropriate to my teaching.	.633		
	I am eager to apply computers and related technologies to facilitate emerging roles of the learner and myself.	.623		
	A computer takes too long to master and produces too few results to be a worthwhile teaching tool.	.548		
	I prefer using it on my own when no one is around to see me make mistakes.	.494		
	Instructional technology is difficult to use.	.490		
	I'm not that interested but I suppose I should be.	.458		
	I prefer to use the textbook instead of the new technology.	.446		
	I'm interested but I do not have the time.	.426		
	I feel lost in the information age.	.408		
Enthusiasm	Instructional technology can be useful in almost all subject areas.		.682	
	Instructional technology can save a lot of teaching time.		.677	
	Instructional technology encourages pupils to work together collaboratively.		.632	
	Instructional technology can be used to meet individual student needs.		.623	
	Instructional technology could help me with my teaching.		.500	
	The use of instructional technology improves the quality of students learning.		.495	
	Teachers should continuously search for new ways to use instructional technology in the class room.		.494	
Needs	I need to develop my skills and knowledge for the pupils' benefit.			.746
	I need additional knowledge and skills in the preparation and utilization of instructional technology.			.652
	I feel I should develop my skills to keep up to date with development in teaching.			.625
	I'm interested but training doesn't seem to be available.			.511
	Instructional technology can be used to motivate students and enhance their learning experience.			.495

6.6.4 Reliability coefficient for attitudes subscales

The reliability coefficients for each of the Attitudes subscales: Anxiety, Enthusiasm, and Attitudes needs were 0.72, 0,72 and 0.63 respectively (Tables 6.39, 6.40 and 6.41), which were reasonably high.

Table6.39: Reliability for factor one (Anxiety)

Items	Corrected Item-Total Correlation	Alpha if Item Deleted	
I feel instructional technology isn't appropriate to my teaching.	.5017	.6858	.725
I'm interested personally but developing my skills and knowledge in instructional technology isn't appropriate to my teaching.	.4865	.6860	
I am eager to apply computers and related technologies to facilitate emerging roles of the learner and myself.	.4800	.6924	
A computer takes too long to master and produce too few results to be a worthwhile teaching tool.	.3867	.7035	
I prefer using it on my own when no one is around to see me make mistakes.	.3459	.7096	
Instructional technology is difficult to use.	.3792	.7045	
I'm not that interested but I suppose I should be.	.3326	.7137	
I prefer to use the textbook instead of the new technology.	.3088	.7150	
I'm interested but I do not have the time.	.3374	.7114	
I feel lost in the information age.	.3211	.7134	

Table 6.40: Reliability for factor two (Enthusiasm)

	Corrected Item-Total Correlation	Alpha if Item Deleted	Alpha
Instructional technology can be useful in almost all subject areas.	.5178	.6648	.720
Instructional technology can save a lot of teaching time.	.4913	.6741	
Instructional technology encourages pupils to work together collaboratively.	.4609	.6803	
Instructional technology can be used to meet individual student needs.	.4632	.6796	
Instructional technology could help me with my teaching.	.3661	.7025	
The use of instructional technology improves the quality of students learning.	.3597	.7043	
Teachers should continuously search for new ways to use instructional technology in the classroom.	.3639	.7030	

Table 6.41: Reliability for factor three (Needs)

	Item-Total Correlation	Alpha if Item Deleted	Alpha
I need to develop my skills and knowledge for the pupils' benefit.	.5551	.5085	.635
I need additional knowledge in the preparation and utilization of instructional technology.	.4117	.5725	
I feel I should develop my skills to keep up to date with development in teaching.	.4417	.5556	
I'm interested but training isn't available.	.3076	.6377	
Instructional technology can be used to motivate students and enhance their learning experience.	.2831	.6308	

6.6.5 Descriptive analysis for attitudes sub-scales

Table 2.A.4 (Appendix) shows that teachers' attitudes were generally positive. They tended to disagree with the negative items (Anxiety), and have good enthusiasm toward the new technology. They had a strong belief that computers could play an important role in improving the quality of teaching (See Appendix 2.A.4). One teacher expressed this attitude as follows:

> Technology develops students' concepts, helps them to develop and improve their higher thinking abilities. It makes teaching and learning more efficient. It helps students to understand how to relate concepts to students' lives, it gives flexibility to the lessons. (Teacher #3)

In general almost all teachers in the interviews emphasised the benefits of technology in general on students' learning. As one teacher said:

> It gives them deeper understanding, improves their skills, adds a lot to their understanding and makes the subject interesting to them and I think the most important point is that it relates the subject to the real world in easy ways. Before, I spent a lot of time telling them how we can employ the concepts in our life. Now, they can explain that to me, from their experience in using the technology. (Teacher # 7)

Table 6.42: Descriptive statistics of Attitudes subscales

		Mean	Std. D
Factor One: Anxiety	I am eager to apply computers and related technologies to facilitate emerging roles of the learner and myself.	1.707	.921
	I feel instructional technology isn't appropriate to my teaching.	1.989	1.068
	I prefer using it on my own when no one is around to see me make mistakes.	2.266	1.111
	A computer takes too long to master and produces too few results to be a worthwhile teaching tool.	2.506	1.232
	Instructional technology is difficult to use.	2.707	1.047
	I'm interested personally but developing my skills and knowledge in instructional technology isn't appropriate to my teaching.	2.717	1.206
	I prefer to use the textbook instead of the new technology.	2.720	1.076
	I feel lost in the information age.	2.727	1.118
	I'm not that interested but I suppose I should be.	2.789	1.291
	I'm interested but I do not have the time.	3.737	1.182
Average		2.586	
Factor two: Enthusiasm	Instructional technology can save a lot of teaching time.	3.947	.977
	Instructional technology can be used to meet individual student needs.	4.153	.810
	Instructional technology encourages pupils to work together collaboratively.	4.220	.783
	Instructional technology can be useful in almost all subject areas.	4.238	.829
	Teachers should continuously search for new ways to use instructional technology in the class room.	4.491	.707
	Instructional technology could help me with my teaching.	4.546	.656
	The use of instructional technology improves the quality of students learning.	4.563	.597
Average		4.308	
Attitudes Needs	I'm interested but training doesn't seem to be available.	3.901	1.064
	I need additional knowledge and skills in the preparation and utilization of instructional technology.	4.339	.786
	I feel I should develop my skills to keep up to date with development in teaching.	4.398	.844
	Instructional technology can be used to motivate students and enhance their learning experience.	4.419	.856
	I need to develop my skills and knowledge for the pupils' benefit.	4.440	.765
Average		4.299	

On the other hand, even if they felt positive towards ICT, they still believed that they need to develop their skills and knowledge to keep updated with new technology. Teachers agreed that lack of time, lack of knowledge, and lack of training hindered their interest in using ICT. One teacher expressed positive attitudes but with worries and difficulties, feeling as follows:

> Of course it is important, especially for my subject, and they have a lot of software in science in the LRC room, I think technology is the perfect answer to teach every type of learner, reaching even the lowest performer. A lot of things, if they are available in the school, if I know how to use them and if I have the direction, all of these factors will make it easy to use in the classroom. (Teacher #7)

Another teacher expressed a very positive attitude when considering whether the lack of knowledge hinders the interest in using new technology

> It is very important, but how can the teacher benefit from this technology if he or she does not know how to use it? A lot of things, firstly to simplify the concepts for the students and to attract their attention. It is very important. It is the language of the future, it makes the concepts more practical for students, and technology is supposed to open doors. Students need to be active in the technology race, because that is what it is. (Teacher #4)

The results are consistent with those of Al-Rashid (2002), who found that teachers' attitudes to ICT use were generally positive: they were keen to know more about ICT. Al-Joudi (2000) also found that teachers in general had positive attitudes toward computers: they tended to agree with the positive statements. On the other hand he also found that they had high levels of anxiety and worried about using computers. Al-Rabaiy (2002) in his study in Oman found that the faculty in the university held positive attitudes toward instructional technology and its use. None of the positive scales in his survey of attitudes met with less than 65% support from faculty. In general researchers in the field have concluded that teachers with positive attitudes tend to use ICT more often (Williams, 2000). Positive attitudes toward using new technology would make in-service teachers feel less anxious while learning to use computers (Lee, 1997).

6.7 Teachers' Opinions and Philosophy

This section aims to explore teachers' opinions about different educational issues, traditional and progressive, to see if personal characteristics are significantly associated with teachers' ideas and opinions about education. The first part of the section is about different aims in education and it is concerned with what teachers thought are the aims of the educational system. The second is about teachers' agreement with various issues, and the last section concerns responses to a paired comparison question, in which eight pairs of philosophical positions were presented.

6.7.1 Reliability of the opinions and philosophy scale

The Aims subscale has a high total reliability (0.888), which indicates that the subscale has very high internal consistency. Table 6.43 shows that inter-item total correlations ranged from 0.56 to 0.75 and therefore this subscale is adequately reliable.

Table 6.43: Reliability for Aims

Item	Corrected item total correlation	Alpha if item deleted	Alpha
AIM1	.6825	.8720	.8882
AIM2	.6104	.8795	
AIM3	.7362	.8680	
AIM4	.7505	.8660	
AIM5	.6816	.8721	
AIM6	.6730	.8732	
AIM7	.6162	.8794	
AIM8	.5669	.8835	

The Issues scale also has reasonable total reliability (0.69). Inter-item total correlations ranged from 0.21 to 0.51 (Table 6.44) and therefore this subscale is adequately reliable.

Table 6.44: Reliability for Issues

item	Corrected item total correlation	Alpha if item deleted	Alpha
ISSUE1	.5069	.6388	
ISSUE2	.2065	.7082	
ISSUE3	.3626	.6730	
ISSUE4	.4256	.6606	.6965
ISSUE5	.3734	.6746	
ISSUE6	.4124	.6649	
ISSUE7	.4330	.6569	
ISSUE8	.4382	.6587	

The Philosophy subscale has a reasonable total reliability (0.71), which indicates that the subscale has good internal consistency. Inter-item total correlations ranged from -.01 to .53 (Table 6.45) and therefore this subscale is adequately reliable.

Table 6.45: Reliability for pphilosophy

item	item total correlation	Alpha if item deleted	alpha
PH1	.5087	.6616	
PH2	.5041	.6566	
PH3	-.015	.7571	
PH4	.4549	.6693	
PH5	.3531	.6915	.7101
PH6	.4134	.6796	
PH7	.4668	.6668	
PH8	.5341	.6511	

6.7.2 Teachers' response to opinion and philosophy

Table 6.46 shows the percentages of the agreement for each aim, the responses were aggregated into essential, important (important + very important) and not important (fairly important + not important) (Frequency table see Appendix 2.A.5).

Table 6.46: Teachers' response to the Aims scale (%)

	Essential	Important	Not Important
Aim 1 An understanding of the world in which pupils live.	63.9	29.8	6.2
Aim 6 The acceptance of normal standards of behaviour.	60.8	34.5	4.4
Aim 2 The acquisition of basic skills in reading and number work.	57.3	36.9	5.7
Aim 3 The development of pupils' creative abilities.	56.8	39.9	3.2
Aim 4 The encouragement of self-expression.	54.0	42.1	3.8
Aim 8 The promotion of a high level of academic attainment.	53.8	40.6	5.3
Aim 5 Helping pupils to co-operate with each other.	52.8	42.1	4.9
Aim 7 The enjoyment of school.	43.3	49.1	7.4

6.7.2.1 Teachers' response to the opinions about Education issues

This section presents the frequencies of teachers' responses to educational issues. From Table 6.47, teachers tended to agree with the positively worded issues (1, 3, 4, 6 and 8) and disagree with the negative statements (2, 5 and 7).

Table 6.47: Frequencies given as percentages of teachers' responses to the Education issues

Issues	Agree	Undecided	Disagree
3 Firm discipline by the teacher leads to good self discipline on the part of the pupil.	92.4	1.1	6.1
6 Pupils work better when motivated by marks or stars.	91.7	1.5	6.4
1 Most pupils feel more secure if told what to do and how to do it.	83.5	2.4	13.8
8 Teachers need to know the home background and personal circumstances of their pupils.	82.6	10.5	6.2
4 The teacher should be well liked by the class.	80.8	14.8	3.9
7 Too little emphasis is placed on keeping order in the classroom nowadays.	36.3	9.6	53.6
5 Children working in groups waste a lot of time arguing and 'messing around'.	32.0	7.5	59.8
2 'Creativity' is an educational fad, which could soon die out.	17.3	25.7	56.5

6.7.2.2 Teachers' response to philosophy questions

In the paired comparison question, eight pairs of philosophical positions were presented. The coding for items 3, 5, and 7 was reversed to make all the statements in the same order, i.e. the constructivist statements on the left side and the traditional statements on the right side.

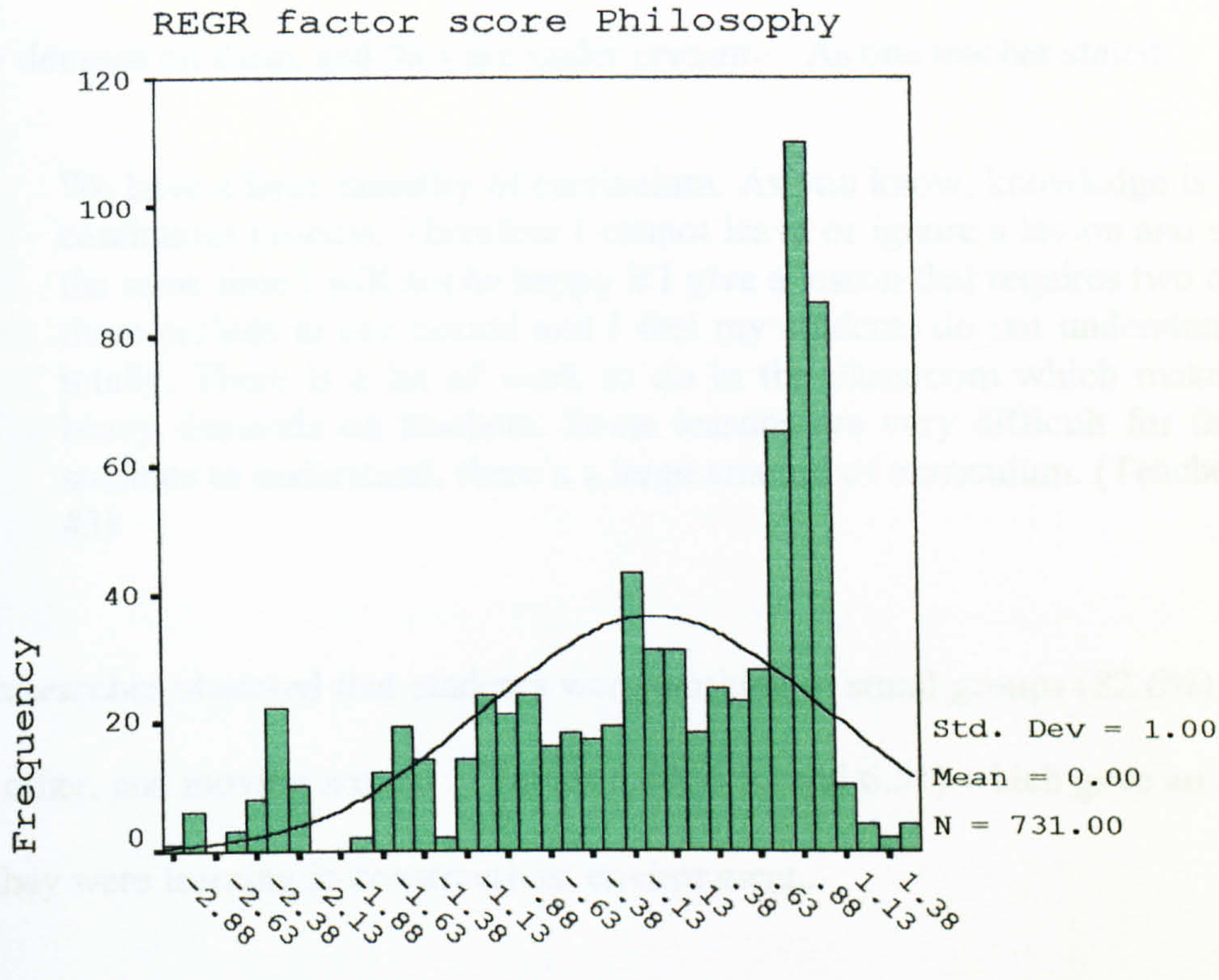
Table 6.48 shows that teachers were substantially more constructivist than traditional in their responses to five of the eight items. Twice as many teachers agreed that there should be multiple project-oriented activities going on as favoured short-duration whole-class assignments. Even more teachers believed that their instructional planning should focus on constructing meaning and on student interest than on coverage of curriculum and textbook content. On the other hand, the teachers tended to be more traditional in preferring a quiet classroom environment (55.9%) to free movement and talking (25.3%). 77.8% of the teachers agreed that the teachers know more than the students and they can explain directly, while only 19.2% agreed with discovery learning.

Table 6.48: Frequencies given as percentages of teachers' responses to Philosophy

	Favoured the more constructivist statement	Middle position on 5-point scale	Favoured the more traditional position
Facilitator vs. instructor.	85.6	2.7	11.3
All sorts of activities vs. whole class the same assignment.	69.3	4.3	26.0
Familiar with many different ideas vs. master a few complex ideas.	59.2	3.8	36.6
Construct concepts vs. structured way.	57.2	7.8	34.6
Students led a discussion vs. whole-class discussion.	45.5	4.2	46.8
Encourage "sense-making vs. content of the curriculum.	36.7	31.8	28.0
Free to talk and move around vs. quiet classroom needed for effective learning.	25.3	15.3	55.9
Discovery learning vs. Teachers know a lot more than students.	19.2	2.6	77.8

Figure 6.8 shows that scores are skewed to the right, which means that most teachers tended to agree with the progressive statements about education. The findings presented in the table and figure suggest that given a brief argument made between support for a philosophical position consistent with constructivist instructional reform and one reflecting a more traditional viewpoint, many more teachers will select agreement with reform than with traditional teaching practice.

Figure 6.8: Philosophy Frequencies



The teachers believe that there are some advantages of the new reform. As one teacher expressed her feeling:

> Group work helps students to co-operate with each other, if the teacher has good management. The set is a mix of different student abilities. It does not affect knowing the differences between students. (Teacher #6)

Some teachers were in the middle group. They have positive attitudes toward the new reform but they also feel that there are some disadvantages. As one teacher said:

> Basic education is more flexible. There are many materials which makes the teaching easier and speeds students' understanding. It develops the students' personality, they can express themselves easily, and they have deeper understanding. On the other hand, I feel that I am busy all the time, there is a large amount of curriculum, the student should be aware of many complex concepts. Actually, the curriculum is very large because you should do a lot of activities in every lesson which takes a lot of time. (Teacher #9)

On the other hand there were some complaints and some negative points toward the new reform. Some teachers felt that they have a large amount of curriculum, there is heavy demand on them, and they are under pressure. As one teacher stated:

> We have a large quantity of curriculum. As you know, knowledge is a continuous process. Therefore I cannot leave or ignore a lesson and at the same time I will not be happy if I give a lesson that requires two or three periods in one period and I feel my students do not understand totally. There is a lot of work to do in the classroom which makes heavy demands on teachers. Some lessons are very difficult for the students to understand, there's a large amount of curriculum. (Teacher #3)

The researcher observed that students were working in small groups (82.6%); talking to each other, and moving around (Tables 6.49, 6.50 and 6.51) which gave an impression that they were learning in constructivist environment.

Table 6.49: Seating configuration in observed classrooms

Years	N	%
Horse shoe	4	17.4
Small groups	19	82.6
Total	23	100.0 □

Table 6.50: Students' movements in observed classrooms

	N	%
Free movement and talk	2	8.7
Certain activities	17	73.9
Not allowed	4	17.4
Total	23	100.0 □

Table 6.51: Group organisation

	N	%
Students decide	2	8.7
Ability	2	8.7
Same group	19	82.7
Total.	23	100.0

During the observation the researcher noticed that some teachers were teaching in a traditional way and talking to the whole class most of the time. In certain activities students were allowed to work and talk together when they worked as a group. It can be concluded from the observation that because teachers are required to teach in a constructivist style and use technology, they start to move from teacher-centred to more student-centred teaching.

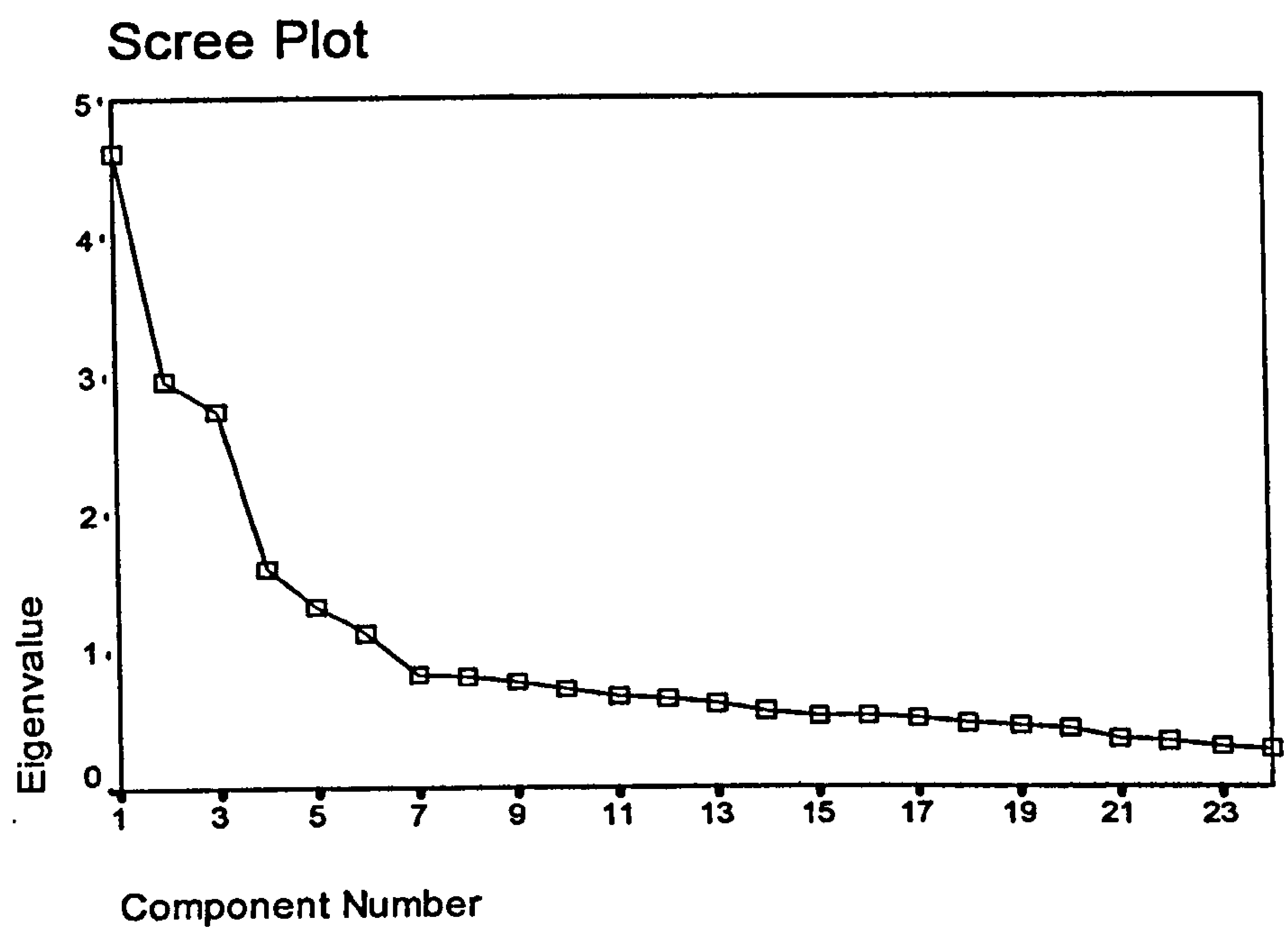
6.7.3 Factor analysis

Table 6.52 shows that the six factors together explained 59.766% of the variance, the largest individual share of variance being for the first factor, Aims (19.193%).

Table 5.52: Initial Eigenvalues for teachers' philosophy

Component	Total	% of Variance	Cumulative %
1	4.606	19.193	19.193
2	2.956	12.315	31.508
3	2.733	11.389	42.897
4	1.602	6.673	49.571
5	1.324	5.515	55.086
6	1.123	4.680	59.766

Figure 6.9: Scree plot for Teachers' Philosophy factor analysis



The scree plot shows that after the third factor the line's slope has changed. According to Pallant (2003) it is up to the researcher to determine the number of factors that he or she considers best describes the underlying relationship among the variables. Tabachnick et al. (2001) recommend that researchers adopt an exploratory approach experimenting with different numbers of factors until a satisfactory solution is found.

The researcher considered the two techniques that can be used to assist in the decision concerning the number of factors to retain: Kaiser's criterion and scree plot and decided to retain three factors.

The rotated components matrix for the three factors and the loadings on each factor are shown in Table 6.53 with the items sorted by size.

Factor one: includes all the aims items, It has an eigenvalue of 4.606 representing 19.193% of the total variance. The items under this factor come under one theme, which is the Importance of the Aims.

Table 6.53: Rotated matrix for philosophy factor analysis

Statements	Component		
	1	2	3
Aim 4: The encouragement of self-expression	.823		
Aim 3: The development of pupils' creative abilities	.814		
Aim 5: Helping pupils to co-operate with each other	.767		
Aim 1: An understanding of the world in which pupils live	.762		
Aim 6: The acceptance of normal standards of behaviour	.748		
Aim 2: The acquisition of basic skills in reading and Number work	.700		
Aim 7: The enjoyment of school	.693		
Aim 8: The promotion of a high level of academic Attainment	.660		
Ph 8: Teachers know a lot more than students do; they should not let students muddle around when they can just explain the answers directly		.799	
Ph 1: I mainly see my role as facilitator		.726	
Ph 2: I try to provide opportunities and resources for my students to discover or construct concepts for themselves		.722	
Ph 4: It is useful for students to become familiar with many different ideas and skills even if their understanding, for now is limited.		.585	
Ph 7: I prefer to lead a whole-class discussion, asking questions that the students could answer quickly		.549	
Ph 6: It is a good idea to have all sorts of activities going on in the classroom.		.547	
Ph 5: I think a quiet classroom is generally needed for effective learning		.490	
Issue 1: Most pupils feel more secure if told what to do and how to do it			.698
Issue 4: The teacher should be well liked by the class.			.673
Issue 8: Teachers need to know the home background and personal circumstances of their pupils			.671
Issue 6: Pupils work better when motivated by marks or stars			.667
Issue 3: Firm discipline by the teacher leads to good self discipline on the part of the pupil			.618
Issue 7: Too little emphasis is placed on keeping order in the classroom nowadays			.504
Issue 5: Children working in groups waste a lot of time arguing and 'messing about'			.438

Factor two: has an eigenvalue of 2.956 representing 12.315% of the total variance. It consisted of five items from the Issues section, with a loading of above 0.6. These items were included within one factor and may be considered under one theme, which is Philosophy.

Factor three: The eigenvalue for this factor is 2.733 accounting for 11.389% of the total variance. The items under this factor can be classified under one main theme, which is Issues.

Little attention has focused on how teachers' views of learning affect the ways they use technology in the classroom. Fulton et al (2000) found that the ways the traditional teachers used technology were very different from the ways in which the constructivist teachers used technology. They indicated that the change does not happen quickly but when computers are brought into the classroom teachers tend to use more constructivist teaching approaches even if they had not subscribed to them previously.

6.8 Summary

This chapter has presented descriptive statistics resulting from a survey of Basic Education Teachers. After presenting a profile of the teachers' background variables, it has reported the results of the analysis of the data.

Frequencies of the use of technology indicated that ICT use was under the mean (2.5). Factor analysis produced two factors, one for ICT items and the second for traditional media. The descriptive statistics showed that only 27.93% of teachers used ICT for instructional purposes and 71.79% indicated that they rarely or never used ICT in the classroom, while 73% of teachers reported that they used Traditional Media regularly (often or sometimes) and 25.48% did not use the Traditional Media. Regarding using computers at home, 79.6% of LRC teachers used computers at home while around two thirds of other subject teachers also used them at home.

Factor analysis for ICT use barriers produced three subscales: Lack of Support, Lack of Resources, and Positive Environment factors. Teachers tended to agree that those factors are barriers to using ICT for instruction. Most teachers agreed that lack of time and lack of availability (access) were the main reasons for not using ICT.

The results also indicated that less than a third of teachers in each subject, except LRC, had received training. Teachers expressed great need for training in Specific areas, General areas, and Classroom needs, even if they had received training before.

Factor analysis on teachers' attitudes toward ICT produced three subscales: Anxiety, Enthusiasm, and Attitudes Needs. The results indicated that teachers had a moderate level (Anxiety agreement average=2.5) of Anxiety and worries about ICT, but they were keen to know more about those technologies and had a high level of enthusiasm towards ICT (Enthusiasm agreement average=4.2). When it came to the reality, they still felt that there were some barriers to their interest and positive attitudes, such as lack of training, and lack of knowledge and skills (Attitudes Needs agreement average=4.3).

Teachers are progressive in general and had positive attitudes toward the new teaching methods.

This chapter has tried to draw a general understanding of Basic Education teachers; their personal characteristics, their level of ICT use, the barriers they face, their training needs and their attitudes toward ICT use and towards the new trends in education in general to have more progressive classes. The results of the first chapter of analysis conclude that those teachers had a low level of ICT use, and still favoured using traditional aids; they faced many environmental barriers, and had many training needs. On the other hand, they tended to be more progressive in their beliefs about education, and were very enthusiastic about integrating ICT into the classroom.

The next chapter will focus more on teachers' ICT use and whether there are differences between teachers according to their background and other variables presented in detail in this chapter, and the predictors of ICT use by Basic Education teachers will be determined.

CHAPTER SEVEN: DATA ANALYSIS

PART TWO

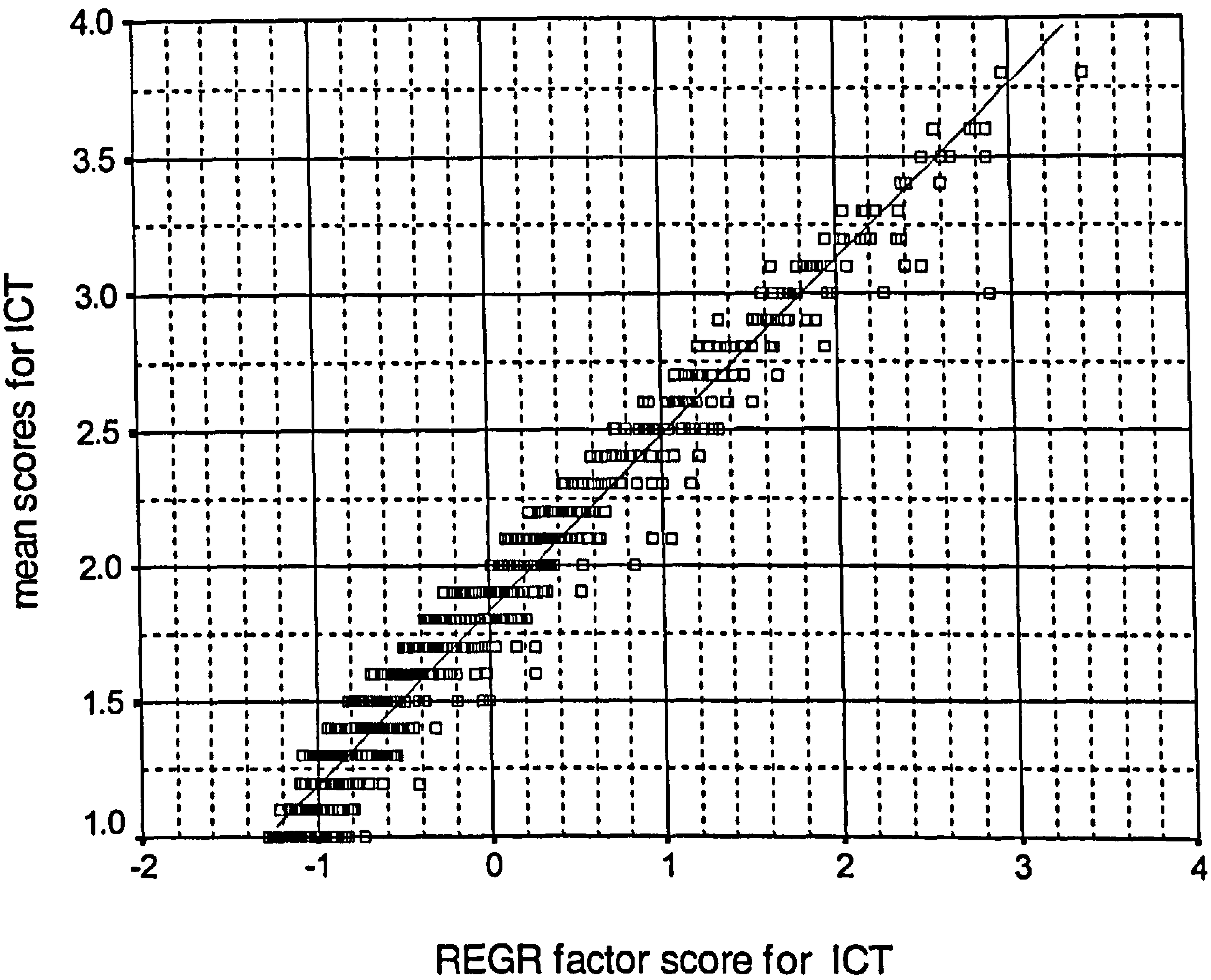
7.1 Introduction

This chapter presents the second and third parts of the analysis of the data. These investigate whether there are any differences in teachers' ICT use according to their background variables, which were presented in chapter six, and the association between ICT use and the other variables in the survey. It also explores whether there are significant relationships between the teachers' use of Modern and Traditional Technology and their attitudes towards using instructional technology with the background variables. The results will be compared with previous research in this field. The final part of the analysis will identify the predictors of ICT use, using regression analysis.

7.2The Relationship Between Instructional Technology Use and Background Variables

The analysis will be carried out using the regression factor scores which were produced by SPSS for factor analysis subscales. These scores are standardized, which means they have been scaled so that they have a mean of zero and standard deviation of one, and about two thirds of the values lie between +1 and -1. The reason for using these scores is that, depending on the loading of items in each factor, each variable in the subscale is weighted proportionally to its involvement in a pattern; the more involved a variable, the higher the weight. There is a high correlation between the mean score for each factor and the factor analysis scores output. Figure 7.1 shows a scatter plot for the mean for ICT and the factor scores produced by SPSS. Converting raw scores into standard scores enables us to work out the exact standing of a particular score in a distribution, using the table in Appendix (3.A) which combines the means of both scores.

Figure 7.1: Scatterplot of the means score of ICT and the Factors scores of ICT



Independent sample t-tests were carried out to investigate if there were significant differences in the use of technology, related to cycle, gender, previous training, using computer at home, and qualification. For the purpose of this analysis the scores for ICT use were re-coded to be 1 (never), 2(rarely, 3(sometimes) and 4(often). (The outcome is shown in Table 7.1)

Table 7.1: T- test for ICT Use, by Cycle

Background Characteristic		N	Mean	Std	T.Value	Sig.
Cycle	First	558	-.117	.985	-5.767	.000
	Second	178	.368	.956		
Gender	Male	68	.717	.958	-6.374	.000
	Female	668	-.073	.975		
Training	Yes	244	.351	1.137	6.345	.000
	No	492	-.174	.874		
Using Computer	Yes	486	.189	1.042	8.099	.000
	No	250	-.368	.791		
Qualification	Higher	277	.165	.969	3.546	.000
	Lower	459	-.099	1.005		

7.2.1 Cycle

Table 7.1 shows that teachers from the second cycle use ICT more than those from the first cycle. The analysis of the usage data by cycle suggests that cycle has a marked impact on teachers' usage of instructional technology.

It might be expected that the nature of the curriculum in each cycle might create specific demands that influence choice and use of a particular item. For example, teaching games and models are most used in the first cycle, as being suitable for students' ages in the first four grades, while learning packages, the internet, and presentation programs will be more suitable to the students in the second cycle, grades 5-10. It is worth noting that most teachers in the second cycle have a university degree and so would have taken courses about the new technology and therefore made more use of ICT items than those in the first cycle.

Table 7.2 shows that there were significant differences (p = .000) between first and second cycle in the qualifications held. The table shows that 23.1% of the first cycle teachers had a higher degree, while 67.9% of them had a qualification below university degree. Most of the second cycle teachers held a higher degree (82.9%), only 17.1% below university level. From year 1998 the Education colleges in Oman started new programmes to graduate teachers for the Basic Education schools. Those teachers started to teach from the year 2001, especially in the second cycle which started in the same year.

Table 7.2: Crosstabulation table for Teachers qualifications and school cycle

CYCLE * qualification Crosstabulation

			Qualification		
			Higher Degree	Below university degree	Total
CYCLE	first	Count	129	430	559
		% within CYCLE	23.1%	76.9%	100.0%
		% within qualification	46.2%	93.3%	75.5%
	second	Count	150	31	181
		% within CYCLE	82.9%	17.1%	100.0%
		% within qualification	53.8%	6.7%	24.5%
Total		Count	279	461	740
		% within CYCLE	37.7%	62.3%	100.0%
		% within qualification	100.0%	100.0%	100.0%

Pearson Chi-Square value=205.605 p=.000

7.2.2 Gender

Table 7.1 shows that there were significant differences between the sexes with male teachers (mean Likert scale value [MLS] 2.4) using ICT more than the female teachers (MLS 1.7). These results are consistent with most of the research on gender differences (BECTA 2002), which tends to show that men make more use of and have more confidence with computers. Female teachers are more familiar with the traditional teaching methods than males. BECTA (2002) in the Computers for Teachers (CfT) scheme found that men use ICT more frequently for administration purposes than women, 71% using it daily, compared to 59% of women. However, in Al-Rashid's (2002) study, females showed more use of ICT than males. Al-Rashid concluded that women showed high use of the internet to obtain information and communication, and for shopping; also, Saudi women found the computer facilities useful in helping them to overcome cultural constraints on movement outside the home and face-to-face meeting, compared with men, who have a wider range of activities open to them. In addition, Al-Rabaiy (2002) in his study about the faculty use of ICT in the Education College in Oman (219 males, 21 females) found that females made greater use of modern technology than males. An interesting result was found by Ruth (2000); his research revealed that women are significantly more willing than men to attribute to the Internet the responsibility for making them more open to new ideas, and are also significantly less likely than men to use the World Wide Web in helping their students, although both men and women use WWW relatively rarely in teaching students.

7.2.3 Previous training

Table 7.1 shows that significant differences were found, at $p<.001$, with trained teachers using ICT more than untrained. Teachers who had received training in ICT use made more use of ICT items (MLS = 2.0) and tools than those who had not received any training (MLS = 1.7), which suggests that training has a positive effect on their use of ICT items. Teachers who have received training feel more confident to use ICT with their students. As one teacher stated:

> I took training by myself; you know I feel I will need it even for writing exams and for preparing the lessons. After that I feel more confident to take my students to the LRC room. (Teacher #17)

The National Centre for Education Statistics (2000) found that, for many instructional activities, teachers who reported feeling better prepared to use technology were generally more likely to use it than teachers who indicated that they felt unprepared. Similar findings regarding teacher preparation were reported in a survey of schools and colleges of education by US Department of Education (1999). This survey found that only 67% of these schools model the integration of instructional technology in their own courses. This study concluded that standalone courses in instructional technology were not sufficient to prepare future teachers to use instructional technology. Integration of technology applications within existing teacher preparation courses was most desirable and had a greater effect on the use of technology in practice.

BECTA (2002) stated that teachers reported greatly improved levels of ability and confidences in many areas of ICT application, such as e-mail, Internet, spreadsheets and word processing after completing the New Opportunities Fund (NOF) training.

7.2.4 Using a computer at home

Table 7.1 shows that teachers who used a computer at home made more use of ICT (MLS = 2.0) than others (MLS=1.6). This familiarity with the computer encouraged them to use it at school, and enabled them to prepare materials for the lesson or search on the net. One teacher explained how he employed his home use of computer for instructional purposes. He said:

> I use the computer at home regularly to prepare for my classes. I use the Internet to find information on the subjects that I am teaching. I also use the word processor and the Draw program to make materials and handouts for my students. (Teacher #23)

This result is consistent with Williams (2000), who found that teachers who use computers at home tend to use ICT more in school. Also The National Centre for Education Statistics (2000) found that 54% of teachers who used computers for instruction also used home computers to a large extent. Kington et al. (2002) found, in the BECTA report of the Department for Education and Skills about the Computers for Teachers (CfT) scheme, that the impact of having computers at home on teachers was that the time spent by many teachers using computers at home increased since they had taken part in the scheme. The majority of teachers felt that having a computer meant that they were increasingly able to organise their own workload more effectively. The impact on their classrooms were: they were able to access a wide range of resources through using the internet regularly for both personal and professional purposes; planning and preparing lessons become possible in the home; and they could increase ICT employment in the classroom. In general, the research provided evidence that personal ownership of a computer through the scheme had positive impacts on participating teachers, their pupils and other colleagues in their schools.

7.2.5 Qualifications

Table 7.1 shows there is a significant difference in ICT use between teachers with a university degree or higher (MLS = 1.8) and teachers with a diploma after secondary school or less (1.9). These results suggest that teachers with a university degree tended to use ICT (the Internet, presentation programs, printer, scanner and photocopier) more than other teachers, which agrees with the results about the relationship between school cycle and the use of instructional technology; the second cycle teachers who were mainly university graduates made the most use of the same items. This can be ascribed to the nature of the second cycle schools, where most of the teachers hold university degrees and have received initial training in using ICT. This result is consistent with that of Al-Rashid (2000) who indicated that teachers who had received an upgrade qualification programme showed higher use of ICT in the classroom than others

7.2.6 Age

Table 7.3 using one way ANOVA, shows that there were significant differences among age groups in ICT use.

Table 7.3: ANOVA test for Instructional Technology Use, by age groups

		df	Mean Square	F	Sig.
ICT	Between Groups	2	7.276	7.402	.001
	Within Groups	733	0.983		

A Tukey test was carried out to shed light on the differences between the age groups. Table 7.4 shows that there is a significant difference in teachers' use of ICT between that of the age group <=25 and that of the other age group, showing that teachers from the age group 25 or less tended to use ICT more than the older teachers did.

Table 7.4: Significant differences in mean scores for use of technology by age groups.

		Mean	<=25	26-30 years	>=31
ICT	<=25	.296		*	*
	26-30	-.063	*		
	>=31	-.071	*		

* indicates a significant difference

These results show that the younger teachers tended to use the computer and the new technology more than the older teachers did. This is probably because younger people tend to be more familiar with computers, because they receive initial training about them in the university; also, they may be more likely to use computers at home. The graph in Fig 7.2 confirms the result that there are differences between the younger group and the other groups.

Figure 7.2: Mean Factor Scores for ICT use by Age

7.2.7 Subject

Table 7.5 presents the results of a one-way ANOVA test on the data about teaching subject and instructional technology use. Significant differences were found, at $p<.001$, for ICT use:

Table 7.5: One way ANOVA test for Instructional Technology Use, by subject.

		Df.	Mean Square	F	Sig.
ICT	Between Groups	4	37.167	46.337	.000
	Within Groups	731	0 .802		

The ANOVA indicates significant differences in the means for ICT, which means that the subject taught has a strong effect on the use of ICT. Table 7.6 gives more details about the differences between each subject in the use of ICT in general.

Table 7.6: Tukey test for significant differences in means in use of ICT by subject.

		Means	Arabic	Maths	English	LRC
ICT	Arabic	-.257		*		*
	Maths	.129	*		*	*
	English	-.159		*		*
	LRC	1.587	*	*	*	

* indicates a significant difference

Table 7.6 shows there are significant differences between teachers of Arabic and Islam and those who teach maths and LRC teachers in their use of ICT. The Arabic and Islamic teachers used ICT less than the Maths and Science and LRC teachers did. It is noticeable that English Language teachers used ICT less than Maths & Science teachers and LRC teachers. LRC teachers used ICT more than all other subjects. As expected, the LRC teachers showed the highest use of the ICT items. The Arabic and Islamic teachers showed the lowest use of ICT. There were also significant differences between Maths and Science teachers and all other teachers in their use of ICT. Maths teachers made higher use of ICT than the Arabic & Islamic teachers and English teachers did. This may refer to their background study in college. Usually, Science departments tend to give students an introduction to computers. Also Science & Maths teachers are more familiar with the machines than others.

This result is consistent with the result of Barron et al. (2003) in a study which focused on teachers' instructional modes related to technology integration. They found significant subject-area differences in teachers' integration of computers in the classroom; science teachers showed higher use of technology as problem-solving and research tools than teachers of other subjects.

7.2.7.1 Experience in Basic Education

One way ANOVA tests were carried out to investigate if there were significant differences in the use of ICT, related to experience in Basic Education. The outcome is shown in Table 7.7.

The table shows that there were significant differences between the teachers with different experience periods in Basic Education.

Table 7.7: ANOVA results for the effect of experience in Basic Education on use of technology

		df	Mean Square	F	Sig.
ICT	Between Groups	2	3.089	3.106	.045
	Within Groups	733	.994		

More details about the statistically significant differences between groups are shown in Table 7.8. The table indicates that there is a significant difference between teachers in their first years in Basic Education and teachers with 3 years or more experience in ICT use; the former use it less than the latter.

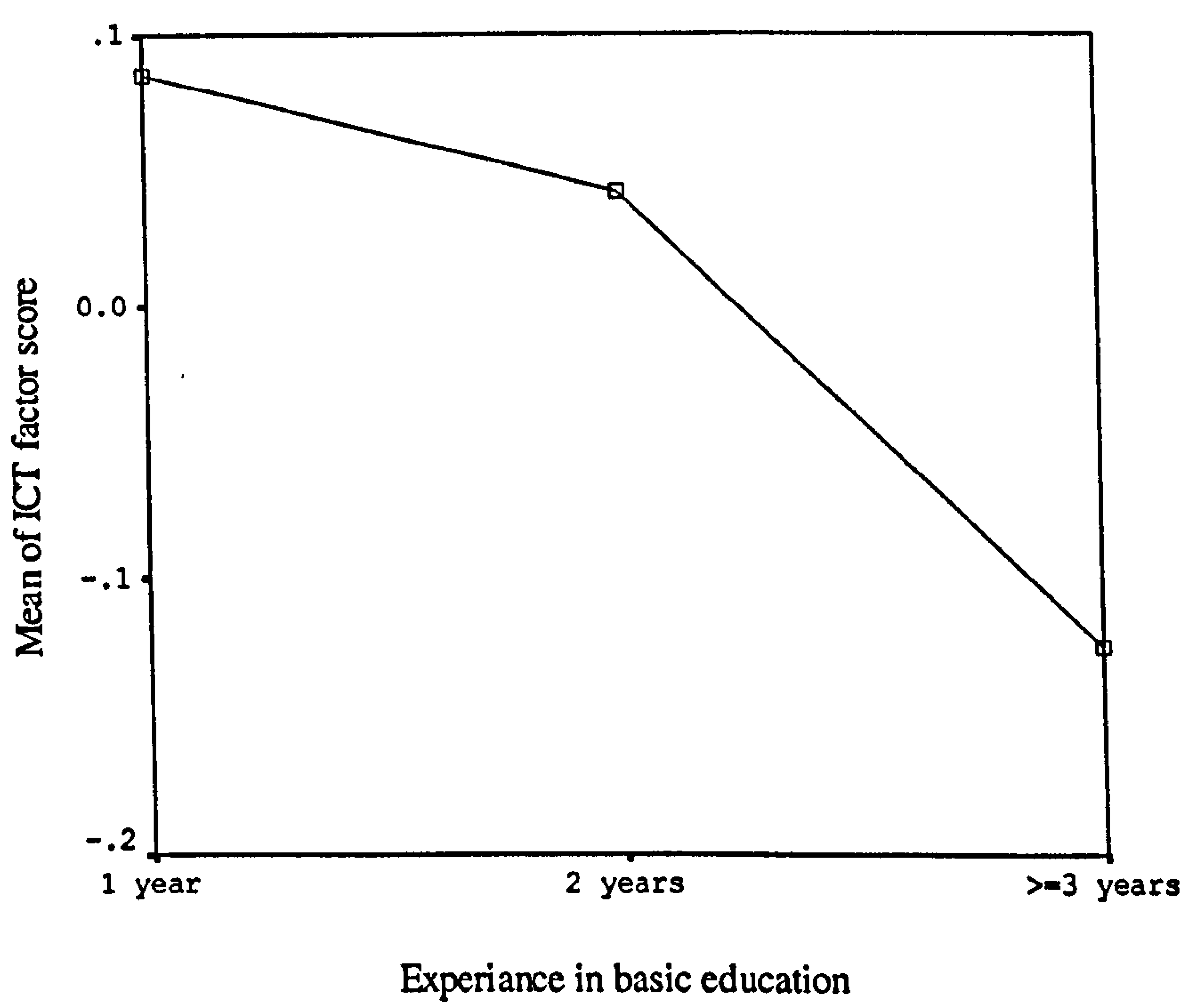
Table 7.8: Tukey test for differences in teachers' use of technology by experience in Basic Education

Factor	years	mean	1 year	2 years	3 and more
ICT	1 year	.085			*
	2 years	.041			
	3 years &more	-.125	*		

* indicates a significant difference

These results are confirmed by the line graph in Fig 7.10 which shows that new teachers made more use of ICT than others.

Figure 7.3: ICT use by Experience in Basic Education



This result is consistent with the result of the National Centre for Education Statistics US (2000), which found that teachers with fewer years of teaching experience were more likely than their more experienced colleagues to indicate that the college work had prepared them to use computers and the Internet, and they used technology more frequently for a variety of purposes (to gather information for planning lessons, create instructional materials, and view best practice examples). Less-experienced teachers indicated they felt better prepared to use computers than did more-experienced teachers.

The results of significance tests on the use of technology with background variables show that teachers' background variables had a strong association with their use of technology. Teachers with higher qualifications and those who taught in the second school cycle made greater use of technology than other teachers.

7.3 Predictors of Teachers' ICT Use

Multiple regression analysis was used to determine which factors were the best predictors of ICT use. The previous chapter (Chapter six) presented the descriptive statistics for predictor variables (attitudes, barriers, and training, philosophy, and background variables). Throughout the discussion the data are divided into the following subject groupings: all subjects, Arabic & Islamic studies, Maths & Science, English Language, and LRC teachers.

Regression analysis, in the form of multiple regression, is regarded as the most widely used and powerful tool for summarising the relationship between variables and for prediction of the dependent variable (Bryman and Cramer, 1997: 256). The main theme of this section is to examine the possible contributions of the independent variables to ICT use. The relative importance of the independent variables to the dependent variables is measured by R^2 (the coefficient of determination), which represents the proportion of the variation in the dependent variable accounted for by the variation of the independent variables (Kennedy, 1998: 13). It is often used as an indication of how well the model implied by the regression equation fits the data. For example, if R^2 of the regression model is 0.49, it can be said that the independent variables entered into the regression equation are providing an explanation of 49% of the variation in the dependent variable. The linear regression model chosen to test the relationship was:

$$y = \text{constant} + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \ldots \beta_n X_n$$

where β_1 to β_n are the regression coefficients and X_1 to X_n are the independent variables entered into the regression equation.

In the computation of the multiple-regression equation, the researcher employed a stepwise procedure to decide the sequence of the entry of variables into the equation. The stepwise selection of independent variables is the most commonly used method in testing regression (Norusis, 1993: 350; Bryman and Cramer, 1997: 267). It is a combination of forward and backward selection. With this procedure, variables are entered in steps, with the variable that exhibits the highest correlation with the dependent variable being entered at the first step, followed by the variable that exhibits the next highest correlation with the dependent variable; and so on, until the regression procedure terminates. The procedure terminates when independent variables fail to conform to the criteria for inclusion operated by the stepwise procedure (Bryman and Cramer, 1997).

A multivariate regression analysis was carried out on the combined data using the environmental factors, attitudes, training needs and the background variables (age, gender, school, cycle, and subject) as independent variables and ICT use as the dependent variable. Prior to the analysis, the data were checked for outliers. Outliers are cases which stand out from other cases within the sample. In univariate analysis, an outlier would be a case which has an extreme value. A multivariate outlier is a case with an unusual combination of scores on two or more variables (Tabachnick & Fidell, 2001:

66). Outliers are known to affect regression analysis. To identify outliers, regression analysis was run on the data, and requests were made for cases that lay more than three standard deviations outside the mean. After removing outliers, regression analysis was carried out again, and this process was continued until no further outliers were found.

7.3.1 All subjects

A multivariate regression analysis was carried out on the combined data using the background variables as independent variables and ICT use as the dependent variable. A stepwise regression was carried out. Table 7.9 shows the results of the analysis. The columns consist of the simple correlation coefficient (r), the unstandardised regression coefficient (B), the standardised regression coefficient (ß), and the semi-partial correlation (sr^2). The table also shows the multiple correlations (R), R^2, and the F value. R^2 measures the contribution that all the independent variables contribute to the variance, and sr^2 is the unique contribution that each independent variable makes separately to the variance. All the background variables were entered in the regression analysis and the stepwise method gave the best predictor variables.

R (regression) was significantly different from zero, $F(15,664)= 34.843$, ($p< .005$). The independent variables contributed significantly to the prediction of ICT use. Altogether, 44% of the variance in ICT use was predicted

Table 7.9: Regression analysis for subjects on ICT use

Predictors	B	Beta	t-Value	Sig.	tolerance
(Constant)	1.837		4.099	.000	
LRC (Subject)	1.451	.355	11.417	.000	.873
Use the computer at home	-.277	-.132	-4.316	.000	.902
Anxiety	-.157	-.156	-5.115	.000	.903
Cycle	.363	.154	4.063	.000	.594
Traditional media	.213	.215	6.383	.000	.742
Arabic studies (Subject)	-.394	-.198	-6.240	.000	.831
P. Training	-.281	-.133	-4.367	.000	.911
Attitudes Needs	-.096	-.097	-3.181	.002	.904
Gender	-.456	-.131	-3.739	.000	.695
Philosophy	.082	.083	2.837	.005	.982
Enthusiasm	.077	.079	2.607	.009	.872
Lack of support	-.092	-.093	-2.970	.003	.930
Classroom Training Needs	.073	.074	2.442	.015	.859
Lack of Resources	-.071	-.072	-2.384	.017	.941
Age	-.016	-.062	-1.988	.047	.927
F(15,664)= 34.843 R=.664 R=.440					

The t-value is an important statistical test, which indicates the statistical significance of individual regression coefficients (Beta). As can be seen from Table 7.9, the coefficient of the independent variables in the model were statistically significant (P- value less than 0.05). This suggests that the calculated coefficients (Beta) for each of the independent variables are unlikely to be zero in the population.

The last column (tolerance) in Table 7.9 provides information about multicollinearity, which refers to the situation in which there is a high multiple correlation when one independent variable is regressed on the others (intercorrelation among independent variables) (Kennedy, 1998; Norusis, 1993). If two independent variables are intercorrelated, they provide very similar information, and it is difficult to determine the contribution of each variable to the dependent variable. The tolerance of a variable is a commonly used measure of multicollinearity (Norusis, 1993: 355). When the tolerance is low (close to zero), the multiple correlation is high and there is the possibility of multicollinearity which renders the results untrustworthy (Bryman et al., 1997; Norusis, 1993). The tolerance for the 15 independent variables included in the model of this study is high (close to one), ranging from 0.59 to 0.98, suggesting that multicollinearity is unlikely and the results are trustworthy.

The multiple regression equation estimated in Table 7.9 suggests several findings. Being an LRC teacher appears to be the best predictor of ICT use (Beta=0.35). Teachers' use of computers at home also appears to be important (Beta=-0.13). Less use of computer at home show less use of ICT at school. The final regression model obtained when all subjects areas were included in this study to predict the dependent variable ICT use is as follows:

ICT use = 1.83 + (1.45 *LRC) –(0.27* home use) – (0.15* anxiety) + (0.36 *school cycle)+ (0.21*using traditional media) – (0.39* Arabic studies) –(0.28* previous training)– (0.09* attitudes needs) – (0.39*gender) + (0.08*teacher philosophy) + (0.07* enthusiasm) – (0.09*lack of support) + (0.07*classroom training needs) – (0.07*lack of resources) – (0.02*age).

The model shows that less anxious teachers who have had previous training and use computers at home are more likely to use ICT. The model shows also that males are more likely to use ICT than females, teachers who teach Arabic studies are less likely to use ICT and second cycle teachers more likely to use ICT than the first cycle teachers.

The other variables in the model which are not strong predictors like these, but are nevertheless statistically significant are: having less needs to become positive towards ICT use; being more progressive; having more enthusiasm; not complaining of lack of support or lack of resources; and thinking that they need to develop their skills by having training in classroom needs. All these variables together predict more use and integration of ICT into teaching.

Being an LRC teacher becomes the strongest predictor in this model because LRC teachers are clearly different from others regarding their duties. They are computer teachers therefore they are far away from other subjects in their use, their training background and their attitudes towards ICT. They use computers every period of every day, and are over the average use of other teachers. The main purpose of this survey is to determine classroom teachers' use. Therefore the next regression models will deal with each subject to concentrate on the predictors of ICT use especially in the normal classrooms, not in the school lab.

7.3.2 Arabic and Islamic Studies

The data were filtered to include the responses of the Arabic and Islamic teachers only. Table 7.10 shows that R for regression was significantly different from zero, $F(8,312) = 18.615$, ($p < .005$). The independent variables contributed significantly to the prediction of ICT use for Arabic & Islamic teachers. Altogether, 32.3% of the variance in ICT use was predicted.

Table 7.10: Regression for Arabic & Islamic Studies

Predictors	B	Beta	t-value	Sig.	tolerance
(Constant)	1.330		3.221	.001	.911
Lack of support	-.225	-.301	-6.234	.000	.540
Cycle	.242	.136	2.141	.033	.758
Traditional media	.201	.238	4.467	.000	.878
Classroom needs	.147	.197	4.077	.000	.792
Gender	-.530	-.205	-3.626	.000	.933
Experience in Basic Education	-.116	-.201	-3.946	.000	.684
Previous training	- .243	-.151	-3.151	.002	.896
Use the computer at home	-.215	-.140	-2.864	.004	.939

Table 7.10 indicates that the tolerance for the 8 independent variables included in the model of this study is high (close to one), ranging from 0.54 to 0.93, suggesting that multicollinearity is unlikely and the results are trustworthy.

The multiple regression equation estimated in Table 7.10 suggests several findings. The best predictor of ICT use by Arabic and Islamic studies teachers is lack of support (Beta= -0.30). One main reason for less use of ICT is the teachers' feeling that they lack support. Teachers' use of traditional media also appears to be important (Beta=-0.24). More use of traditional media shows more use of ICT. Another important predictor is experience in Basic Education (Beta= -0.20), which means that newly graduated teachers made more use of ICT in their subject because they had received initial training in using the new technology in their teaching practice.

The final regression model obtained when just Arabic & Islamic studies subjects area was included in this study to predict the dependent variable 'ICT use' is as follows:

ICT use by Arabic & Islamic studies = 1.33 – (0.22*lack of support) + (0.24*school cycle)+ (0.20*using traditional media) – (0.53*gender) - (0.24*previous training) – (0.215*home use).

The model shows that Arabic & Islamic studies teachers who have had previous training, use computers at home, already use traditional media in their teaching and have less negative feeling about lack of support are more likely to use ICT in their teaching.

7.3.3 Maths and Science Subjects

Table 7.11 shows that R for regression was significantly different from zero, F(9,216)=12.84, (p< .005). The independent variables contributed significantly to the prediction of ICT use for Maths & Science teachers. Altogether, 35 % of the variance in ICT use was predicted.

Table 7.11 indicates that the tolerance for the 8 independent variables include in the model of this study is high (close to one), ranging from 0.77 to 0.98, suggesting that multicollinearity is unlikely and the results are trustworthy.

Table 7.11: Regression for Maths & Science

Predictors	B	Beta	t-value	Sig.	tolerance
(Constant)	.279		.927	.355	
Use the computer at home	-.290	-.146	-2.552	.011	.926
General training needs	-.155	-.154	-2.636	.009	.883
Enthusiasm	.148	.157	2.704	.007	.901
Lack of support	-.173	-.183	-3.085	.002	.860
Philosophy	.155	.166	2.966	.003	.964
Traditional media	.265	.294	4.714	.000	.778
Cycle	.580	.269	4.238	.000	.751
Anxiety	-.156	-.176	-2.973	.003	.867
Previous Training	-.284	-.145	-2.557	.011	.935
			F(9,216)=12.844	R=.590	R^2=.35

The model indicated that Maths & Science teachers who are more likely to use ICT are: familiar with computers at home, have received training, are enthusiastic about ICT and are positive about the provision of support, and already make use of traditional media, show less anxiety toward ICT, and have a progressive philosophy. Also, the second cycle maths & Science teachers made more use of ICT. The regression equation for this model is as follows:

ICT use by Maths & Science teachers = 0.27 – (0.29*home use) – (0.15*general training needs) + (0.14*enthusiasm) – (0.17*lack of support) + (0.15*philosophy) + (0.26*using traditional media) – (0.58*school cycle) – (0.28*previous training).

7.3.4 English Language

Table 7.12 displays the results for a stepwise regression of the background variables, environment factors, attitudes, and training needs on ICT use for English Language teachers. The stepwise multiple regression of all the variables on ICT use produced 5 significant predictors.

Table 7.12: Regression for English

Predictors	B	Beta	t	Sig.	Tolerance
(Constant)	-.872		-3.116	.003	
Anxiety	-.331	-.336	-3.518	.001	.939
Traditional media	.207	.205	2.175	.033	.967
Cycle	.669	.308	3.132	.002	.884
Lack of Support	.209	-.244	2.490	.015	.888
Philosophy	.185	.198	2.115	.038	.977
			F(5,80)=7.356	R=.561	R^2=.315

The multiple regression R was significantly different from zero, F (5,80) = 7.356. Altogether, 31.5% of the variance in ICT use was predicted.

Table 7.12 presents the predictors of ICT use by English Language teachers. English Language teachers who have less anxiety towards new technology, use traditional media, have progressive attitudes and do not think that there is any lack of support are more likely to use ICT. The following regression equation summarises these predictors:

ICT use by English Language teachers = -0.872 – (0.33*anxiety) + (0.21*traditional media) + (0.67*cycle) – (0.21*lack of support) + (0.18*philosophy).

7.3.5 LRC

Table 7.13 shows that R for regression was significantly different from zero, F (6, 37) = 35.9, ($p < .005$). The independent variables contributed significantly to the prediction of ICT use for LRC teachers. Altogether, 80 % of the variance in ICT use was predicted.

Table 7.13 indicates that the strongest predictors for ICT use with LRC teachers are receiving training, having access to the computer at home, and feeling less anxiety.

Table 7.13: Regression for LRC

Predictors	B	Beta	t	Sig.	tolerance
Constant	6.152		10.403	.000	
Previous training	-1.150	-.404	-4.279	.000	.581
Use the computer at home	-1.464	-.473	-5.624	.000	.734
Anxiety	-.312	-.274	-3.285	.002	.744
Gender	-.727	-.205	-2.758	.009	.940
$F(6,37)=35.9$ $R=.89$ $R^2=.80$					

The following regression equation summarises these predictors:

ICT use by LRC teachers = 6.152 – (1.15 * previous training) – (1.47 * computer at home) – (0.31 * anxiety) – (0.78 * gender).

7.3.6 Summary of factors determining use of ICT

Table 7.14 summarises the factors that appear to make a difference in ICT use. The factors are ordered according to Beta value in the regression results for each subject.

Table 7.14: Summary of regression Analysis (by Subject)

Predictors		All subjects	Arabic & Islamic studies	Maths & Science	English Language	LRC teachers
Background variables	Cycle	4		2	2	
	Experience		4			
	Subject	1				
	Gender	7	3			4
Use	Traditional media	2	2	1	4	
Barriers	Lack of support	9	1	3	3	
	Access (home)	6	7	8		1
Attitudes	Anxiety	3		4	1	3
	Enthusiasm	11		6		
	Needs	8				
Training	Previous training	5	6	9		2
	Classroom training needs	12	5	7		
Philosophy	Progressive Philosophy	10		5	5	

Using traditional media appears to be a strong positive predictor for all subjects (except LRC). Perhaps this is because teachers use traditional media in the present more than ICT, and this use encourages them eventually, as opportunities arise, to make more use of modern technology.

Lack of support is a strong negative predictor for ICT use. This means that lack of support appears to be the main barrier to ICT, as shown in the review of literature and the teachers' responses to under-use factors. This support could be in different ways such as administrative, technical, and support in the area of developing their skills and knowledge through guides, workshops and continuously updated in-service training.

When teachers feel that there is support and encouragement, they tend to use ICT more. Therefore schools should encourage and offer support for teachers when they need it. In the new reform, the teachers still need a lot of support and guidance to help them integrate the new technology into their teaching.

Home access seems to be a strong predictor for ICT use. Teachers who use computers at home have the chance to become familiar with new technology. It may not be possible to provide teachers with computers in the classroom in the near future, but encouraging the teachers to use the computer at home will give them the chance to prepare materials and to search on the Web for relevant teaching materials.

If the teachers have support, become familiar with new technology by having access in home and school and receive continuous training, this will help them to be less anxious towards ICT, to be more progressive and open minded and, in the end, will help them to integrate new technology into their teaching to be a main part of the curriculum.

This result is consistent with that of Williams et al (2000), who found that training alone is unlikely to be effective in the development of ICT skills and knowledge, and enhanced use of ICT in schools. A more holistic approach is required; comprising appropriate training, ready access to ICT resources; and ongoing support and advice to encourage progression beyond formal training.

Clark (2000) in his study investigating teachers' use, understanding, and feelings about Instructional Technology found that teachers feel that technology is an integral part of the process of educating their students, and they see a need for more technology in their classrooms. He concluded that teachers are ready to take educational technology to another level. They want technology that can be useful for a multitude of educational processes and research, and they have positive attitudes towards it. However, these positive attitudes could tarnish if teachers are not given opportunities to use and integrate technology in their classrooms, and therefore teachers need support and encouragement.

7.4 Summary

In this chapter, an analysis was carried out by conducting stepwise multiple regressions on ICT use with the independent variables (background variables, environmental factors, training needs, and attitudes toward using instructional technology), individually for each subject and in all combinations. Each subject had its own predictors which can help to understand its special requirements to help teachers use ICT.

In general, support, reduced anxiety, using traditional technology, using a computer at home and having in-service training seem to be the strongest predictors of ICT use in Basic Education schools in Oman. The results of the analysis will be discussed in more detail in the next chapter.

CHAPTER EIGHT: FINDINGS, SUMMARY, AND RECOMMENDATIONS

8.1 Introduction

In this chapter, the researcher provides a comprehensive summary of the main research findings of this thesis. Where appropriate, the implications that these findings have for the implementation of educational computing are highlighted. Some useful recommendations for improvement of the implementation process are then made, taking into account the Omani context. The chapter concludes with suggestions for future research, and the limitations of this study.

8.2 Summary of the Study

This study has explored the use of ICT and its integration in teaching, by Basic Education teachers in Oman. As mentioned in chapter two, one of the main objectives of Basic Education is employing new technology in schools in the transition from the traditional style of teaching and learning to a more progressive environment. The review of the literature showed that there are some independent variables that have been found in other contexts to affect the use of ICT and the level of its implementation. The research has considered these variables, and explored their effect as predictors of ICT use. These variables are: the environmental barriers to ICT use; teachers' attitudes towards ICT; teachers' ICT training needs; and teachers' educational philosophies and beliefs about using progressive methods in teaching.

The main findings of the study were presented in chapters six and seven and were related to previous research in the field. The findings from the questionnaires, interviews and classroom observation were discussed and interpreted in the light of the literature and of the Omani educational and cultural setting. The next section gives a summary of these findings.

8.3 Research Questions

The five research questions posed in chapter one draw a picture of teachers' use of ICT and the factors that enhance or hinder the implementation of ICT in teaching and learning.

8.3.1 Use of ICT

Teachers' use of ICT was considered in this study to be the dependent variable. The questions about ICT use referred to ten modern technology aids and seven traditional media tools. Factor analysis was carried out and the items were divided into two sets, traditional and modern. From Table 6.20 the results showed that on average, only 27.93% of teachers reported using ICT at least once a week (sometimes), while 71.79% did not make use of ICT. This result indicated that teachers' use of ICT is still low. The Modern items were used later on in the analysis as the dependent variable in the regression analysis.

8.3.2 Under-use factors of ICT

A list of 23 factors of different types was presented in a five-point Likert Scale to elicit teachers' reasons for under-use of the ICT items. The factor analysis gave three main factors, which are: lack of support, lack of resources, and a positive technical environment. In the first factor, lack of support, the item "Lack of adequate technical support" had the greatest agreement (M = 4.17). From the interviews with teachers and observation, this barrier appears to be the main factor in the under-use of ICT.

In the second factor, lack of resources, the items: "Not enough funding to provide extra instructional technology equipment" (M = 4.04), and "Lack of time in the computer laboratory timetable for using instructional technology" (M = 4.32) appear to be the main problems causing the under-use of ICT. These results were supported by the interview and observation data.

Finally, in the third factor, teachers tended to agree that a positive environment has a strong effect on their use of ICT.

8.3.3 Teachers' training needs

Lack of established guidelines on instructional technology usage was seen as a barrier to use of ICT in the first factor of the barriers to ICT use, lack of support. This factor highlights the importance of training. Teachers felt that they require guides and knowledge to help them in their usage of ICT. This help could be offered by a suitable amount and quality of training.

The scale consisted of 17 suggested training needs. Respondents were asked to indicate the degree of need for each item, using a 4-point scale. The factor analysis produced three factors: Specific needs, general needs, and classroom activities needs. The teachers showed great needs for all three kinds. Table 5.47 showed that all these needs attracted support from 78% and above of responses except learning about the history of the computer: 60% which indicated that teachers were more interested to learn about computers in practical way to help them in their teaching. This view point agreed with Williams et al. (2000), who also found that primary school teachers were more interested in developing their technical skills and knowledge.

The results from the interviews showed that teachers complained of lack of training in using ICT and familiarity with different software. Even LRC teachers who received training related to the natural of their subject but they still feel that they need continuous training. Robertson et al. (1996) concluded that there is need for adequate and careful training so that teachers become aware of the range of a uses possible ICT.

8.3.4 Teachers' Attitudes towards ICT

Most studies in the review of the literature showed that less anxious teachers tend to integrate new technology more than those with high levels of anxiety do. The research recognised the importance of attitudes as an influence on ICT use. Moseley & Higgins (1999) concluded that teachers who successfully made use of ICT had a positive rather than negative attitude towards ICT. Table 6.46 shows that teachers' attitudes were generally positive. They tended to disagree with the negative items (Anxiety, M = 2.5), and have good enthusiasm (M = 4.3) towards the new technology. They had a strong belief that computers could play an important role in improving the quality of teaching. On the other hand, even if they felt positive towards ICT, they still believed that they needed to develop their skills and knowledge to keep up-to-date with new technology (needs: M = 4.29). This positive attitudes is an encouraging sign that if the other barriers were under control the teachers would make the best of the new technology with the availability of support and training to use ICT.

8.3.5 Teachers' Philosophies

Teachers seem to be progressive in some issues and more traditional in others. Most of them felt that the teachers' role in the classroom should be as a facilitator more than instructor (85.6% to 11.3%). In addition, they believed that to have a variety of activities is better than giving the whole class the same assignment (69.3% to 26%). They also believed that students should be familiar with many different ideas, rather than master a few complex ideas (59.5% to 36.6%). On the other hand, most teachers opposed the idea of letting students move freely around the classroom whenever they want to. This finding was confirmed by the classroom observation, which showed that students moved or talked only during certain activities, or when the teacher asked them to do so. When teachers' philosophy was related to ICT use it indicated that the more progressive Maths and English teachers are more wiling to use ICT. This struggling between traditional and progressive methods of teaching may refer to the reason that teachers still do not have clear idea and view about the new reform in the education system. They are required to teach in progressive ways while some of their beliefs still lie with the traditional way of teaching. Another reason may be that they have the instruction to follow the progressive methods but they do no not have a clear idea how to do it in practical way. According to Fullan (1991) one of the fundamental problems in education reform is that people do not have a clear and coherent sense of the reasons for educational change, what it is and how to proceed, which produced much faddism, superficiality, confusion and failure of change programmes.

8.3.6 Predictors of ICT use

This study discussed a large number of independent variables. The researcher decided to carry out a linear regression analysis to put all the variables in one analysis to predict the variables which had the strongest effect on teachers' use of ICT. All the above variables were included in the analysis, plus the use of traditional media, which appeared as a factor in the ICT items, teachers' home use of computer, and previous training. Some important personal characteristics were also included in the analysis, such as qualifications, school cycle, gender, and experience. Using the stepwise method, the regression analysis was run for different cases, first for all subjects together, then for each subject, because there are significant differences between subjects in their use of ICT. Also LRC teachers, of course, were different from other teachers because of their qualifications and the nature of their work. Table 7.17 presented all the results of the regression, which revealed some interesting points which drive the recommendations of this study:

1. Teachers who use computers at home are more able to use ICT at school. This result agrees with most research which has studied the effect of having computers at home on teachers' use of ICT in the classroom (Dusick, 1998; Williams et al, 2000; Kington, 2002).
2. Those who used traditional media more often made the most use of ICT. This result may indicate that familiarity with the equipment made the teachers less anxious towards the modern technology.
3. Males are more likely to use ICT than females. This result is consistent with most research about gender differences in ICT use which show that males in general have more positive attitudes than females. Also males were found to have higher confidence and lower anxiety then females (Harrison et al, 1997; Shashaani, 1993; Shashaani, 1997; Young, 2000; and Jackson et al, 2001).
4. Teachers with less anxiety are more likely to use ICT. In general teachers' attitudes seems to influence their use of ICT. This result agreed with research which showed that teachers with positive attitudes benefits from the new technology more than others (Yildirim, 2000; Simpson et al, 1999; Reynolds et al., 2003).
5. Lack of support is a main reason for the under-use of ICT. Most of the studies show that lack of support was a particular problem of ICT use and integration. The support could take various forms, such as technical support, peer support and administration support (Robertson et al. 1996, Saye, 1998; Williams et al., 2000; Reynolds et al., 2003).

Those results indicate that those who have received training, use computers at home, have low anxiety, and feel that they have support are more likely to use ICT than others.

These results led the researcher to formulate the following recommendations to improve teachers' level of technology use.

8.4 Recommendations

The above discussion has a number of educational implications. These recommendations are formulated for teachers, head teachers, educational supervisors, and administrators in the Ministry of Education.

- **Ongoing support is an essential component of ICT development**

Head teachers, supervisors and administrators have a particular role to play in stimulating environmental support. Teachers want to feel that they are supported in progressing their ideas as far as possible. When those in authority are willing to perform a small first step, it must not be assumed that further steps will follow by chance. There must be a concerted effort to continue proposing changes and to support those proposals with evidence of the need for computer use in education, and its benefits. Appeals to using computers 'just because they are great' will not convince anyone that they are needed. The advantages of using computers must be plainly shown. This may become easier as more effective software and hardware is developed and marketed. Administrators must be shown how computers actually help meet instructional goals and help students learn.

Realistic, detailed proposals must be presented on a regular basis, along with hard evidence to support them. Those who agree with the proposals must be convinced to encourage approval of such proposals. Funding ideas must be developed to encourage the approval of proposals. It must be understood that a college of education that does not use computers is not meeting the minimum professional preparation criteria that are being added to public and private credential requirements across the country.

Head teachers have a particular role to play in encouraging the use of ICT. They, in turn, need to be aware of the benefits of ICT across the school, in all contexts, and can set examples by being seen to be using ICT themselves where appropriate.

Technical support is an essential component: mechanisms need to be put in place to ensure that teachers have adequate access to technical support and advice, and to ensure that teachers do not feel that they have to become technical experts themselves. The support need not only be in the form of an in-school technician, but could take the form of one designated individual who also networks with others with similar roles. Mechanisms should be put in place to support teachers in identifying, selecting and evaluating the ICT resources appropriate to their needs. Methods which allow teachers themselves to disseminate their knowledge and critical appraisal of materials, are likely to be particularly effective. Preparing LRC teachers in each school to face the technical problems would help to save a lot of time and money.

One solution, suggested by Hawkins (2002) is to give students more responsibility for maintaining the labs. Many students are as or more adept with the technology than the "professional" technicians who are often hired. An example of such a programme is the "Kids on the Block" initiative in Namibia, in which School Net Namibia works with youth to provide them with the technical training necessary to refurbish, install, and maintain the school computer labs. Providing students with some basic training and a whole lot of trust can save a school and a school system time and money. Other solutions, however, must also be evaluated, such as additional training for technical staff in schools and administration offices and outsourcing this technical support to private organizations.

- **Availability and ready access to ICT resources are main factors in encouraging teachers to use and employ Technology into classrooms**

It was mentioned in the Plan for Basic Education that by completion in 2002, all schools would have, in addition to the station network in the LRC, one or two computers in every classroom. However, this has not been achieved, as the present study showed from the observation and teachers' interviews. The limited number of computers in each school creates problems for teachers, as they do not have access to computers when they want and need it. Therefore, the Ministry of Education need to take important steps to improve the plan of Basic Education in Oman as follow:

1- A first realistic step to achieve this is to provide schools with more than one lab to provide teachers and students with ready access when needed without wasting time waiting for one room to be free depending on the timetable.

2- Provide teachers in their meeting rooms with computers to prepare the materials they need and to help each other exchange their experience and knowledge.

3- Connect all schools to the Internet. Actually this is available in some schools in Oman but this service is available to the administrative staff only to receive e-mails from the ministry which mean that it should be expanded to include teachers and students.

However, the government must also provide enough money to cover the cost needed for this plan of training.

- **Providing teachers with computers at home will give them more access to the computer (BECTA).**

From the regression analysis results, using a computer at home was an important predictor for ICT use. Also, Table 7.1 shows that those who use computers at home tend to use then more at school; it helps teachers to become more familiar with then and less anxious. In addition, teachers can prepare materials for class work; they can search for resources on the internet and share ideas with other teachers. In the UK, the Computers for Teachers (CfT) scheme, which gave teachers subsidies to help them to purchase personal computers, increased teachers' confidence and competence in using ICT in their teaching. In Oman, the government has started to support teachers who would like to buy personal computers by cooperation with computer dealers to give teachers special offers. Form this study around two thirds of teachers used computers at home (Table 6.8) which means that they are interested in dealing with the new technology and so the Ministry plan would encourage those who are thinking about starting to use it.

- **Teachers need to be provided with ongoing training and professional development**

Teachers who have had previous training tend to use ICT more often than those who have not received any. With the rapidly changing world of technology, a one- time or short course training would not be enough for those teachers who are looking to develop their skills and knowledge. Therefore, teachers really need ongoing training to cope with developments in the technology world. Williams et al (2000) recommended some useful conditions for planning for future training. It should:

- be designed to increase familiarity with a wide range of ICT;
- be focused on the types of ICT resources available to teachers in school: training in the use of ICT resources before they are available to teachers on a day-to-day basis will result in demotivation and wasted effort;
- be flexible, allowing choice and guidance where appropriate for teachers who are at different stages of ICT literacy and information literacy, who

teach different levels and curricula, and who are at different stages in their own career progression;

- encourage teachers to reflect on, and make decisions about their own ICT development needs on an ongoing basis;
- focus on ICT as a tool for lifelong learning for teachers as well as for the pupils.

The following suggestions are offered in direct response to an administrative decision to study the addition of computers to teacher education further before approving implementation fully. The definition of computer literacy and instructional objectives based upon it should be reviewed annually to identify out-of-date components and new information that should replace those old components. The curriculum should be modified accordingly. The instructors of the education computer courses should coordinate this effort. Faculty members in teacher education need to be included in this process, since they ought to know their various disciplines best, as well as the most recent applications developed for those disciplines. If the objectives of computer training are not revised, they could produce negative results as the skills become obsolete. In other words, the proposal to add computer literacy to teacher education must be the start of an ongoing effort.

Those who do have a vision for integrating computers in education must work to convince those in administrative positions of its value in teacher education. To assist in this effort, those who use computers must commit themselves to helping to train other teacher educators. They must encourage the use of computers in their own non-computer courses. They should present positive examples to encourage pre-service and in-service teachers who want to use computers more. They should encourage students to request more computer training in their education courses. Administrators often react to the demands of students, who are the customers, to avoid the potential loss of students by ignoring such needs.

The computer is one of the most amazing tools ever conceived by man. It is, however, a complicated technology that places a high value on training. If the school board members, supervisor, and principals of Basic Education Schools are truly interested in computer use and integration into classroom instruction, a new organizational value should be placed on training. This would require some new and fundamental budget changes. It would require that a much larger percentage of the technology budget be spent on training. Computer repair, computer replacement, and support contracts would have to continue, but procuring new computers and equipment would be halted for a time (e.g., year, budget period, and biennium).

The training timetable is very important for both teachers and administrators. Teachers are looking for helpful training, but at the same time, they do not want to be overloaded with a heavy training commitment in relation to their school duties. Administrators want training which can be fitted around the teachers' timetable and does not cause any disruption in covering the curricula. Therefore, training could begin before the start of school. During the summer, teachers who were classified as non-users or beginners could be required to attend (with pay) a basic computer skills class with a classroom teacher as the instructor. During the opening workshops at the beginning of the school year, traders could be invited to display new hardware and software by grade level and curriculum. There could be one for each grade level, from grade 1 to grade 10. They could be scheduled by curriculum area.

After teachers have chosen the software that fits the curriculum, a series of training sessions with classroom teachers as trainers could be arranged. These sessions could be scheduled for half day each week during a semester. Substitutes could be used to cover classes while teachers were being trained. A second group could be trained during the second semester.

Meeting for half a day per week would allow the teachers to try out what they have learned in their own classrooms, and return to class the next week to share experiences and problems. Ten classes could be taught per semester, with one in the morning and one in the afternoon, from Saturday to Wednesday. During the next summer, a cadre of teacher-trainers would be sent to software companies to train (salary plus expenses) in the use of new software packages for the next round of training. Teacher evaluation forms could be changed to include computer use as an observation goal.

At the end of the first year, a study similar to this present one could be conducted to measure computer use in classroom instruction. If a significant increase were recorded, the process could be repeated until an acceptable amount of use was attained. A significant change in the organizational value of computer training would be realized. When teachers see the value that the school board members, superintendent, central office staff, and principals have placed on computer training, they will place a new value on the need for computer integration into classroom instruction. Once the values of the technology and the school system match, computer use in classroom instruction should improve.

- **Give special attention to female teachers to develop their skills and make them experience less anxiety toward ICT**

In this study, males showed more use of ICT, which means that females need more encouragement and training. In the first cycle (Grade 1-4) all teachers are females and so they should have special consideration in the area of ICT use. Training should be concentrated in the beginning on how using the new technology could be interesting for them, being an active way for communication with others, and how they can benefit from the internet in their social life and in their work. According to Al-Rashid (2002) women in Saudi Arabia were more interested in using computers because it gave them the chance to communicate with others and it was an easy way to do their shopping on the internet.

8.5 Considerations for Future Research

This study can be considered the first of its kind in two ways. First, it is the first in Oman to study ICT use in Basic Education schools, considering very important variables such as training needs, teachers' attitudes towards ICT, school environment factors, and a very important variable, which is teachers' philosophies and beliefs about education issues in the age of technology. Second, it is the first study that analyses ICT use using regression analysis to predict the independent variables that have most effect on teachers' use of ICT.

While this study has confirmed, or reconfirmed, many of the findings in other studies, there are several areas for possible future research. While this study is a start at looking at how Basic Education schools integrate technology, it should be expanded and continued. This research was limited only to first and second cycle schools in Oman.

Such research needs to be extended to all grade levels and to other types of schools, urban, rural, private, etc. The same scales that were described in chapter four would be used to measure teachers' implementation of ICT.

More research is needed to determine which specific methods of computer integration are most effective for teaching which kinds of topics in Basic Education. While many applications exist, there is little empirical support to validate the use of computers in many applications. There should be continued research on what methods can have a positive influence on teachers with different philosophies of education. For example, stating that computers can transform education will have a negative impact on teachers who have a traditional philosophy of education.

Research should be conducted to study the effects of providing training that is required for teachers and for teacher educators. Will attitudes toward computers and levels of confidence be improved or harmed by requiring computer training?

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Appendix 1.A Teacher Questionnaire (English Version)

Survey questionnaire for the Basic Education teachers in Oman

The Implementation of ICT in the Basic Education Schools in Oman

Dear Colleagues:

This questionnaire is a part of my research work at the University of Hull (UK). I would be grateful if you could spare the time to complete and return it to me. Your response will be treated confidentially.

The purpose of my study is to study the computer awareness of the teachers of basic education in Oman. It also intends to investigate teachers' ideas about the strengths and weaknesses concerning the introduction of IT in the Oman basic education schools and finally, to support the implementation and development of new technologies in the Oman educational system. Your contribution is very important indeed to the research.

Would you please complete all details by / / 2002, when I will come to collect the questionnaire from you.

I thank you in advance for your valuable contribution.

Yours sincerely,
Amal O. Al-Majeeni

Section one: You and Your Teaching Experience

Please Tick in the relevant details by the category that best describes you:

1. School:---------------------- Area:-------------- Cycle:--------
2. What is the location of your current school?

RURAL	☐	CITY	☐

3. Nationality

OMANI	☐	NON OMANI	☐

4. Gender

MALE	☐	FEMALE	☐

5. What is your date of birth?--------/------/19---.
6. Are you?

TEACHER	☐	SENIOR TEACHER	☐

7. What subjects are you currently teaching?---------

8. Which of the following educational qualifications do you have?
   a) Master Degree
   b) Higher Diploma ☐
   c) University educational degree ☐
   d) University degree ☐
   e) Diploma after secondary school ☐
   f) Teachers diploma (secondary level) ☐
   g) Secondary school ☐
   h) Less than secondary level ☐
   i) Others (please state)---------------, ☐

9. Last qualification: Year Obtain : ----------------------,
   Place of study : ----------------------,
   Field of study : ----------------------.

10. How long have you been teaching:
    In general education: ------------------------,
    In Basic education: ------------------------.

Section Two: Teachers' Use of Technology

During this academic year (2002/2003), how frequently, on average, did you use any of the following items of Instructional Technology in your teaching? Please, tick the appropriate frequency box, to indicate how often you used each of the 20 items below:
Equipment

NO	EQUIPMENT	OFTEN	SOMETIMES	RARELY	NEVER
1	Educational Films				
2	Audiocassettes				
3	Overhead Projector				
4	Teleconferencing via Satellite				
5	Learning Packages				
6	Word Processing (e.g. Microsoft Word, Word Perfect)				
7	Spreadsheet (Microsoft Excel, Lotus)				
8	Presentation Program (e.g. Microsoft Power Point‹ Freelance Graphics)				
9	Computer-based assignment				
10	Internet for extra teaching materials				
11	CD-ROMs/Multimedia system				
12	Video Camera				
13	Scanner				
14	Printer				
15	Photocopier				
16	Maps, Pictures or Stickers				
17	Whiteboard/Blackboard				
18	Teaching games				
19	Models				

Section Three: factors influence the use of instructional technology

How well, in your opinion, does each of the following statements suggesting possible factors influencing the use of instructional technology in teaching apply in basic education schools? Please respond to the statements in terms of your experience of teaching in these schools. Kindly use the following scales:

SA= Strongly Agree, A= Agree, U= Undecided, D= Disagree, SD= Strongly Disagree.

NO	STATEMENT	SA	A	U	D	SD
1	Limited access to Instructional technology.					
2	Not enough computer software programming.					
3	Lack of time in the computer laboratory timetable for using instructional technology.					
4	Lack of adequate technical support.					
5	Not enough funding to provide extra instructional technology equipment.					
6	Instructional technology is available when needed.					
7	Difficulty of moving instructional technology items to and from classrooms.					
8	Lack of planning in school on use of instructional technology.					
9	Little encouragement and administrative support for classroom use of instructional technology.					
10	School is not fully aware how to use and operate items of instructional technology.					
11	Classrooms are suitable for the use of instructional technology.					
12	Lack of software programs written in Arabic.					
13	Good quality equipment.					
14	Students' lack of basic instructional technology skills.					
15	Not having enough information about the materials available.					
16	Large number of students in classroom.					
17	Enough resources that illustrate how to integrate instructional technology into the curriculum.					
18	Regular Maintenance to the equipment.					
19	Lack of suitable software programs in the area I teach.					
20	Lack of established guidelines on instructional technology usage.					
21	There is a sufficient amount of technological equipment available in my school to aid and improve students learning.					
22	My school has added some very usable computer hardware for teachers to use in the last two years.					
23	New computer users in my school receive help from experienced personnel who know who to use computers.					

Section four: Teachers' View of Technology

The following statements represent varying points of views about the use of instructional technology, please, respond according to your degree of agreement with each statement. Kindly use the following scales:

SA= Strongly Agree, A= Agree, U= Undecided, D= Disagree, SD= Strongly Disagree.

NO.	STATEMENTS	SD	D	U	A	SA
1	Instructional technology could help me with my teaching.					
2	Teachers should continuously search for new ways to use instructional technology in the class room.					
3	Teaching plans should include instructional technology every day.					
4	The use of instructional technology improves the quality of students learning.					
5	I need additional knowledge and skills in the preparation and utilization of instructional technology.					
6	A computer takes too long to master and produce too few results to be a worthwhile teaching tool.					
7	I feel comfortable using technology in the classroom.					
8	I am eager to apply computers and related technologies to facilitate emerging roles of the learner and myself.					
9	I feel instructional technology isn't appropriate to my teaching.					
10	I feel I should develop my skills to keep up to date with development in teaching.					
11	I need to develop my skills and knowledge for the pupils' benefit.					
12	I'm interested personally but developing my skills and knowledge in instructional technology isn't appropriate to my teaching.					
13	I'm interested but training doesn't seem to be available.					
14	I'm not that interested but I suppose I should be.					
15	I'm interested but I do not have the time.					
16	Instructional technology can be used to motivate students and enhance their learning experience.					
17	I prefer using it on my own when no one is around to see me make mistakes.					
18	I feel lost in the information age.					
19	Instructional technology encourages pupils to work together collaboratively.					
20	Instructional technology is difficult to use.					
21	Instructional technology can save a lot of teaching time.					
22	Instructional technology can be useful in almost all subject areas.					
23	Instructional technology can be used to meet individual student needs.					
24	I prefer to use the textbook instead of the new technology.					
25	I consider it takes me a long time to prepare technology materials for teaching.					
26	I find it easy to select appropriate instructional technology resource for my teaching.					

Section Five: Instructional Technology Training

1. training background

In this section we wish to know about the training you have received in instructional technology, Please Tick in the relevant details by the category that best describes you

1. Have you ever been given a course in the instructional technology?
   a) Yes ☐
   b) No. (please go to Q 5 in the same section) ☐

2. If the answer of the previous question was yes was it:
   a) Not useful at all. ☐
   b) Useful to some extent ☐
   c) Average. ☐
   d) Useful to a grate extent ☐
   e) Excellent. ☐

3. The in-service training programs you have attended were: (tick all answers that apply)
   a) Meeting individual needs in your job. ☐
   b) Fit your time schedule. ☐
   c) Have upgrade information. ☐
   d) Have hands-on experience ☐
   e) meeting individual needs of your students ☐
   f) Purpose/application off technology was made clear in teaching process ☐
   g) Other ☐

4. Do you feel that you need training in the use of instructional technology?

Yes	☐	No.	☐

5. Do you use the computer at home?

Yes	☐	No.	☐

2. Training needs

Please rate your need for computer training in each area by circling the response that most closely corresponds to your assessment for each topic:

4= Great need
3= Some need
2= No need
1= Cannot answer-No knowledge

NO		4	3	2	1
	To select appropriate teaching materials for a selected subject.				
	To operate and use the instructional technology available in your school.				
	To match teaching materials to learners' abilities.				
	Knowing how to program in a computer language.				
	Knowing how to get information in and out of a computer.				
	Knowing how to select educational computer software.				
	Learning about the history and the development of computers.				
	Knowing how to use a computer as a means of teaching problem solving.				
	Knowing how to use the computer to help with class housekeeping chores (i.e., attendance, student records).				
	Knowing how to apply the computer to evaluate students' abilities.				
	Knowing how to apply the computer to diagnose students' needs.				
	Knowing how to use multimedia.				
	Knowing how to use a spreadsheet.				
	Knowing how to use word processing.				
	Knowing how to use a database.				
	Knowing how to use a computer for presentation.				
	Knowing how to benefit from the internet.				

Section five: Teachers views and opinion about educational issues

5.1 Teaching Aims

The following are probably all worthwhile teaching aims, but their relative importance may, be influenced by the situation in which the teacher work.. Please rate each aim on the five-point scale to indicate it. Importance in relation to your class. Kindly use the following scales:
SA= Strongly Agree, A= Agree, U= Undecided, D= Disagree, SD= Strongly Disagree.

No.	Statement	Not important	Fairly Important	Important	Very Important	essential
1	An understanding of the world in which pupils live.					
2	The acquisition of basic skills in reading and number work.					
3	The development of pupils' creative abilities.					
4	The encouragement of self-expression.					
4	Helping pupils to co-operate with each other.					
5	The acceptance of normal standards of behaviour.					
6	The enjoyment of school.					
7	The promotion of a high level of academic Attainment.					

5.2 Opinion about Education Issues

Please indicate the strength of your agreement or disagreement with the following statements, kindly use the following scales:
SA= Strongly Agree, A= Agree, U= Undecided, D= Disagree, SD= Strongly Disagree.

NO.	STATEMENT	SD	D	U	A	SA
1	Most pupils feel more secure if told what to do and how to do it.					
2	Creativity' is an educational fad, which could soon die out.					
3	Firm discipline by the teacher lead, to good self discipline on the part of the pupil.					
4	The teacher should be well liked by the class.					
5	Children working in group' waste a lot of time arguing and 'messing about'.					
6	Pupils work better when motivated by marks or stars.					
7	Too little emphasis is placed on keeping order in the classroom nowadays.					
8	Teachers need to know the home background and personal circumstances of their pupils.					

5.4 Teaching Philosophy

In the following statements different teachers have described very different teaching philosophies, for each of the following pairs of statements, check the box that best shows how closely your own beliefs are to each of the statements in a given pair, the closer your beliefs to a particular statement, the closer the box you check. Please ☑ only one for each set.

		1	2	3	4	5	
a.	I mainly see my role as facilitator.	☐	☐	☐	☐	☐	I see my role as academic instructors.
b.	I try to provide opportunities and resources for my students to discover or construct concepts for themselves.	☐	☐	☐	☐	☐	I think students really will not learn the subject unless the teacher goes over the material in a structured way; it is my job to explain, to show students how to do the work, and to assign specific practice.
c.	The most important part of instruction is the content of the curriculum.	☐	☐	☐	☐	☐	The most important part of instruction is that to encourage "sense-making" or thinking among students. Content is secondary.
d.	It is useful for students to become familiar with many different ideas and skills even if their understanding, for now is limited.	☐	☐	☐	☐	☐	It is better for students to master a few complex ideas and skills well, and to learn what deep understanding is all about.
e.	I think a quiet classroom is generally needed for effective learning.	☐	☐	☐	☐	☐	Students will take more initiative to learn when they feel free to talk together and move around the room during class.
f.	It is a good idea to have all sorts of activities going on in the classroom.	☐	☐	☐	☐	☐	It is more practical to give the whole class the same assignment, one that has clear directions, and one that can be done in short intervals that match students' attention spans and the daily class schedule.
g.	I prefer to lead a whole-class discussion, asking questions that the students could answer quickly.	☐	☐	☐	☐	☐	I prefer the students led a discussion and the questions come from the students themselves.
h.	Teachers know a lot more than students do; they should not let students muddle around when they can just explain the answers directly.	☐	☐	☐	☐	☐	Students gain more knowledge from discovery learning, it is meaningful to raise questions and let the students discuss the problem among themselves in small groups.

Thank you very much for your assistance

Appendix 1.B Teacher Questionnaire (Arabic Version)

استبيان مقدم إلى مدرسي التعليم الأساسي فـي سلطنـة عُمـان

التاريخ : 2003/4/5

<u>*الموضوع : واقع تكنولوجيا التعليم في مدارس التعليم الأساسي في سلطنة عُمان*</u>

إلى الزملاء المعلمين والمعلمات المحترمين

تهدف هذه الدراسة إلى التعرف على واقع تقنية المعلومـات وإستخدامات الحاسب الآلي في مدارس التعليم الأساسي للوقوف على المشكلات التي يواجهها القائمون بالتدريس في هذه المدارس حول مدى توافر هذه التقنيات وإمكانيات إستخدامها وطرق توظيفها في مجال التدريس توظيفا نظاميا وكذلك دراسة تلك المعوقات لأجل تحسين مستقبل العملية التربوية بشكل عام والممارسات التدريسية بوجه خاص.

هذا الاستبيان هو جزء من دراستي لنيل درجة الدكتوراة في مجال التربية من جامعة (Hull) بالمملكة المتحدة والرامية لمعرفة مدى إستخدام تكنولوجيا التعليم في مدارس التعليم الأساسي.

ولأهمية هذا الاستبيان في البحث الذي أعده أرجو منكم شاكرين التكرم بتعبئته وإنكم تدركون أهمية الاستبيانات في إكمال البحوث الدراسية. ولذلك فإنني على ثقة بأنكم لن تألوا جهداً في مساعدتي ودعمي في هذا البحث والذي أرجو أن يكلل بالنجاح ولن يكون مساهمة مني في سبيل تطوير التعليم في بلادي . وسوف يساعدني هذا الاستبيان على معرفة وإدراك نقاط الضعف والقوة المتعلقة بإدخال تقنية المعلومات في مدارس التعليم الأساسي في السلطنة .

رجائي من المعلمين والمعلمات إجابة جميع محتوى هذا الاستبان بكل موضوعية من خلال خبراتهم وتجاربهم في مجال التدريس. مع التنويه بأن جميع البيانات لن تستخدم إلا لخدمة البحث العلمي فقط ولن يطلع عليها سوى الباحثة.

وتفضلوا بقبول فائق الاحترام ،،

أمـل المجينـي

القسم الأول :- معلومات شخصية تشمل الخبرة في مجال التدريس :

أرجو التكرم بتعبئة المعلومات التالية، وذلك بوضع ☑ في المربع المناسب.

1- المدرسة : .... الحلقة.................................. المنطقة : ....

2- الجنسية:	عماني	☐	غير عماني	☐
3- الجنس:	ذكر	☐	أنثى	☐

4- تاريخ الميلاد :.....................19

5- الوظيفة:	معلم	☐	معلم أول	☐

6- المادة التي تقوم بتدريسها حاليا:.................................

7- المؤهلات العلمية :

أ.	الماجستير	☐
ب.	دبلوم عالي بعد الجامعي	☐
ج.	جامعي	☐
د.	دبلوم معلمين بعد الثانوية	☐
ه.	دبلوم معلمين (مستوى ثانوية)	☐
و.	ثانوية عامة+ دورة تدريبية	☐
ز.	أقل من الثانوية	☐
ح.	أخرى (حدّد) --------------------	☐

9- *آخر المؤهلات التي حصلت عليها :*

السنة : ....

مكان الدراسة : ....

مجال الدراسة : ....

10- عدد سنوات الخبرة العملية في مجال التدريس مع السنه الحالية :

في التعليم العام : ....

في التعليم الأساسي : ....

القسم الثاني : استخدام تقنية المعلومات :

خلال تدريسك في هذا العام الدراسي (2003/2002) حدد متوسط استخدامك للوسائل التعليمية الواردة في الجدول التالي، الرجاء وضع علامة (✓) تحت البند المناسب لاستخدامك

م	الوسيلة	دائما	أحيانا	نادرا	لاأستخدم
1-	الأفلام التعليمية				
2-	الشرائط السمعية				
3-	جهاز عرض الشرائح التعليمية الشفافة				
4-	التلفزيون التعليمي				
5-	برامج الحاسب الآلي التعليمية				
6-	معالج و منسق الكلمات (Word Processing)				
7-	برنامج الجداول الرياضية (Excel)				

8-	برنامج تقديم وعرض المعلومات (power point)				
9-	الإنترنت (خدمات شبكة المعلومات) للتعليم				
10-	الأقراص المبرمجة للتعليم(CD-ROMs)				
11-	كاميرا الفيديو				
12-	الماسحة الضوئية				
13-	الطابعة				
14-	الآلة الناسخة				
15-	الخرائط الصور والملصقات				
16-	السبورة (البيضاء أو السوداء)				
17-	الألعاب التعليمية				
18-	النماذج والمجسمات				
19-	مختبر اللغة				

القسم الثالث : العوامل المؤثرة على إستخدام تقنية التدريس :

من وجهة نظرك هل تؤثر العوامل المدرجة في الجدول أدناه على مستوى ا ستخدامك لتقنية المعلومات في التدريس في مدارس التعليم الأساسي. الرجاء وضع (✓) في البند المناسب من خلال خبرتك في مجال التدريس.

م	العبـــــارة	أوافق بشدة	أوافق فقط	لا قرار	لا أوافق	لا أوافق بشدة
1-	صعوبة الحصول على الوسائل التعليمية المناسبة.					
2-	عدم كفاية برامج الحاسب الآلي المتوفرة.					
3-	عدم توفر الوقت الكافي في الجدول المدرسي لاستخدام مختبر الحاسب الآلي.					
4-	عدم وجود الدعم الفني الكافي والتدريب لتعلم كيفية إستخدام التقنية.					
5-	عدم توفر التمويل الكافي لتوفير معدات مناسبة.					
6-	عدم توفر التقنية عند الحاجة إلى إستخدامها.					
7-	صعوبة نقل الأدوات من والى الفصول.					
8-	سوء التخطيط لاستخدام التقنية في المدرسة.					
9-	عدم توفر التشجيع والدعم الإداري الكافي.					
10-	عدم توفر المعرفية الكافية لاستخدام وتوظيف التقنية في المدرسة.					
11-	بيئة الفصول مناسبة لاستخدام التقنية.					
12-	عدم توفربرامج الحاسب الالي المكتوبة باللغة العربية.					
13-	توفر معدات جيدة النوعية.					
14-	نقص المهارات الأساسية لدى الطلبة لاستخدام تقنية المعلومات.					
15-	عدم توفر المعلومات الكافية حول المواد المتوفرة في المدرسة.					
16-	ازدحام الفصول بالطلبة بأعداد كبيرة.					
17-	وجود معلومات كافية لتوضيح كيفية توظيف الوسائل التعليمية في المنهج.					
18-	الصيانة المنتظمة للمعدات.					
19-	قلة برامج الحاسب الالي التي تدعم المواد التي أدرسها.					
20-	نقص الارشادات في كيفية استخدام تقنية المعلومات.					
21-	وجود معدات كافية في المدرسة لمساعدة الطلبة وتحسين تعليمهم .					
22-	توافر أجهزة حاسب آلي لاستخدام المدرسين.					
23-	المستخدمين الجدد للحاسب الآلي يتلقون المساعدة من الذين لديهم خبرة في استخدام الحاسب الآلي في المدرسة.					

القسم الرابع :الأتجاهات نحو إستخدام تكنولوجيا التعليم

يرجى وضع (✓) على المعلومات المناسبة التي توافق عليها حسب درجة موافقتك عليها :

م	العبـــــارة	أوافق بشدة	أوافق	لا قرار	لا أوافق	لا أوافق بشدة
1-	استخدام تقنية المعلومات يساعد على تأدية مهام التدريس بشكل جيد.					
2-	على المدرسين البحث باستمرار عن الاساليب الجديدة لاستخدام التقنية في الفصول.					
3-	خطة الدرس اليومية يجب أن تتضمن استخدام الوسائل التعليمية.					
4-	استخدام التقنية يحسن من مستوى تعلم الطلبة.					
5-	احتاج لمزيد من المعرفة والمهارات في اعداد واستخدام التقنية					
6-	يحتاج الحاسب الالي لزمن طويل للتعود عليه وليس له نتائج مفيدة كافية					
7-	اشعر بالارتياح من استخدام التقنية					
8-	اشعر بأنني أصبحت في عمر لايوهل لاستخدام التكنولوجيا الحديثة.					
9-	اشعر بان التقنية لا تناسب اسلوب تدريسي					
10-	اشعر بأني بحاجة لتطوير مهاراتي في استخدام التكنولوجيا لكي أواكب التطور في مجال التعليم.					
11-	احتاج لتنمية مهاراتي ومعرفتي في التقنية لفائدة الطلبة					
12-	اهتم بالتقنية ولكن تطوير مهارتي في هذا الجانب لايناسب طريقة تدريسي					
13-	اهتم ولكن لا يوجد التدريب المناسب					
14-	لا اشعر باهتمام ولكن ارى انه يجب علي ان اهتم					
15-	اهتم ولكن ليس لدي الوقت الكافي لذلك					
16-	يمكن استخدام التقنية لتحفيز الطلبة وتعزيز تجربتهم التعليمية					
17-	افضل استخدام التقنية منفردا حتى لا يرى الاخرون اخطائي					
18-	اشعر بالضياع في عصر المعلومات					
19-	تشجع التقنية الطلبة على العمل معا					
20-	التقنية التدريسية صعبة الاستخدام					
21-	توفر التقنية التدريسية الكثير من الوقت					
22-	يمكن ان تكون التقنية مفيدة في كل المواد الدراسية					
23-	يمكن استخدام التقنية لتلبية الاحتياجات الفردية للطلبة					
24-	افضل استخدام الكتب على التقنية الجديدة					
25-	اشعر بان تجهيز التقنية للاستخدام في الصف يأخذ الكثير من وقتي					
26-	أجد من السهولة اختيار موارد التقنية التدريسية للمواد التي اقوم بتدريسها					

القسم الخامس : التدريب على تقنية المعلومات

أولا- خلفية التدريب :

في هذا القسم أود معرفة التدريب الذي تلقيته في مجال تقنية المعلومات ، يرجى التأشير على كل المعلومات التي تناسبك .

1. هل تلقيت دورة في تقنية المعلومات خلال عملك في مجال التدريس :

نعم	☐	لا (يرجى التقدم إلى السؤال الرابع في نفس القسم)	☐

2. هل تشعر بأنك في حاجة للتدريب على إستخدام تقنية التدريب ؟

نعم	☐	لا	☐

3. هل تستخدم الكومبيوتر في المنزل؟

نعم	☐	لا	☐

ثانيا. الاحتياجات التدريبية:يرجى تحديد درجة حاجتك للتدريب على تقنية المعلومات في كل مجال حسب التقسيم التالي :-

م	العبـــــارة	حاجة كبيرة	بعض الحاجة	لاحاجة للتدريب	لاعلم لي
-1	التدريب على اختيار وتقييم المواد التعليمية المناسبة لكل مادة.				
-2	التدريب على استخدام تقنية المعلومات المتوفرة في المدرسة.				
-3	مطابقة المواد التعليمية مع قدرات المتعلمين.				
-4	معرفة كيفية البرمجة في لغة الحاسب الآلي.				
-5	معرفة كيفية ادخال المعلومات في الحاسب الالي ولخراجها منه.				
-6	معرفة كيفية اختيار واستخدام البرامج التعليمية للحاسب الالي.				
-7	معرفة تاريخ وتطور الحاسب الآلي.				
-8	معرفة كيفية استخدام الحاسب الآلي كوسيلة للتعليم و حل المشكلات.				
-9	معرفة كيفية استخدام الحاسب الآلي للمساعدة في اجراءات ضبط وادارة الفصل والحصص(سجلات الغياب، الدرجات،...الخ).				
-10	معرفة كيفية تطبيق برامج الحاسب الآلي لتقييم قدرات الطلبة.				
-11	معرفة كيفية تطبيق برامج الحاسب الآلي لتشخيص احتياجات الطلبة.				
-12	معرفة كيفية استخدام الوسائط المتعددة في الحاسوب Multimedia.				
-13	معرفة كيفية استخدام الجداول في العمليات الحسابية وغيرها Excel.				
-14	معرفة كيفية استخدام برامج معالجة الكلمات Word Processing .				
-15	معرفة كيفية استخدام قواعد البيانات Database.				
-16	معرفة كيفية استخدام الحاسب الآلي في عرض وتقديم المعلومات Power Point .				
-17	معرفة كيفية الاستفادة من الانترنت .				

القسم السادس : وجهات نظر الأساتذة وأراهم حول القضايا التعليمية

أولا - الأهداف التعليمية : يرجى تحديد درجة أهمية الأهداف التربوية التالية بالنسبة لك كمعلم

م	الهــــــدف	غير هلم	هام لحد ما	هام	هام جدا	ضروري وأساسي
1	فهم العالم والمحيط الذي يعيش فيه التلاميذ					
2	الحصول على مهارات اساسية في القراءة ومعرفة استخدام الارقام وعملها					
3	تطوير قدرات التلاميذ في الابتكار والتفكير الذاتي					
4	تشجيع التعبير عن الذات					
5	تشجيع التلاميذ على العمل الجماعي.					
6	إكتساب السلوك الأجتماعي المقبول في المجتمع.					
7	قضاء وقت ممتع في المدرسة					
8	تشجيع الحصول على انجاز اكاديمي على مستوى عال.					

أولا – الآراء حول القضايا التعليمية :يرجى توضيح مدى اتفاقك أو عدمه مع العبارات التالية

م	العبـــــارة	أوافق بشده	أوافق	لا قرار	لا أوافق	لا أوافق بشدة
1	معظم التلاميذ يشعرون بأمان اكبر وثقة خلال الدرس إذا ما اخبروا ماذا يفعلون وكيف يفعلون ذلك					
2	الابتكار مجرد ظاهرة زمنية لا شك ستختفي بعد فترة وجيزة من انتهاء الدرس					
3	انتظام وانضباط المدرس يؤدي الى انتظام وانضباط التلميذ					
4	يجب ان يكون المدرس محبوبا من قبل التلاميذ					
5	الأطفال الذين يعملون في مجموعات يهدرون الوقت في المجادلة والمشاغبة					
6	يعمل التلاميذ بشكل افضل عندما تقدم لهم حوافز كالدرجات.					
7	هناك تركيز اقل على تنظيم وضبط الفصول عما سبق.					
8	يحتاج المدرسون لمعرفة خلفيات التلاميذ وظروفهم الأسرية الخاصة					

ثالثا:فلسفة المعلم التربوية

يصف المعلمون فلسفات تدريسية مختلفة ومتضادة في كل زوجين متقابلين من العبارات التالية، لكل زوج من هذه العبارات اشر ***الى مربع واحد فقط*** الذي يوضح مدى قرب أي من العبارتين إلى معتقداتك، كلما قربت معتقداتك من العبارة كلما قرب اليها المربع الذي تشير إليه.كالتالي:

المربع 1 يعني أنك(موافق بشدة) على العبارة التي في الجانب الأيمن أكثر من العبارة في الجانب الأيسر،

والمربع 2 يعني أنك (موافق) على العبارة التي في الجانب الأيمن أكثر من العبارة في الجانب الأيسر،

المربع 3 يعني أنك (لاقرار) بالنسبة للعبارتين،

المربع 4 يعني أنك(موافق) على العبارة في الجانب الايسر أكثر من الجانب الأيمن.

والمربع5 يعني أنك(موافق بشدة) على العبارة في الجانب الايسر أكثر من الجانب الأيمن.

		1	2	3	4	5	
مثال	الضرب وسيلة تربوية مجدية	☐	☐	☐	☐	☑	الضرب يدمر شخصية الطالب ولايفيد العملية التربوية

إختيار رقم 5 يعني أني موافق بشدة على ان الضرب يدمر شخصية الطالب أي أني مع العبارة في الجانب الايسر وضد العبارة في الجانب الأيمن

ملاحظة:الرجاء التاشير على مربع واحد فقط لكل سؤال.

		1	2	3	4	5	
-1	أرى ن دوري الرئيسي هو تيسير التعلم لدي الطلبة إرشادهم.	☐	☐	☐	☐	☐	أرى أني أتحمل مهمة التعليم بالكامل فدوري هو التدريس الأكاديمي
-2	أحاول أن أوفر لتلاميذي فرص التعلم ومصادره حتى يتمكنوا من إكتشاف المفاهيم وتركيبها وتنظيمها بأنفسهم.	☐	☐	☐	☐	☐	في إعتقادي لايتعلم الطلاب المادة إلا إذا درست بطريقة منظمة، لذلك من واجبي أن أشرح وأن أوضح لهم كيفية أداء العمل ومن ثم تعين انشطة محددة.
-3	أرى أن أهم عنصر في العملية التربوية هو محتوى المنهج.	☐	☐	☐	☐	☐	أعتقد أن أهم عنصر في العملية التربوية هو تنمية الحس الإدراكي لدى التلاميذ وتشجيع التفكير الذاتي المستقل أما محتوى المنهج فيأتي في مرتبة ثانوية.
-4	أرى أنه من المفيد للطلبة الإلمام بمختلف الأفكار والمهارات حتى وإن كان فهمهم لها محدود في هذه المرحلة.	☐	☐	☐	☐	☐	من الأفضل للطلاب إتقان وتعلم قليل من المهارات والأفكار المركبة مع الفهم العميق لها .
-5	التعليم الفعال المثمر يحتاج إلى صف هادئ.	☐	☐	☐	☐	☐	يتعلم الطلاب أكثر عندما يشعروا بحرية للتحدث إلى بعضهم، وبحرية الحركة داخل الصف أثناء الدرس.
-6	أعتقد أنها فكرة جيدة أن يقوم الطلبة بنشاطات متنوعة داخل الصف بحيث تؤدي كل مجموعة نشاط مختلف عن الأخرى.	☐	☐	☐	☐	☐	عمليا يجب أن يعطى جميع الطلاب نفس المهام والأنشطة بحيث تكون ذات تعليمات واضحة ويمكن إنجازها في فترة زمنية تتناسب مع فترة تركيز الطلبة ومع الجدول الدراسي اليومي.
-7	أفضل أن أقود مناقشات صفية جماعية وأن أوجه اسئلة يمكن للطلبة الإجابة عليها بسهولة.	☐	☐	☐	☐	☐	أفضل أن يدير الطلبة المناقشة بأنفسهم وأن تأتي الأسئلة منهم.
-8	يكتسب الطلاب الكثير من المعرفة عن طريق التعلم الإستكشافي، لذلك من المفيد إثارة الأسئلة وتشجيع الطلاب على المناقشة في مجموعات صغيرة.						معرفة المعلم أوسع من معرفة الطالب، لذلك يجب أن لايترك الطلاب في حالة تشويش وبلبلة عندمايكون بإمكانه شرح الإجابة مباشرة.

شكرا جزيلا لتعاونكم ووقتكم الثمين

Appendix 1.C Interview Questions

Background information

Name of Interviewee---------- ----------- Date-------- School--------------------, Area-------

-----------------Subject------------- Age -------- Qualification

What kind of material do you usually use during the lessons?

1. Do you have a learning resource centre in your school? If yes; are you aware of what teaching materials are available in your school?
2. Do you face difficulties to use the items in the learning resource centre in the school?
3. Did you receive training in the area of using instructional technology or teaching methods?
4. What encourages you to use technology in your teaching?
5. Have you ever used computers to teach your subject? Explain when and how?
6. Do you think ICT is important in your teaching? Why?
7. What are some words of advice to help teachers beginning to use technology in their classroom to integrate technology into their curriculum?
8. From your experience as a teacher, what do you think are the advantages and the disadvantages of the new reform changes on the teaching quality and student's achievements?

Appendix 1.D: Check-List for Observation

School:---------------------------------------	Teacher:---------------,Sex F ☐ M☐
Grade:-------------, No. students:---------- --	Subject:-------------------------------------
Lesson:---------------------------------------	Date:-- -

Learning Environment

Seating Configuration	Rows	☐	Horseshoe	☐	Small Groups	☐
Temperature	Cold	☐	Ok	☐	Hot	☐
Curtains/Blinds	Not available	☐	Partial blackout	☐	Full blackout	☐
Projection screens	Not available	☐	Free standing	☐	Wall mounted	☐
Classroom material storage	Yes	☐	No	☐		
Small library or store of books	Yes	☐	No	☐		
Flexible room furnishing	Yes	☐	No	☐		
Computers	Yes	☐	No	☐		

Classroom organisation

Students moving around	Free movement	☐	Certain activity	☐	Not allowed	☐
Students talking together	When they wish	☐	Certain activity	☐	Not allowed	☐
Group organisation	Students decide	☐	Ability	☐	Same group	☐

Evaluation of Teaching Strategy

Method	Duration
Teacher talking to the class as a whole	
Teacher led a whole class discussion	
Teacher using I T	
Students asking questions	
Students using IT	
Students working together co-operatively in groups	
Students working individually	
Total	

The Role of Technology

The teacher uses learning materials	Yes	☐	No	☐		
The students uses learning material	Individuals	☐	In groups	☐	Did not use	☐
The material is supplied by	School	☐	Teacher	☐	Students	☐
Students know how to use the material	Yes	☐	Teacher help	☐	No	☐

Appendix 1.E: Atlas Coding for Interview Data

students to the LRC room

P 1: Copy of Interview 2.txt - 1:78 (816:818) (Super)
Codes: [training]

Q18.3: Do you receive training in the area of using instructional technology or teaching methods? No just an introduction course in the beginning of the basic education

P 1: Copy of Interview 2.txt - 1:82 (871:873) (Super)
Codes: [training]

Q21.3: Do you receive training in the area of using instructional technology or teaching methods? I received training in teaching methods and using materials

P 1: Copy of Interview 2.txt - 1:90 (926:928) (Super)
Codes: [training]

20.3: Do you receive training in the area of using instructional technology or teaching methods? Yes in using educational technology and teaching methods.

P 1: Copy of Interview 2.txt - 1:97 (973:975) (Super)
Codes: [training]

23.3: Do you receive training in the area of using instructional technology or teaching methods? Now, for three years each year I received training in teaching methods.

Code: training+use {1-0}

P 1: Copy of Interview 2.txt - 1:91 (921:928) (Super)
Codes: [training+use]

Q22.2: Do you face difficulties to use the items in the learning resource centre in the school? Yes we have. I take my students there usually. I have enough experience and help from colleagues. Q20.3: Do you receive training in the area of using instructional technology or teaching methods? Yes in using educational technology and teaching methods.

□

thinking of starting to learn about it.

P 1: Copy of Interview 2.txt - 1:55 (573:576) (Super)
Codes: [training]

Q10. 3: Do you receive training in the area of using instructional technology or teaching methods? No. I do not have any background about how to use the equipment in the LRC room

P 1: Copy of Interview 2.txt - 1:58 (610:613) (Super)
Codes: [training]

Q11.3: Do you receive training in the area of using instructional technology or teaching methods? Yes, during the last academic year, I took some training to use computers and I bought one at home to continue my practice.

P 1: Copy of Interview 2.txt - 1:64 (660:662) (Super)
Codes: [training]

Q12.3: Do you receive training in the area of using instructional technology or teaching methods? Yes initial and in service training

P 1: Copy of Interview 2.txt - 1:71 (732:735) (Super)
Codes: [training]

13.3: Do you receive training in the area of using instructional technology or teaching methods? yes both, we visit other schools to see the other teachers with experience teach

P 1: Copy of Interview 2.txt - 1:73 (742:744) (Super)
Codes: [training]

13.5: Have you ever used computers to teach your subject? Explain when and how? I took training using computer by my self

P 1: Copy of Interview 2.txt - 1:74 (769:772) (Super)
Codes: [training]

Q17.3: Do you receive training in the area of using instructional technology or teaching methods? No I do not received any training in using materials for over head projectors, but I did not receive any training in using computer

P 1: Copy of Interview 2.txt - 1:75 (778:782) (Super)
Codes: [Computer Use] [training]

.5: Have you ever used computers to teach your subject? Explain when and how? I took training by my self, you know I feel I will needed even for writing exams for preparing the lessons, after that I feel more confident to take my

It was fairly useful but still I need more training, because I have no background in this field. It was practical, but the time was short.

P 1: Copy of Interview 2.txt - 1:38 (411:422) (Super)
Codes: [training]

Q7.3: Do you receive training in the area of using instructional technology or teaching methods? 4 years ago I received training, in the beginning of the basic education, and since then I have not received any, in using the instructional technology or computers, I did not receive any. I feel that I need a lot of training. Each day we see a lot of developments around us in the world and we hear about new methods of teaching but if you do not receive training, how can you employ it in your job? Our senior teacher had received a lot of training and she tries to transfer this experience to us, but it is not like when you learn directly.

P 1: Copy of Interview 2.txt - 1:44 (475:478) (Super)
Codes: [training]

Q8.2:Do you receive training in the area of using instructional technology or teaching methods? No, I have not received any training on using instructional technology but, I received training in teaching methods.

P 1: Copy of Interview 2.txt - 1:47 (495:497) (Super)
Codes: [Advice] [training]

8.7: What are some words of advice to help teacher beginning to use technology in their classroom to integrate technology into their curriculum? Try to ask other teachers how know more, try to take training.

P 1: Copy of Interview 2.txt - 1:49 (514:521) (Super)
Codes: [training]

Q9.3: Do you receive training in the area of using instructional technology or teaching methods? I received training in teaching methods. But I think that the experience benefited me a lot. We tried a lot of things and when we have new equipment in the school we ask for help from those who know, but to be honest there is still some equipment in the school that I have no idea how to benefit from in my teaching.

P 1: Copy of Interview 2.txt - 1:52 (539:544) (Super)
Codes: [Advice] [training]

What are some words of advice to help teachers beginning to use technology in their classroom to integrate technology into their curriculum? I think they should have training, they should ask the help from those how know. I feel sorry that I cannot use computers with my students but I'm

Codes: [teacher' use and students abilities]

21.4: With the technological ability of your students, has it been easy to incorporate technology into the classroom or have there been challenges? Sometimes, but what surprising me is that some students know more about computer more than I do. They learn because they spend more time on computers at home. Q21.5: Have you ever used computers to teach your subject? I use it to prepare my lessons and activities, but I do not use it with students.

Code: training {21-0}

P 1: Copy of Interview 2.txt - 1:2 (17:22) (Super)
Codes: [training]

Q1.3: Do you receive training in the area of using instructional technology or teaching methods? During the study day, we have different training on different media. It is suitable but still we need more training and there is a plan to give us training in the technical maintenance of the equipment.

P 1: Copy of Interview 2.txt - 1:8 (95:99) (Super)
Codes: [training]

Q2.3: Do you receive training in the area of using instructional technology or teaching methods?No, I have not received any training in using the materials but I try to take training in my spare time to develop my skills. At the beginning of basic education,

P 1: Copy of Interview 2.txt - 1:10 (121:124) (Super)
Codes: [training]

Q3.3: Do you receive training in the area of using instructional technology or teaching methods? We took in teaching methods. It was fairly useful but the experience cover

P 1: Copy of Interview 2.txt - 1:17 (198:201) (Super)
Codes: [training]

4.3:Do you receive training in the area of using instructional technology or teaching methods? No, but some teachers took workshop out side the school and transferred their knowledge to use

P 1: Copy of Interview 2.txt - 1:24 (290:297) (Super)
Codes: [training]

5.3: Do you receive training in the area of using instructional technology or teaching methods? I took training in the teaching methods, how to use the available materials, how to prepare the activities for the students.

Q10.2 : Do you face difficulties to use the items in the learning resource centre in the school? I want to use computers. The supervisor asked me to use power point in some lessons, but I do not know.

Code: Lack of time in Lab {1-0}

P 1: Copy of Interview 2.txt - 1:96 (968:971) (Super)
Codes: [Difficulties] [Lack of time in Lab]

23.2: Do you face difficulties to use the items in the learning resource centre in the school? We have and I know how to benefit from these materials. But Lack of time, sometimes because they are always busy.

Code: LRC difficulties {2-0}

P 1: Copy of Interview 2.txt - 1:65 (664:671) (Super)
Codes: [Difficulties] [LRC difficulties]

Q12.4: Was it easy to incorporate technology into the classroom or have there been challenges? The main challenge is that as an LRC teacher I take the class once a week. They work very well in the class, but by the next week they have forgotten what they learned, especially those how do not have computers at home and do not receive help. Usually I let my students try to learn by themselves and do the exercise without help.

P 1: Copy of Interview 2.txt - 1:69 (717:718) (Super)
Codes: [Difficulties] [LRC difficulties]

Sometimes we have some complex programmes but the teaching plan is flexible and we can take what we feel is suitable for students.

Code: teacher' use and students abilities {2-0}

P 1: Copy of Interview 2.txt - 1:3 (24:33) (Super)
Codes: [Difficulties] [teacher' use and students abilities]

Q1.4: was it easy to incorporate technology into the classroom or have there been challenges? We have many difficulties. Some students have a lack of or weak background. If students use computers at home they have continuous learning, but if they just use them in school from one week to the week after they forget what they have learned about it. I face this problem. Some programs are higher than students thinking , or using programs in English higher than students' level.

P 1: Copy of Interview 2.txt - 1:85 (875:883) (Super) plan is flexible and we can take what we feel is suitable for students.

P 1: Copy of Interview 2.txt - 1:70 (726:730) (Super)
Codes: [Difficulties]

Q13.2: Do you face difficulties to use the items in the learning resource centre in the school? They are very helpful in the LRC but some times we have old equipment which breakdown easily especially if the lesson is practical and students used with the teachers

P 1: Copy of Interview 2.txt - 1:72 (737:740) (Super)
Codes: [Difficulties]

Q13.4: was it easy to incorporate technology into the classroom or have there been challenges? Using technology, adds a lot to the students understanding but some students do not how to use the materials, or try to make it as a game.

P 1: Copy of Interview 2.txt - 1:77 (807:814) (Super)
Codes: [Difficulties]

Q18.2: Do you face difficulties to use the items in the learning resource centre in the school? I know what is there, I visit the centre and I have taken my students there. It is a kind of change for them, it has a positive affect on them to see new equipment that they do not have in the class., sometimes the equipment is not enough for all teachers in the school.

P 1: Copy of Interview 2.txt - 1:87 (892:899) (Super)
Codes: [Advice] [Difficulties]

Q21.7: What are some words of advice to help teachers beginning to use technology in their classroom to integrate technology into their curriculum? One of the difficulties is that teachers don't have time to learn a new set of facts and skills and technical knowledge. This applies particularly to computers, therefore new teachers should spend more time learning about technology.

P 1: Copy of Interview 2.txt - 1:96 (968:971) (Super)
Codes: [Difficulties] [Lack of time in Lab]

23.2: Do you face difficulties to use the items in the learning resource centre in the school? We have and I know how to benefit from these materials. But Lack of time, sometimes because they are always busy.

Code: Lack of Knowledge {1-0}

P 1: Copy of Interview 2.txt - 1:54 (568:571) (Super)
Codes: [Computer Use] [Lack of Knowledge]

make a reservation to use it in the LRC room, and because we have one room, sometimes we do not do it at the right time The senior teachers gave each teachers list of what is available in the LRC room and if any new equipment arrives, she informs us of it.

P 1: Copy of Interview 2.txt - 1:40 (432:438) (Super)
Codes: [Attitudes Toward Technology] [Difficulties]

Q7.6: Do you think Instructional technology is important in your teaching? Why? Of course, especially for my subject and they have a lot of software in science in the LRC room, I think Technology is the perfect answer to teach every type of learner, reaching even the lowest performer. A lot of things, if they are available in the school, if I know how to use them and if I have the direction, all of these factors will make it easy to use in the classroom.

P 1: Copy of Interview 2.txt - 1:48 (505:512) (Super)
Codes: [Difficulties]

Q9.2: Do you face difficulties to use the items in the learning resource centre in the school? usually they provide us with a list of what is available and what is new. Actually, they are very helpful and they offer the help when we have any question. The materials are available but the equipment quality is very bad and it always breaks down. Also it is old style. Sometime we borrow some new equipment from other schools.

P 1: Copy of Interview 2.txt - 1:63 (653:658) (Super)
Codes: [Difficulties]

Q12.2: Do you face difficulties to use the items in the learning resource centre in the school? Not at all, because I'm an LRC teacher I received enough training and the equipments was easy to use. In the LRC we have 15 computers (two not working), TY, video, audiocassette, books, games, video projector.

P 1: Copy of Interview 2.txt - 1:65 (664:671) (Super)
Codes: [Difficulties] [LRC difficulties]

Q12.4: Was it easy to incorporate technology into the classroom or have there been challenges? The main challenge is that as an LRC teacher I take the class once a week. They work very well in the class, but by the next week they have forgotten what they learned, especially those how do not have computers at home and do not receive help. Usually I let my students try to learn by themselves and do the exercise without help.

P 1: Copy of Interview 2.txt - 1:69 (717:718) (Super)
Codes: [Difficulties] [LRC difficulties]

Sometimes we have some complex programmes but the teaching enough software in the LRC room, but if the LRC teachers, we have 15 PCs, usually we do not take the whole class together because we do not have 30 PCs. Therefore, me and my colleague here divide the class into two groups, one using the computer and the other group do some activities related to the lesson, but she is not here today therefore I took the whole class and each two students work on one computer. I have taught in general, education for ten years, therefore I can help the other teachers to use and create some materials. For each field in basic education there is at least one overhead, TV tape recorder. As regards maintenance, I am an old graduate; therefore, I have no experience in the technical area. Therefore, if I face any problem cannot fix it quickly. This is my second year; we call the computer experts from the department.

P 1: Copy of Interview 2.txt - 1:25 (299:308) (Super)
Codes: [Difficulties]

5.4: was it easy to incorporate technology into the classroom or have there been challenges? It depends on the students' environment. If they use it at home they will be excellent in their use and understanding, but if the environment is not aware of the importance of this technology grades, from the 1-3 they have 1 period a week and in the forth grade, two I think it is not enough for a to student start to discover this new technology and enjoy the new world..

P 1: Copy of Interview 2.txt - 1:29 (344:346) (Super)
Codes: [Difficulties]

Q6.2: Do you face difficulties to use the items in the learning resource centre in the school? We do not have computers in the classrooms.

P 1: Copy of Interview 2.txt - 1:31 (352:357) (Super)
Codes: [Difficulties]

Q6.4: Was it easy to incorporate technology into the classroom or have there been challenges? Sure, some of the students do not totally, know how to use computer, and that is difficult for me because I am supposed to teach them objects and the computer is an aid to satisfy these objects, because each object of the lesson should be supported by aids.

P 1: Copy of Interview 2.txt - 1:37 (399:409) (Super)
Codes: [Difficulties]

7.2: Do you face difficulties to use the items in the learning resource centre in the school? Maybe it was difficult in the beginning, but now after 4 years in basic education, I think that I have the experience to solve any problem I have in using the equipment. Some equipment is difficult to move to the classroom, therefore we should background. If students use computers at home they have continuous learning, but if they just use them in school from one week to the week after they forget what they have learned about it. I face this problem. Some programs are higher than students thinking , or using programs in English higher than students' level.

P 1: Copy of Interview 2.txt - 1:9 (109:119) (Super)
Codes: [Difficulties]

3.2: Do you face difficulties to use the items in the learning resource centre in the school? Yes, but with the help of my colleagues and the senior teacher helps us a lot as advisor and guider. Just with the computer, sometimes the time is not suitable for our work time-table. There are a lot of useful things and equipment which I found very useful in my teaching now I have experience to use them, to decide which one is the best to fulfil my lesson objectives.

P 1: Copy of Interview 2.txt - 1:11 (126:134) (Super)
Codes: [Difficulties]

Q3.4:Was it easy to incorporate technology into the classroom or have there been challenges? We faced some difficulties with students in the beginning, because they transferred from the early stages to the second cycle, therefore teachers should develop their use of instructional technology. If they start to use computers from the first cycle they feel comfortable using them.

P 1: Copy of Interview 2.txt - 1:16 (186:196) (Super)
Codes: [Difficulties]

.2: Do you face difficulties to use the items in the learning resource centre in the school? In the beginning of the year, I did not know about many types of equipment in the school. The senior teacher held a workshop to guide us about how to use and when to use each equipment. I visit the LRC room regularly to see what is new. Usually I go to the LRC room before my lesson to see what are available to use. The senior teacher has a list of what is available there.

P 1: Copy of Interview 2.txt - 1:18 (203:206) (Super)
Codes: [Difficulties]

4.4: Was it easy to incorporate technology into the classroom or have there been challenges? Students who do not have experience with new technology treat it as a game.

P 1: Copy of Interview 2.txt - 1:23 (265:288) (Super)
Codes: [Difficulties]

5.2: Do you face difficulties to use the items in the learning resource centre in the school? We do not have

Explain when and how? Actually no I'm a beginner in the use of computer

P 1: Copy of Interview 2.txt - 1:84 (882:883) (Super)
Codes: [Computer Use]

Q21.5: Have you ever used computers to teach your subject? I use it to prepare my lessons and activities, but I do not use it with students.

P 1: Copy of Interview 2.txt - 1:89 (921:924) (Super)
Codes: [Computer Use]

22.2: Do you face difficulties to use the items in the learning resource centre in the school? Yes we have. I take my students there usually. I have enough experience and help from colleagues.

P 1: Copy of Interview 2.txt - 1:92 (935:937) (Super)
Codes: [Computer Use]

20.5: Have you ever used computers to teach your subject? Explain when and how? Yes I use the computer to teach my subject.

P 1: Copy of Interview 2.txt - 1:98 (977:982) (Super)
Codes: [Computer Use]

23.4: Have you ever used computers to teach your subject? Explain when and how? I regularly use the computer to prepare for my classes. I use the Internet to find information on the subjects that I am teaching. I also use the word processor and the draw program to make materials and handouts for my students.

Code: Difficulties {21-0}

P 1: Copy of Interview 2.txt - 1:1 (7:15) (Super)
Codes: [Difficulties]

Q1.2: Do you face difficulties to use the items in the learning resource centre in the school? From the beginning of our study as computer teachers we received workshops and initial and in-service training. There is regular maintenance of the equipment we just call the department if we have any problem and they send a specialist to solve anything we face. Yes I'm responsible for what is available in the LRC room (22 computers).

P 1: Copy of Interview 2.txt - 1:3 (24:33) (Super)
Codes: [Difficulties] [teacher' use and students abilities]

Q1.4: was it easy to incorporate technology into the classroom or have there been challenges? We have many difficulties. Some students have a lack of or weak

LRC teachers, but I use it sometimes alone to prepare some cards for the students.

P 1: Copy of Interview 2.txt - 1:45 (484:487) (Super)
Codes: [Computer Use]

8.4: Have you ever used computers to teach your subject? Explain when and how? I do not use the computer with the students, but they use it with LRC teachers , and they continue with her what we do in the classroom.

P 1: Copy of Interview 2.txt - 1:50 (528:529) (Super)
Codes: [Computer Use]

Q9.5: Have you ever used computers to teach your subject? Explain when and how? No, I do not have enough experience in using computers.

P 1: Copy of Interview 2.txt - 1:54 (568:571) (Super)
Codes: [Computer Use] [Lack of Knowledge]

Q10.2 : Do you face difficulties to use the items in the learning resource centre in the school? I want to use computers. The supervisor asked me to use power point in some lessons, but I do not know.

P 1: Copy of Interview 2.txt - 1:59 (615:617) (Super)
Codes: [Computer Use]

Q11.4: Have you ever used computers to teach your subject? Explain when and how? No, just the LRC teacher gave them the lesson.

P 1: Copy of Interview 2.txt - 1:60 (603:607) (Super)
Codes: [Computer Use]

11.1: What kind of material do you use usually I used the big book, which is similar to the student book, I used the clock, watch, board, tape recorder, overhead projector. Sometimes, I prepare some papers for the classroom. I used word processing and the drawing program to prepare materials for the class.

P 1: Copy of Interview 2.txt - 1:75 (778:782) (Super)
Codes: [Computer Use] [training]

.5: Have you ever used computers to teach your subject? Explain when and how? I took training by my self, you know I feel I will needed even for writing exams for preparing the lessons, after that I feel more confident to take my students to the LRC room

P 1: Copy of Interview 2.txt - 1:79 (824:826) (Super)
Codes: [Computer Use]

Q18.5: Have you ever used computers to teach your subject?

think, is the biggest disadvantage. Also, the llong day. Students in basic education are more active than in general education. They can hold a discussion with other students have more confidence. We have a large quantity of curricula

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Code: Computer Use {17-0}

P 1: Copy of Interview 2.txt - 1:12 (136:137) (Super)
Codes: [Computer Use]

3.5: Have you ever used computers to teach your subject? Explain when and how? Yes. I try to use it whenever I have chance.

P 1: Copy of Interview 2.txt - 1:19 (208:212) (Super)
Codes: [Computer Use]

Q4.5: Have you ever used computers to teach your subject? Never, because I do not know how to use it and benefit, I did not receive any training, and they do not have software for maths.

P 1: Copy of Interview 2.txt - 1:26 (310:315) (Super)
Codes: [Computer Use]

5.5: Have you ever used computers to teach your subject? Explain when and how? We cooperate with the field teachers. We have a teaching plan for all subjects. Therefore we organise with them, when they start to give the lesson, we start at the same time it's like a practical part..

P 1: Copy of Interview 2.txt - 1:30 (348:350) (Super)
Codes: [Computer Use]

Q6.3: Do you receive training in the area of using instructional technology or teaching methods? I used a computer at home but I have not received any training.

P 1: Copy of Interview 2.txt - 1:32 (359:366) (Super)
Codes: [Computer Use]

Q6.5: Have you ever used computers to teach your subject? It very important, but we do not have enough time to take them. The LRC room is usually busy and I should arrange with them two weeks in advance, I know how important the computer is and I know how to use it but unfortunately the time, the availability, they are all difficulties. We have a big amount of curriculum. Usually, once in a term I have the class in the LRC room.

P 1: Copy of Interview 2.txt - 1:39 (428:430) (Super)
Codes: [Computer Use]

ve you ever used computers to teach your subject? Explain when and how? With the students, no, they use it with the

17.8: From your experience as a teacher, what do you think are the advantages and the disadvantages of the new reform changes on the teaching quality, student's achievements, and future of education in Oman? I think the output of the basic education is better than the general education, they have rich experience, but the day is long to the student especially for year one I think the curriculum is suitable to teem we have if the teachers arrange his time very well he will not face this challenge in the future.

P 1: Copy of Interview 2.txt - 1:81 (841:859) (Super)
Codes: [attitudes Towards new reform]

Q18.8:From your experience as a teacher, what do you think are the advantages and the disadvantages of the new reform changes on the teaching quality, student's achievements, and future of education in Oman? Making the students pass has one positive effect, that students are all of the same age, but the students can not cope with other students. The students knows that they will pass, which affects their achievement. About teaching future we should ask ourselves the following questions: What do we want from this system? What is the benefit from this system to the community? There are a lot of difficulties for the system: At the beginning, the number of students was not supposed to be higher than 25 and now it is getting higher and higher. I notice every year students' achievement becomes lower. Some projects need money. The school cannot offer that to the students, and their families can't support the students because they are also poor. They will gain more knowledge, but sometimes it wastes time to prepare, it depends on the students' ability.

P 1: Copy of Interview 2.txt - 1:88 (901:913) (Super)
Codes: [attitudes Towards new reform]

21.8: From your experience as a teacher, what do you think are the advantages and the disadvantages of the new reform changes on the teaching quality, student's achievements, and future of education in Oman? The day is too long, maybe it is ok for the first cycle, but I think in the second cycle, I think the system should be reviewed at this point, I think if the teachers have deep understanding of the aims of the basic education and work hard for these aims, the students will have a high standard of achievement. If we cope with the new movement and work hard, we will have good results in the future.

P 1: Copy of Interview 2.txt - 1:95 (952:960) (Super)
Codes: [attitudes Towards new reform]

Q22.8: From your experience as a teacher, what do you think are the advantages and the disadvantages of the new reform changes on the teaching quality, student's achievements, and future of education in Oman? Automatic upgrade, I thinking ability in basic education. the basic education curriculum is larger that the general curriculum, but I feel that in general there is heavy demand on the teacher, while in the basic education the student is an active member in the class.

P 1: Copy of Interview 2.txt - 1:62 (626:645) (Super)
Codes: [attitudes Towards new reform]

Q11.7: From your experience as a teacher, what do you think are the advantages and the disadvantages of the new reform changes on the teaching quality, student's achievements, and future of education in Oman? We need to give the students homework, to give them exams from year three. The day is too long especially for the first cycle. Really, I learned a lot from using the new methods. When I prepare the lessons I have to read a lot about teaching methods. I learned how to discover new ways to use different aids, how to transfer the knowledge to be understood by each student. Working in groups save a lot of the period time. Also I can know my students ability by choosing different student each time to present the results of the work, so they can all work together. Sometimes they work in pairs. The English curriculum more advanced than the other subjects but I feel it makes heavy demands on me as a teacher, because I should watch them in everything: I have a lot of things to do The curriculum amount is suitable for to the time. The time is more than enough.

P 1: Copy of Interview 2.txt - 1:68 (694:715) (Super)
Codes: [attitudes Towards new reform]

Q12.12: From your experience as a teacher, what do you think are the advantages and the disadvantages of the new reform changes on the teaching quality, student's achievements, and future of education in Oman? The different activities in the classroom encourage the students to work together and improve their understanding In group work sometimes the weak students depend on the excellent and let them do all the work Teaching quality is better in the basic education. The teachers have a lot of material to use. The new system encourages them to use the new technology and try to know about the new things in teaching methods. In basic education, the teachers have many duties to do besides the administration work, the files and records. The variety of activities a effect the concentration on teaching the basic skills, reading writing, numbers. Some programs are higher than students ability, especially if it is in English, some require different systems which are not available to us. I can save a lot of time when they work in groups, but sometime I feel that the weak students depend a lot on the good students and that affects both of them.

P 1: Copy of Interview 2.txt - 1:76 (789:797) (Super)
Codes: [attitudes Towards new reform]

the end of the year and just know how to read.

P 1: Copy of Interview 2.txt - 1:36 (389:391) (Super)
Codes: [attitudes Towards new reform]

roup work helps students to co-operate with each other, if the teacher has good management. The set is a mix of different student abilities. It does not affect knowing the differences between students

P 1: Copy of Interview 2.txt - 1:43 (456:468) (Super)
Codes: [attitudes Towards new reform]

7.8: From your experience as a teacher, what do you think are the advantages and the disadvantages of the new reform changes on the teaching quality, student's achievements, and future of education in Oman? The disadvantages are the long study day, teachers and students become tired in the end of the day, the automatic upgrade makes the students sure that they are going to be pass so they become careless In science I have a lot of activities in the curricula and I have to finish most of it because the supervisor will to ask me about it but to be honest some concepts do not need all of those that activities, especially when I'm sure that all student have got that concept.

P 1: Copy of Interview 2.txt - 1:53 (546:562) (Super)
Codes: [attitudes Towards new reform]

Q9.8 From your experience as a teacher, what do you think are the advantages and the disadvantages of the new reform changes on the teaching quality, student's achievements, and future of education in Oman? Basic education is more flexible, there are a lot of materials which makes the teaching more easy and speeds students' understanding, it develops the students' personality, they can express themselves easily, they have deeper understanding. On the other hand, I feel that I am busy all the time, there is a large amount of curriculum, the student should be aware of many complex concepts, which could be Actually, the curriculum is very large because you should do a lot of activities in every lesson which takes a lot of time. higher than their understanding; there is heavy demand on the teacher.

P 1: Copy of Interview 2.txt - 1:57 (587:599) (Super)
Codes: [attitudes Towards new reform]

10.7: From your experience as a teacher, what do you think are the advantages and the disadvantages of the new reform changes on the teaching quality, student's achievements, and future of education in Oman? Automatic pass makes the parents not care and not follow-up their children. Working in groups they depend on one student. The achievement in general education is better than in basic education. They read better, they write better, while the have higher sometimes it is difficult to assess students under group work.

P 1: Copy of Interview 2.txt - 1:15 (160:176) (Super)
Codes: [attitudes Towards new reform]

3.8: From your experience as a teacher, what do you think are the advantages and the disadvantages of the new reform changes on the teaching quality, student's achievements, and future of education in Oman? we have a large quantity of curriculum. As you know knowledge is a continuous process. Therefore I cannot leave or ignore a lesson and at the same time I will not be happy if I give a lesson that requires two or three periods in one period and I feel my students do not understand totally. There is a lot of work to do in the classroom which makes heavy demands on teachers. Some lessons are very difficult for the students to understand, there's a large amount of curriculum.

P 1: Copy of Interview 2.txt - 1:22 (233:256) (Super)
Codes: [attitudes Towards new reform]

4.8: From your experience as a teacher, what do you think are the advantages and the disadvantages of the new reform changes on the teaching quality, student's achievements, and future of education in Oman? I think everything is available to the students in at the basic education but in the end of the year in general education we have very excellent students, but now the students do not have a means of comparison, who is good in the beginning he is the good at in the end of the year others do not developed, they are still at the same level. I think when students work in groups they rely on the good students and do not try to do the work. When the teacher uses a limited number of materials the students keep quiet. To have, one activity and concentrate on it, in my opinion is better than 10 activities without concentration. Students are better in general education. At the end of the year, I have a large group of excellent students, they are fighting to be the best.

P 1: Copy of Interview 2.txt - 1:35 (376:387) (Super)
Codes: [attitudes Towards new reform]

Q6.8: From your experience as a teacher, what do you think are the advantages and the disadvantages of the new reform changes on the teaching quality, student's achievements, and future of education in Oman? The large amount of curriculum, especially in the Arabic curriculum, and the long day makes the child tired and bored. Basic education adds a lot to my knowledge. the number of students is less. Student achievement is better in the general education, because it is higher than students level, they ask them to do very advanced levels. In the basic reading and writing by the end of the year in general education, all students know how to read and write, but in my class now we are at

Q18.6: Do you think Instructional technology is important in your teaching? Why? Student practice it is a new experience for students which they was not familiar with before. They gain A lot of new experience which they did not have before. to do.

P 1: Copy of Interview 2.txt - 1:83 (875:880) (Super)
Codes: [Attitudes Toward Technology]

Q21.4: With the technological ability of your students, has it been easy to incorporate technology into the classroom or have there been challenges? Sometimes, but what surprising me is that some students know more about computer more than I do. They learn because they spend more time on computers at home.

P 1: Copy of Interview 2.txt - 1:86 (885:890) (Super)
Codes: [Attitudes Toward Technology]

Q21.6: Do you think Instructional technology is important in your teaching? Why? Yes, I think there's a very powerful trend toward more interesting uses of computers, shifting from schools to homes. A lot of understanding. It prepare them for the future. The students are more attractive to the computer than traditional media.

P 1: Copy of Interview 2.txt - 1:93 (939:942) (Super)
Codes: [Attitudes Toward Technology]

Q15.6: Do you think Instructional technology is important in you r teaching? Why? Yes of course. It provide the student with Wide knowledge, deeper understanding.

P 1: Copy of Interview 2.txt - 1:99 (984:989) (Super)
Codes: [Attitudes Toward Technology]

Q23.5: Do you think Instructional technology is important in your teaching? Why? Computers and other technology can be a great help in increasing the range of maths and Science that we are able to teach, Of course it offers a lot to the students, but with the technology the student could benefit a lot.

Code: attitudes Towards new reform {14-0}

P 1: Copy of Interview 2.txt - 1:6 (69:78) (Super)
Codes: [attitudes Towards new reform]

1.8: From your experience as a teacher, what do you think are the advantages and the disadvantages of the new reform changes on the teaching quality, student's achievements, and future of education in Oman? Students depend for their understanding on the media which leads them to ignore the books, therefore there should be cooperation between school and home.Long time to stay at school (school day), employ the concepts in our life. New, they can explain that to me, from their experience in using the technology.

P 1: Copy of Interview 2.txt - 1:46 (489:492) (Super)
Codes: [Attitudes Toward Technology]

Q8.5: Do you think Instructional technology is important in your teaching? Why? Technology in the classroom prepares students for the future. The students will use technology at work, in school, and at home. It is helpful to learn it now.

P 1: Copy of Interview 2.txt - 1:51 (531:537) (Super)
Codes: [Attitudes Toward Technology]

9.6: Do you think Instructional technology is important in your teaching? Why? Many children really need something to look at to help them learn, rather than just to be talked to, and that is what technology does. It is the language of this age. When they know how to benefit from it now, it will help them a lot in the future.

P 1: Copy of Interview 2.txt - 1:56 (582:585) (Super)
Codes: [Attitudes Toward Technology]

your teaching? Why? A lot. When the teacher uses a variety of technology the students become more active in the classroom, and have deeper understanding of the lesson.

P 1: Copy of Interview 2.txt - 1:61 (619:624) (Super)
Codes: [Attitudes Toward Technology]

Q11.5: Do you think Instructional technology is important in your teaching? Why? For my subject, basic education is better because they start early from year one while in general education they start from year four. We teach them by games, songs, by indirect methods. Instructional technology makes my teaching easier than before; it is like another teacher in the classroom.

P 1: Copy of Interview 2.txt - 1:66 (677:685) (Super)
Codes: [Attitudes Toward Technology]

Q12.6: Do you think Instructional technology is important in your teaching? Why? Yes, it is the language of this century. It is new for most of the students. They learned a lot from computers, because they enjoy working with computers they try their best with the work. Our lessons here in the centre continue what they did in the classroom. We are looking now to make the subject teachers teach in the LRC room and encourage them to use computers with the students.

P 1: Copy of Interview 2.txt - 1:80 (828:834) (Super)
Codes: [Attitudes Toward Technology]

your teaching? Why? Technology develops students' concepts, helps them to develop and improve their higher thinking abilities. It makes teaching and learning more efficient. It helps students to understand, how to relate concepts to students' life, it gives flexibility to the lessons.

P 1: Copy of Interview 2.txt - 1:20 (214:225) (Super)
Codes: [Attitudes Toward Technology]

Q4.6: Do you think Instructional technology is important in your teaching? Why? It is very important, but how can the teacher benefit from this technology if he do/ she does not know how to use it? A lot of things, firstly to simplify the concepts for the students, to attract their attention, it is very important. It is the language of the future, it makes the concepts more practical for students, Technology is supposed to open doors. Students need to be active in the technology race, because that is what it is.

P 1: Copy of Interview 2.txt - 1:27 (317:322) (Super)
Codes: [Attitudes Toward Technology]

5.6: Do you think Instructional technology is important in your teaching? Why? Sure, it is essential in the school or our daily life we continue with them, we have a lot of students who have very advanced skills in using computers , now the students are very familiar with the new technology

P 1: Copy of Interview 2.txt - 1:33 (368:370) (Super)
Codes: [Attitudes Toward Technology]

6.6: Do you think Instructional technology is important in your teaching? Why? It very useful for reading, writing, I think it would prepare them better. If it was employed, very well it will definitely encourage them a lot.

P 1: Copy of Interview 2.txt - 1:40 (432:438) (Super)
Codes: [Attitudes Toward Technology] [Difficulties]

Q7.6: Do you think Instructional technology is important in your teaching? Why? Of course, especially for my subject and they have a lot of software in science in the LRC room, I think Technology is the perfect answer to teach every type of learner, reaching even the lowest performer. A lot of things, if they are available in the school, if I know how to use them and if I have the direction, all of these factors will make it easy to use in the classroom.

P 1: Copy of Interview 2.txt - 1:41 (440:446) (Super)
Codes: [Attitudes Toward Technology]

t gives them deeper understanding, improves their skills, adds a lot to their understanding and makes the subject interesting to them and I think the most important point is that it relates the subject to the real world in easy ways. Before, I spent a lot of time to tell them how we can is that teachers don't have time to learn a new set of facts and skills and technical knowledge. This applies particularly to computers, therefore new teachers should spend more time learning about technology.

P 1: Copy of Interview 2.txt - 1:94 (944:950) (Super)
Codes: [Advice]

Q1347; What are some words of advice to help teachers beginning to use technology in their classroom to integrate technology into their curriculum? Do not wait to take in-service training, try to develop yourself. Try to change the old idea about education, that you should do all the work. The student is the centre of the class. Dive them the confidence.

Code: Attitudes Toward Technology {18-0}

P 1: Copy of Interview 2.txt - 1:4 (39:54) (Super)
Codes: [Attitudes Toward Technology]

Q1.6: Do you think Instructional technology is important in your teaching? Why? It gives students more and faster understanding. If I compare when I was a student, many concepts were very difficult for us when we were in secondary school but now students in grade 5 have deeper understanding of complex ideas in maths and science because they use different technology to deliver these for them. I notice it adds a lot to students' learning. It simplifies the concepts, makes than more attractive for the students. Ttechnology is helpful, if it is helpful for teachers and students, and it is being used well. It makes it clearer for the students to understand the lesson and provides reminders to follow.

P 1: Copy of Interview 2.txt - 1:7 (80:93) (Super)
Codes: [Attitudes Toward Technology]

Q2.6:: Do you think Instructional technology is important in your teaching? Why? It adds a lot to student understanding. The students use different ways of thinking. Once had a difficult puzzle and to be honest I could not solve it. I asked the maths teachers about it and they did not know either , then I gave my students the exercise, and asked them to try to solve it. On of the students started to draw and try at home and in play time, he spent his time until he solved it. It creates a challenge for the students thinking using different levels of thinking. I think students knowledge becomes more rich using technology, not just save information and forget it later.

P 1: Copy of Interview 2.txt - 1:13 (139:147) (Super)
Codes: [Attitudes Toward Technology]

3.6: Do you think Instructional technology is important in class. Each student should have the advantage in some area.

P 1: Copy of Interview 2.txt - 1:34 (372:374) (Super)
Codes: [Advice]

6.7: What are some words of advice to help teachers beginning to use technology in their classroom to integrate technology into their curriculum? It is very important to use aids and technology in each lesson.

P 1: Copy of Interview 2.txt - 1:42 (448:454) (Super)
Codes: [Advice]

.7: What are some words of advice to help teachers beginning to use technology in their classroom to integrate technology into their curriculum? Even if you did not receive any training, try to develop yourself through reading, try to take training by yourself, because it will add a lot to you as a teacher and as a person living in this large world which runs very fast in all fields. Try to buy personal computer, try to use the internet.

P 1: Copy of Interview 2.txt - 1:47 (495:497) (Super)
Codes: [Advice] [training]

8.7: What are some words of advice to help teacher beginning to use technology in their classroom to integrate technology into their curriculum? Try to ask other teachers how know more, try to take training.

P 1: Copy of Interview 2.txt - 1:52 (539:544) (Super)
Codes: [Advice] [training]

What are some words of advice to help teachers beginning to use technology in their classroom to integrate technology into their curriculum? I think they should have training, they should ask the help from those how know. I feel sorry that I cannot use computers with my students but I'm thinking of starting to learn about it.

P 1: Copy of Interview 2.txt - 1:67 (687:692) (Super)
Codes: [Advice]

12.7: What are some words of advice to help teachers beginning to use technology in their classroom to integrate technology into their curriculum? It is not hard to integrate technology into teaching, if the teacher believes that it is really essential and part of the educational process, he will do his best; just training and reading.

P 1: Copy of Interview 2.txt - 1:87 (892:899) (Super)
Codes: [Advice] [Difficulties]

Q21.7: What are some words of advice to help teachers beginning to use technology in their classroom to integrate technology into their curriculum? One of the difficulties

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Code: Advice {11-0}

P 1: Copy of Interview 2.txt - 1:5 (56:67) (Super)
Codes: [Advice]

Q1.7: What are some words of advice to help teachers beginning to use technology in their classroom to integrate technology into their curriculum? They should have a reasonable background and positive attitudes to using technology, benefit from colleagues' experience, use the net, magazines, reading. I can see that the new graduate teachers look more positively towards the benefits from computer but some teachers who do not have any idea of the new technology have a lot of anxiety towards computers and they are more comfortable to depending on what they know and what they are used to using.

P 1: Copy of Interview 2.txt - 1:14 (149:158) (Super)
Codes: [Advice]

Q3.7: What are some words of advice to help teachers beginning to use technology in their classroom to integrate technology into their curriculum? Knowledge is a big world. Getting a university degree do not mean that we should stop there. Each day you should learn a new thing, even from the young students you will to learn. In this age, try to know what is going on in the world of technology and education.

P 1: Copy of Interview 2.txt - 1:21 (227:231) (Super)
Codes: [Advice]

Q4.7: What are some words of advice to help teachers beginning to use technology in their classroom to integrate technology into their curriculum? Develop her self skills, in using computer, ask colleagues with experience.

P 1: Copy of Interview 2.txt - 1:28 (324:333) (Super)
Codes: [Advice]

Q5.7: What are some words of advice to help teachers beginning to use technology in their classroom to integrate technology into their curriculum? She should develop herself through reading and take training in computers, even if she is not an LRC teacher. Remember that it depends on the teacher. Students learn discipline from the teacher. There fore I do not think a quite classroom means a better

Appendix 2.A: Analysis Frequencies Tables

Table 2.A.1: Frequency of Teachers' Use of ICT

Frequency / Item	Often (1)		Sometimes(2)		Rarely(3)		Never(4)	
	F	%	F	%	F	%	F	%
Models	370	51.46	260	36.16	60	8.34	29	4.03
Maps	389	54.10	219	30.46	57	7.93	54	7.51
Photocopier	311	43.44	167	23.32	54	7.54	184	25.70
Audiocassettes	310	43.18	209	29.11	102	14.21	97	13.51
Teaching games	252	35.10	299	41.64	88	12.26	79	11.00
Overhead Projector	242	33.66	296	41.17	99	13.77	82	11.40
Printer	177	24.65	159	22.14	77	10.72	305	42.48
Educational Films	153	21.31	340	47.35	139	19.36	86	11.98
Learning Packages	64	8.91	210	29.25	214	29.81	230	32.03
Presentation P.	60	8.36	160	22.28	113	15.74	385	53.62
Educational TV	56	7.80	349	48.61	173	24.09	140	19.50
Scanner	50	6.96	105	14.62	82	11.42	481	66.99
Word Processing	50	6.96	78	10.86	120	16.71	470	65.46
CD-ROMs	33	4.59	128	17.80	113	15.72	445	61.89
Internet	24	3.34	71	9.89	90	12.53	533	74.23
Spreadsheet	18	2.51	65	9.05	113	15.74	522	72.70
Video Camera	10	1.39	71	9.89	106	14.76	531	73.96

Table 2.A.2: Teachers' responses to the factors of under use of ICT

Statement	SA		A		U		D		SD	
	F	%	F	%	F	%	F	%	F	%
Lack of time	437	58.8	205	27.6	29	3.9	46	6.2	25	3.4
Lack of technical support	354	47.6	260	35.0	45	6.1	69	9.3	14	1.9
Not enough funding	301	40.5	279	37.6	70	9.4	81	10.9	11	1.5
Difficulty of moving	263	35.4	273	36.7	54	7.3	125	16.8	27	3.6
Not enough software	253	34.1	279	37.6	69	9.3	116	15.6	24	3.2
Students' lack of skills	252	33.9	292	39.3	72	9.7	110	14.8	13	1.7
Lack of software in teaching area	241	32.4	309	41.6	72	9.7	101	13.6	18	2.4
I T is not available	231	31.1	314	42.3	75	10.1	107	14.4	12	1.6
Large number of students	206	27.7	210	28.3	50	6.7	214	28.8	61	8.2
Lack of established guidelines	192	25.8	335	45.1	76	10.2	116	15.6	22	3
Add very usable computer hardware	190	25.6	175	23.6	42	5.7	188	25.3	145	19.5
School not aware how to use	184	24.8	276	37.1	69	9.3	171	23.0	42	5.7
Limited access	173	23.3	305	41.0	31	4.2	185	24.9	48	6.5
Lack of information about the materials available.	138	18.6	293	39.4	90	12.1	185	24.9	33	4.4
Lack of Arabic software	123	16.6	172	23.1	140	18.8	235	31.6	71	9.6
Lack of planning	118	15.9	247	33.2	131	17.6	199	26.8	47	6.3
Little administrative support	114	15.3	173	23.3	125	16.8	269	36.2	58	7.8
Classrooms are suitable	102	13.7	223	30.0	67	9.0	220	29.6	127	17.1
Regular Maintenance	84	11.3	164	22.1	110	14.8	262	35.3	120	16.2
sufficient amount of equipments	72	9.7	223	30.0	68	9.2	263	35.4	115	15.5
New computer users receive help	61	8.2	88	11.8	94	12.7	297	40	201	27.1
Enough illustrate	58	7.8	222	29.9	81	10.9	259	34.9	120	16.2
Good quality equipment	42	5.7	173	23.3	101	13.6	290	39.0	133	17.9

Table 2.A.3: Teachers' training needs frequency

Statement	*G.N		S.N		N.N		D.K	
	F	%	F	%	F	%	F	%
Knowing how to program in a computer language.	492	66.2	182	24.5	46	6.2	23	3.1
To operate and use the instructional technology available in your school.	451	60.7	229	30.8	59	7.9	4	0.5
Knowing how to benefit from the internet.	446	60.0	190	25.6	81	10.9	26	3.5
Knowing how to use a computer as a means of teaching problem solving.	429	57.7	247	33.2	52	7.0	14	1.9
Knowing how to select educational computer software.	423	56.9	227	30.6	75	10.1	17	2.3
Knowing how to get information in and out of a computer.	413	55.6	192	25.8	123	16.6	15	2.0
Knowing how to use computer for presentation.	408	54.9	201	27.1	108	14.5	26	3.5
Knowing how to use the computer to help with class housekeeping chores (i.e., attendance, student record).	404	54.4	226	30.4	86	11.6	25	3.4
Knowing how to use multimedia.	400	53.8	233	31.4	60	8.1	50	6.7
Knowing how to apply the computer to evaluate students' abilities.	397	53.4	263	35.4	62	8.3	21	2.8
To select appropriate teaching materials for a selected subject.	397	53.4	264	35.5	65	8.7	17	2.3
Knowing how to use database.	390	52.5	219	29.5	73	9.8	61	8.2
Knowing how to apply the computer to diagnose students' needs.	390	52.5	268	36.1	61	8.2	24	3.2
Knowing how to use word processing.	355	47.8	226	30.4	118	15.9	43	5.8
To match teaching materials to learners' abilities.	353	47.5	284	38.2	76	10.2	30	4.0
Knowing how to use spreadsheet.	339	45.6	249	33.5	117	15.7	38	5.1
Learning about the history and the development of computers.	203	27.3	247	33.2	259	34.9	33	4.4

*G.N: Great Need, S.N: Some Need, N.N: NO Need. D.K: Do not know.

Table 2.A.4: Teachers attitudes toward using ICT

STATEMENTS	SA	A	U	D	SD
	%	%	%	%	%
Teaching plan should include instructional technology every day.	67.3	28.4	.8	3.0	.5
Instructional technology could help me with my teaching	61.4	34.1	2.7	1.6	.3
The use of instructional technology improves the quality of students learning.	60.4	36.5	1.9	.9	.1
Teachers should continuously search for new ways to use instructional technology in the class room	57.6	37.0	3.2	1.2	.9
Instructional technology can be used to motivate students and enhance their learning experience.	57.2	34.3	3.0	3.4	.1
I feel I should develop my skills to keep up to date with development in teaching	55.7	35.0	3.4	4.8	.9
I need to develop my skills and knowledge for the pupils' benefit.	54.9	39.3	1.6	3.2	9.
I need additional knowledge and skills in the preparation and utilization of instructional technology.	48.2	42.1	5.5	3.4	.7
Instructional technology can be useful in almost all subject areas.	42.8	44.5	6.3	6.3	42.8
I feel comfortable using technology in the classroom.	39.3	47.9	5.7	4.0	3.1
Instructional technology encourages pupils to work together collaboratively.	38.5	50.6	5.5	5.2	1.
Instructional technology can be used to meet individual student needs.	34.3	52.4	6.7	5.4	.5
I'm interested but training doesn't seem to be available.	31.9	43.9	9.0	12.5	2.6
Instructional technology can save a lot of teaching time.	31.1	45.8	10.9	11.3	9.
I'm interested but I do not have the time.	27.9	44.5	6.9	14.9	5.8
I consider it takes me a long time to prepare technology materials for teaching.	13.5	40.9	10.9	30.7	.2
I'm not that interested but I suppose I should be.	12.7	21.8	12.4	38.0	15.1
A computer takes too long to master and produce too few results to be a worthwhile teaching tool.	10.2	14.1	10.2	46.8	18.6
I'm interested personally but developing my skills and knowledge in instructional technology isn't appropriate to my teaching.	8.9	21.4	16.3	38.8	14.3
I prefer to use the textbook instead of the new technology.	6.6	22.5	12.8	52.6	5.5
Instructional technology is difficult to use.	6.3	21.3	13.5	54.8	4.2
I feel lost in the information age.	6.1	23.6	.18	.41	.10
I feel instructional technology is not appropriate to my teaching.	5.4	5.2	8.3	44.8	36.1
I prefer using it on my own when no one is around to see me make mistakes	4.7	13.2	10.8	46.7	24.6
I am eager to apply computers and related technologies to facilitate emerging roles of the learner and myself.	2.6	3.6	5.8	38.0	49.9
I find it easy to select appropriate instructional technology resource for my teaching	.11	.35	.10	.36	.6

Table 2.A.5: Frequencies of teachers' responses to the Aims section

	Not important		Fairly important		important		Very important		essential	
	N	%	N	%	N	%	N	%	N	%
Aim1	11	1.5	35	4.7	71	9.6	150	20.2	475	63.9
Aim6	3	.4	30	4	69	9.3	187	25.2	452	60.8
Aim2	16	2.2	26	3.5	89	12	185	24.9	426	57.3
Aim3	6	.8	18	2.4	66	8.9	230	31	422	56.8
Aim4	6	.8	22	3	87	11.7	226	30.4	401	54
Aim8	14	1.9	25	3.4	87	11.7	215	28.9	400	53.8
Aim5	11	1.5	25	3.4	91	12.2	222	29.9	392	52.8
Aim7	13	1.7	42	5.7	142	19.1	223	30	322	43.3

Table 2.A.6: Frequencies of teachers' responses to the Education issues

No.	SA		A		U		D		SD	
	F	%	F	%	F	%	F	%	F	%
4	415	55.9	185	24.9	110	14.8	26	3.5	3	.4
3	392	52.8	294	39.6	8	1.1	42	5.7	3	.4
1	341	45.9	279	37.6	18	2.4	94	12.7	8	1.1
6	334	45	347	46.7	11	1.5	42	5.7	5	.7
8	284	38.2	330	44.4	78	10.5	43	5.8	3	.4
7	85	11.4	185	24.9	71	9.6	344	46.3	54	7.3
5	79	10.6	159	21.4	56	7.5	341	45.9	103	13.9
2	47	6.3	82	11	191	25.7	328	44.1	92	12.4

Appendix 2.B: Students in LRC room

Appendix 3: Means score of ICT and the Factors scores of ICT

mean scores for ICT	Factors scores	N	Std. Deviation
1.00	-1.1136985	72	.1245804
1.10	-1.0084565	39	.1086374
1.20	-.9192670	40	.1419999
1.30	-.8207461	47	.1661694
1.40	-.6992683	62	.1437458
1.50	-.5751730	38	.1955775
1.60	-.4050215	43	.1909609
1.70	-.2718210	40	.1808417
1.80	-.1181740	44	.1680489
1.90	4.821596E-02	42	.1849839
2.00	.2326148	29	.1754607
2.10	.3602546	32	.2212513
2.20	.4572191	29	.1057966
2.30	.6709790	21	.1960889
2.40	.8177809	20	.1499911
2.50	1.0155009	21	.1916700
2.60	1.1581848	17	.1596452
2.70	1.2977329	14	.1561655
2.80	1.4324168	13	.1899095
2.90	1.6325197	12	.1730568
3.00	1.9184568	13	.3392110
3.10	1.9677090	11	.2564886
3.20	2.1102519	9	.1217188
3.30	2.1993341	8	9.160723E-02
3.40	2.4493856	4	.1000177
3.50	2.6907567	6	.1472391
3.60	2.7732561	5	.1255051
3.80	3.1905932	2	.3279420
Total	-3.8214094E-03	733	.9953046