THE IMPACT OF TECHNOLOGY ON TEACHING AND LEARNING IN HIGH SCHOOLS IN THE UNITED ARAB EMIRATES

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Dedication

This thesis is dedicated to my deceased Father who nurtured in me the research spirit, and to my husband, my mother and my children (Ramzi and Rami).

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Abstract

The “Information Age” is characterized by open computing, the internet and a different breed of users. However most educational institutions such as high schools in the UAE need to affect the desired changes to realign themselves effectively with the ‘Information Age’. Consequently many schools are developing new capabilities and skills through reorganization, restructuring and reallocation, which can enable such successful transformation.

This research explores the impact of Technology (ICT) on teaching and learning in high schools in the UAE. The aim is to gain insight on the consequences of appropriate use of ICT on the teaching function, and the contribution of ICT to student learning. The status of ICT was explored; status being a factor affecting impact.

This study used a positivist quantitative approach to examine the skills, attitudes and usage of ICT at high schools in the UAE. The methodology used is a mixed quantitative/qualitative approach. Three surveys, two interview schedules and one observation protocol was developed by the researcher that contained a list of research questions to be addressed to school principals, teachers and students. These research questions sought for answers on the status of ICT in high schools in the UAE and as a consequence its impact on teaching and learning.

The study found ICT curriculum approaches for students were very little aligned with a stage of development which does not emphasize the integration of ICT into existing curricula and current classroom practice. There was poor alignment between the management vision and the realization of policies regarding hardware, software, multimedia and the internet. Also very little is being done in teacher training to develop their skills in the technical and pedagogical aspects of ICT. Although the majority of teachers had agreed that ICT affected the planning of teaching regarding course preparation; nevertheless, there was a mismatch between policy and implementation. Very little is being

done regarding the assessment methods, as teachers need support and time in making use of new strategies and technologies to enhance their personal work before learning to use them in their teaching. High schools seem to produce students with skills as the major contribution of ICT rather than being a tool to enhance their various intellectual capabilities nevertheless it was interesting to see that the whole school had a positive attitude towards ICT. There was poor alignment between overlapping policies between policy and classroom practice. Classroom observations confirmed that local practice found a reliance on office software as an enhancer of ICT skills and classes are teacher centered.

From these findings a general model was derived for the purpose of answering the specific research questions, The model termed as the UAE Professional Learning Community Model (for high schools) is made up of four major components: – Policies, Structures, Resources and People where each component is unable to stand alone and needs strong support from the others if the adoption of ICT for teaching and learning is to occur. The common elements which drive the model are adequate funds, the allocation of time for collaboration, and strong leadership. The model is cyclical in nature, each major component is constantly feeding into the other components and is directly susceptible to and strongly influenced by global and local factors. Ultimately the adoption of ICT for teaching and learning can be achieved if these components, principles and elements are in place.

This study provides guidance for future policies concerning the planning and adoption of ICT in a practical way, teacher ICT professional development and argues for their alignment with curriculum frameworks for ICT in high school education. The outcomes of this study also provides guidance on the integration possibilities and impact of ICT in high schools in the UAE

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CHAPTER ONE

1.0 Area of Concern: Impact of Technology on Teaching and Learning

1.1 Introduction

The focus of my research is to explore the impact of Technology (ICT) on teaching and learning in high schools in the UAE. The aim is to gain insight on the consequences of appropriate use of ICT on the teaching function, and the contribution of ICT to student learning. The status of ICT was explored; status being a factor affecting impact. At certain stages views, status & impact coincide to provide a synergy which offers a valuable insight to the culture and environment of high schools in the UAE.

This Chapter has five main sections. The following section provides background information in order to identify the focus for this particular study. The third section identifies the purpose of the thesis including its aims and objectives, followed by the specific research questions which were addressed. The fourth section provides insight on the research relevance and contribution followed by a final section that presents an overview of the organization of the thesis.

1.2 Background

Traditionally, the role of education has been to prepare students to live and work within their own society. Globalization of world economies and the introduction of more sophisticated technologies are placing pressure upon these institutions of learning as governments, employers and students clearly expect them to have the answers for the future. Such institutions are turning to Information and Communication Technology (ICT) for many of these answers (Dolence & Norris, 1995; Pearson & Somekh, 2006).

It is well recognized that societies of developed countries have now truly entered into the 'Information Age', an era characterized by electronic transmission and processing of information. Technologies involving computers, computer-based learning packages, interactive video and multimedia, audio graphic communication systems and video conferencing, have now surfaced throughout schools. Over the past decade teaching staff at schools in developed countries have been using ICT in a number of different ways. A number of successful courses and projects utilizing ICT have been developed by many schools, often through special funding from international and governmental organizations (SITES, 2005).The diffusion and subsequent uptake and impact of such innovations within high schools in the UAE are the essential substance of this research.

The diffusion of educational innovations based on the work of Rogers (1995), identifies at least five categories of innovation uptake from high level through to low level – innovators, early adopters, early majority, late majority and laggards. In this model for significant change to occur, a 'critical mass' of individuals needs to have adopted and implemented a given innovation (Gilbert & Green, 1995; Rogers (1995); Deden, 1998; Rogers & Scott, 1997, Hivner et al., 2003). This 'critical mass' occurs when enough individuals have adopted the innovation so that innovations further rate of adoption becomes self-sustaining. In the words of Rogers' (1995) model then, one would say that when the teaching staff and students of educational institutions have reached a 'critical mass' level in the adoption of ICT (termed as ‘the innovation’) then the use of ICT in teaching and learning would be self sustaining. The literature suggests that this can be a slow and in many cases, a difficult process (Clarke, 2001).

The major question however, facing most educational institutions such as high schools in the UAE, is how can the desired changes that need to take place in order to realign themselves effectively with the 'Information Age', be best achieved? The ministry of education in the UAE has embarked on this challenge by initiating a number of ICT initiatives to complement the school's vision statement (Ministry of Education, 2000). In an effort to transform the schools in the UAE into schools that will not only survive but flourish in this 'Information Age', a strategic plan under the name vision 2020 for restructuring of the teaching, administration and learning processes within the schools was developed with the purpose of starting the implementation of the plan in 2001 (Ministry of Education, 2000). Consequently many schools are developing new capabilities and skills through reorganization, restructuring and reallocation, which can enable such successful transformation to a school reflecting the 'Information Age'. It is clear though, that just because a great deal of change is occurring in schools does not necessarily mean that a real transformation process is taking place. Fullan (1998) has consistently emphasized this of educational change being a process and not an event. In the context of schools in the UAE this would mean that the school does not necessarily guarantee that change will occur for any or all individuals. Rather, that change needs to be seen as a process in which each individual (principal, school staff, teachers and students) actually participates in these initiatives and applies them to their teaching and learning practices.

High schools in the UAE are dominated by a culture of rote 'memory learning' and the 'traditional model' of curriculum structure (Ministry of Education, 1999). The predominant curriculum structure is described as:

> *Throughout the twentieth century a certain pattern of organizing instruction in schools has become well established and is easily recognizable as the traditional model of classroom teaching :using the text book based curriculum with its grade-level sequencing; dividing the day into periods for teaching different subjects, with each subject subdivided into units and lessons; and teaching with whole-class instructional methods. (Heinich et al., 1996, p.312)*

Heinich et al., (2004) propose a number of alternatives to the traditional model, which are made possible through the use of computers. He enumerates a number of what he calls 'process technologies' or specific teaching learning patterns that have been validated by research and proven to provide effective learning. These pedagogical methods, he claims, typically yield an improvement in student achievement by placing the learner in direct interaction with the subject matter (p.324). Heinich (2004) goes on commenting on how society is open to new technology but that education as a subset of the society has been resistive to incorporating new technology to change the way instruction is performed. Nevertheless, things are changing as Smaldino et al., (2004) point out; the teacher's role in the learning process is also changing with the introduction of ICT. The teacher must of necessity become facilitator and mentor rather than presenter of information. Bussel (2001) points out in his paper 'The Future of Multimedia in Education' that interactive media and the digital world in which we live are in part the reason for the need to change our approach to learning. Bussel (2001) goes on to state that the new educational model must be learner driven and that educational institutions that will survive will have to change their approach to the issues of access, equity, and process.

What are widely called Emerging Information and Communication Technologies (EICT) are currently arousing curiosity in many teaching environments (Anderson & Weert, 2002). Now aware of the growing role that these technologies occupy in numerous spheres of social life and the attraction they hold, in many forms, for young people, we wonder about the attention that the school system should give to them, and specifically what impact they could have on student learning and instructional practice. The expression "EICT" refers to three features of new technologies that are the most important for education - the capability to digitalize process and transmit information. Words that are commonly used for the definition of these technologies in research and policy documents include such terms as *21st century tools*, *computer*, *information technologies, communication technologies, multimedia*, *information and communication technologies*, *digital technologies*, *network technologies*, *learning technologies* or just *technologies*. However, the scope and meaning of these terms are not the same. For instance, the terms *multimedia*, *digital* (EC, 2003), *computer* and *information technology* (Lennon et al., 2003) imply only the digitalisation and processing of information. *Communication* (ETS 2002, 2003), *network* (Bawden, 2001) or similar terms entail only digitalisation and transmission. The term *information and communication technologies* (Anderson & Weert, 2002) covers all three features. More general terms - *21st century tools* (Partnership for 21st Century Skills, 2002), *technology* (ISTE, 1998) or *learning technology* (ACTG, 2004) - are usually used in a broader sense than ICT and involve other (*i.e.*, non-ICT) technologies that could be applied for teaching and learning.

The most exact and sustainable term, which has been used broadly in the educational domain, is *information and communication technology* (Anderson & Weert 2002; Lennon et al., 2003). The most comprehensive description of this term was proposed by UNESCO as far back as 1994 (Weert & Tinsley, 1994); and it is still used (Anderson & Weert, 2002). This definition of ICT explicitly includes not only hardware and software, but also 'organizational and human aspects' and 'industrial, commercial, governmental and political implications' (Anderson & Weert, 2002, p.12). Other recently proposed definitions of ICT have similar meaning and include all three aspects of modern technologies - digitalisation, processing, and transmission (Cuttance & Stokes, 2000; Lennon et al., 2003). They particularly emphasize ICT's ability to enable communication.

In summary, *information and communication technology* (ICT) is one of the most appropriate terms for use in an educational context. Generalising the UNESCO (2000); (Anderson & Weert, 2002) and other (Cuttance & Stokes, 2000; ETS 2002, 2003) commonly employed definitions, ICT can be described as the application of information processing and transmission systems in society, including hardware, software, communication tools and networks, organizational and human aspects, and the industrial, commercial, governmental, political, social and cultural implications of these.

Since these technologies are by definition emerging, it is not possible to take stock of their "impact" in the same way as we would an existing education technology. In the vast majority of cases, the applications of these technologies that we find in the public high school systems (in the UAE) are part of pilot projects or experiments whose environment, most often, is only partially in harmony with their characteristics and possibilities. It is for this reason that in this thesis write up, I am interested not only in hard scientific conclusions, but also research findings, which, although still tentative, are conducive to stimulating current thinking on teaching and learning models and the reform of the school system (specially in the UAE as this subject matter is in its early stages and where little research has been conducted). It is worth noting that this latter approach is justified by the fact that if we refer to the existing body of knowledge on relations between technology and education "it is becoming increasingly clear that technology in and of itself, does not directly change teaching or learning but rather, the critical element is how technology is incorporated into instruction." (US Congress, Office of Technology Assessment, 1995, p. 57).

1.3 Purpose of the Thesis- Aims & Objectives-

Schools have to re-examine their existing structures and practices in order to meet the needs of the ‘Information Age’. This is requiring a major transformation (Dolence & Norris, 1995; Daniel, 1997). According to Dolence & Norris (1995) one of the major concerns that hinders the transformation process is the lack of useful models and success stories to lead the way. The present study proposes to identify the Status & Impact of ICT on Teaching and Learning in high schools in the UAE. In light of the these results and after extensive reading on the experiences of other countries in this domain, a model for implementing ICT into teaching and learning practices across high schools in the UAE has been developed in chapter six.

This main research question was further developed into two sub-questions namely:

1. The impact of ICT on teaching
2. The impact of ICT on learning

The first research question was further explored from both the school and teachers perspectives to cover the:

a. Skills, attitudes, policies and usage of ICT in schools in the UAE &

b. The consequences of appropriate use of new technology on the teaching function.

The second research question was further explored to gain insight of the contribution of new technologies to student learning.

I would also like to identify the potentials and contribution of ICT rich learning environments for high- school learners and teachers in the UAE. This environment is made possible by various applications and equipment that allows for the possibility of transmitting and sharing data in various formats such as text, diagrams, graphs, moving images, sound etc. The learning media I refer to covers not only course subject matter (content), but also intellectual skills that are associated with these course subjects; such applications that improve “mental image” making, qualitative and quantitative reasoning, judgment making, and problem solving skills. This learning process can be seen as the development of social and professional skills such as self-reliance and responsibility. Other applications are the traditional phases of preparation, communication and assessment in teaching, student support activities and the environment established to stimulate a process of discovery and assimilation by the students.

Three main groups of players are addressed namely the principal of the school, the teacher and the student. Consequently my key research questions run across the following three dimensions.

The schools perspective:

- What are the skills and attitudes the school system considers as a formal part of its educational mission?
- How is technology incorporated into instruction?

- What is the relationship between practices, purposes and situations and ICT (in the UAE)?

Teacher's perspective. The consequences of appropriate use of new technology on the teaching function:

- How is the role of teachers affected by ICT?
- How is the immediate planning of teaching affected?/ Assessment of learning

Student's perspective. Contribution of new technology to student learning:

- What is the students' technology literacy level
- What is the specific learning achieved
- Are students motivated /empowered by ICT?
- Relationship of students to learning?

The sample population involved in this research is 12 UAE based public high schools, 432 students, 118 teachers and 12 principals. By adopting a positivist approach the assumption is made that the findings of this study will be pertinent both to the high schools covered by our sample and other similar high schools in the UAE. A combination of quantitative (survey and Likert-type instruments) and qualitative (interview and observation) methods were employed.

1.4 Research Relevance and Contribution

Although much published work has been conducted in various contexts in the UK, Australia, United States and Western Europe, nevertheless a limited amount of investigation has been done in the Emirates regarding this subject matter making my study timely and appropriate since the issue that I am tackling has been the subject of only of a limited number of papers, none addressing the high-school level. Also the few literature resources I found on the UAE tackle this subject matter in pieces and do not look at it from a holistic view point. In my dissertation I intend to tackle the subject matter in a "Holistic" manner. Namely refer to policy and practice, social and cultural perspectives, curriculum issues, pedagogy, student learning and the school leadership and management environment. Thus I will seek the view of the Meta leaders (Government); the users (teachers), the receivers (Students) and the implementer (School Management & teachers).

This study should be of particular interest to those policy makers at schools who intend planning for the adoption of ICT in a practical way to enhance the teaching and learning in their school. This study also develops a practical model, which promotes the adoption of specific strategies over others. The recognition and adoption of a particular model and subsequent strategies by an institution would certainly be of significance to the staff and students at that school.

1.5 Overview of the Thesis

Chapter two of this thesis examines in some detail the global changes that have affected educational institutions around the world. The organizational culture of education focusing on professional learning organizations and communities is discussed and the notion of transformation as identified by various authors and is examined focusing on effective leadership and change management. The chapter concludes by presenting an overview of the education system in the UAE; its background, current status and future strategic plans with emphasis on the infusion of technology.

Chapter Three identifies the specific impact that technology has had on educational institutions, the changes that have resulted and how institutions are attempting to manage these changes. This chapter begins with a description of the current climate of ICT use in education. This section is further developed into an examination of the factors affecting the adoption of ICT at both the institutional level and the individual level. The chapter also states the theoretical foundation upon which this study is based, more specifically in terms of change and innovation. The review identifies the various theories of change and how these concepts and processes impact learning environments. Rogers' (1995) diffusion of innovation theory is examined in detail. This theory will be used in formulating the researcher's model. The chapter continues to identify how ICT specifically affected the teaching and learning practices of the teaching staff and the implication of technology on the curriculum structures and emerging curriculum patterns that might enrich the proposed model. Two major areas are discussed that relate to the thesis subject matter namely the consequences of appropriate use of new technologies on the teaching function of teachers and the contribution of new technologies to student learning.

Chapter four reveals the research methodology adopted by this study and outlines the design describing each of the four phases. This is followed by a description of the triangulation methods adopted as well as the process involved in managing, analyzing and storing the data. Ethical issues have been addressed in this chapter, including the precautions which were carried out in order for the research to be conducted in a professional and ethical manner. Finally a brief summary concludes this chapter.

Chapter five presents the results and interpretation of the data which is directly linked to the research questions. In particular, it provides background information for the various data sets, as all three instruments are combined to provide a comprehensive picture of how high schools in the UAE are utilizing ICT in their teaching and learning. This chapter also leads to identifying an appropriate model for future implementation of ICT into teaching and learning at high schools in the UAE.

The final chapter, Chapter six provides a number of assertions which have been generated from a synthesis of the research findings. Weaknesses and limitations are reviewed as well as suggestion for further research. Also some recommendations and suggestions are made for policy and practice.

CHAPTER TWO

2.0 Transforming Educational Institutions

2.1 Introduction

This chapter examines in some detail the global changes that have affected educational institutions around the world. The organizational culture of education focusing on professional learning organizations and communities is discussed in the following sections while the notion of transformation as identified by various authors is also examined. This focuses on effective leadership and change management. The chapter concludes by presenting an overview of the education system in the UAE; its background, current status and future strategic plans.

2.2 Global Changes

Educational institutions tend to develop a disturbing imbalance with their environments (Clark 1998). He characterizes the typical school – environment relationship as a "deepening asymmetry between environmental demand and institutional capacity to respond" (p xvi). This imbalance creates the problem of institutional insufficiency where existing methods are not adequate or appropriate for the new demands placed on schools. This institutional insufficiency is caused by the differences in the practices and structure of traditional educational institutions (Industrial age) where individuals are taught to make things whereas today's system is faced with preparing individuals for the Information Society (handling information) (Dolence and Norris, 1995).

It is also noted that society is undergoing a transformation, and that education is 'reacting' to the emergence of the Information Society (Plomp, Brummelhuis & Tapmund, 1996). Le Grew (1995) and Plomp et al., (1996) see that these trends have contributed to, and are causing a transformation – a paradigm shift. Le Grew (1995) and others (Dolence & Norris, 1995; Mason, 1998; Marchese,

1998) all argue that new information and communication technologies (ICT) will cause the traditional boundaries of study to erode, and that the in formation society will generate completely new definitions of education.

2.3 Organizational Culture of Educational Institutions

The notion that the culture of an organization directly impacts the production and effectiveness of an organization has been around for a very long time (Roethlishberger & Dickenson, 1939; Cavanagh, 1997; Ramsden, 1998). The beliefs, values and norms shared by the members of an organization form the culture of the organization (Gibson et al., 1985) and these cultures are created and fostered by the leaders and managers over time (Hargreaves & Fullan, 1998; Ramsden, 1998; McNaught el al., 1999). Hargreaves & Fullan (1998) point to the distinction between the descriptive terms 'restructuring' and're-culturing'. In their view, restructuring involves the changes which are made to the formal structure of and organization- management, roles, time frames. They note that restructuring in education alone, has not made any significant impact on improving teaching and learning. They advocated the need to re-culture, which involves changing the norms, values, incentives, skills and relationships in an organization (schools) in order to support people to work differently together. The pattern they identified is that once people have invested emotionally in transforming the culture, they then in turn place pressure on existing structures in order for them to change and meet their new needs. They also note that this usually occurs over a time-span of many years.

On the other hand an examination of school culture is important because, as Goodlad's study (2004) on school culture points out, "alike as schools may be in many ways, each school has an ambience (or culture) of its own and, further, its ambience may suggest to the careful observer useful approaches to making it a better school" (p. 81). Depending upon how well leaders understand and use this notion; culture can assist school improvement efforts for students, or act as a barrier to change (Deal & Kennedy, 2000; ; Fink, 1999; Blumenfield et al., 2000; Blumenfield et al., 2000).

It is believed that the culture of the school reflects the local culture in many ways (Moos et al, 2000; Blumenfield et al, 2000). When schools seek to improve, a focus on the values, beliefs, and norms of both the school and the environment outside the school is necessary (Sarason, 1982; Deal & Peterson, 2002). A specific review of the literature in this area reveals that there are essentially four ways of conceptualizing and analyzing organizational (school) culture. The first is the *nomothetic* approach which places organizations into certain defined categories. Handy (1976) defined these categories as 'power', 'role', 'task', or 'person'. The second is the *functionalist* approach which is also a unitary one, where the culture of an organization plays an important role in the survival and development of an organization- the members share a common purpose. Schein (1985), Smart & Hamm (1993), and McNay (1995) adopted this functionalist approach in their work with organizations in educational institutions. In particular, McNay (1995) developed a model to describe school change. He based his model on the degree of 'looseness' or 'tightness' concerning the issues of policy definition and control over implementation. The third approach to conceptualizing and analyzing organizational culture is the *inductively-derived categorizing* approach which is a similar, yet more sophisticated approach to the nomothetic one. In this case organizations are studied first then conclusions are drawn from the main characteristics of the institution. The fourth approach is the *phenomenological* one which views culture as being created uniquely in each social setting which is constantly changing as values and understanding develop causing behavioral changes.

Trowler (1998) strongly challenges these conceptions of organizational culture viewing organizational culture as encompassing a variety of notions. One such notion is that culture is partly constructed as well as enacted. Individuals within an organization do not simply adopt the views or attitudes found within the organization as individuals and groups; they construct the culture of the organization. Finally, Trowler (1998) sees organizational cultures as essentially open and pluralistic in nature. With such an approach, Trowler (1998) had basically adopted the theoretical construct by Alvesson (1993) where the belief is that large organizations are characterized by a unique multiple cultural configurations which are a set of cultures of different levels and kinds, manifested in different ways. For example, individuals may primarily identify mainly with organizations (schools), with sub-units (department, classes, subjects) of it, or perhaps even with the wider community (their profession). It is important to note that individuals bring with them certain cultural characteristics that relate to social status, gender, ethnic group and so on, making such an institution accessible to influences outside the institution itself.

> *This vision of cultures within organizations is also a dynamic one in the twin sense that it is itself in constant movement and show how cultural characteristics may be configured in ways which will impede or facilitate change. (Trowler, 1998, p.30)*

This conceptual view of organizational culture initially developed by Alvesson (1993) and adopted by Trowler (1998) provides a valuable framework for viewing the dynamic process of culture within schools. However to enhance this framework the notion of, schools as learning organizations and learning communities is addressed in section 2.5.

2.4 Transformation of educational institutions

Innovation is transformative only if institutions can find ways of employing examples of success which can lead to new forms, new structures and new cultures (McClenney, 1998). In schools this would necessarily involve systems, faculty and functions. She presents the notion that the tools for transformation are will, vision, focus, data (on how and what students are learning) and the strength to push the changes through.

Dolence and Norris (1995) identify four components which they suggest encapsulate the process of transformation required by educational institutions:

- ✓ Realigning education with the Information Age.
- ✓ Re-designing education to achieve this realigned vision.
- ✓ Redefining the roles and responsibilities with a realigned, redesigned education system, and
- ✓ Reengineering organizational processes to achieve dramatically higher productivity and quality.

According to these authors, one of the major concerns that hinder such a transformation process is the lack of useful models and success stories to lead the way.

2.4.1 Effective Leadership and Change Management

The underlying principles of academic leadership according to Ramsden (1998) are varied and involve such dimensions as: a dynamic process; an outcomes-focused agenda; a multi-level operation; the leader's learning; transformation. Cavanagh (1997), who researched factors affecting high school culture, identified transformational leadership as focusing upon the maintenance and growth of the school culture. He found that transformational leaders support individual teachers and also ensure that organizational pressures do not conflict with the values and social processes which provide the school community with cohesion. Fullan (1992b) was of the view that there was a need for school principals to develop collaborative school cultures which are characterized by co-operation, so that staff and not just the principal control the development and implementation of innovations. Values that are shared unite the school community, create the community's vision and provide everyone with a common sense of purpose (Fullan, 1992a; Sergiovanni, 1992).

Visions are about change, representing a picture of the future (Senge, 1990). According to Ramsden (1998) visions are at the heart of leadership. Bates (2000) believes that developing a vision for the use of ICT in teaching and learning is the most important of all strategies. He also believes the process of visioning should be completed at different levels (institutional, staff and class), however he sees that the best place to start is at the class level where the actual teaching occurs. Researchers have found particular cultural norms that can facilitate school improvement. Norms such as introspection, collegiality, and a shared sense of purpose or vision combine to create a culture that supports innovation (Staessens, 1991).

Fullan at al., 1991 further stresses that vision involves two dimensions:

> *"The first is what the school could look like; [this vision] provides the direction and driving power for change and the criteria for steering and choosing…The second [dimension] is a vision of the change process: What will be the general game plan or strategy for getting there?" (p. 82).*

Both dimensions of the vision are both sharable and shared (Fullan et al., 1991). A cultural norm supporting the involvement of teachers in decisions or plans that will affect them heightens the possibility that changes will be appropriate in a particular setting. Involvement makes it more likely that responsibility will be assumed and not be attributed to others (Sarason, 1982; Deal & Peterson, 1998).

In conclusion, establishing and nurturing a culture of shared power and decision making, with norms of introspection for continuous improvement, is an important task for school administrators. It is a task that is shaped by the community and institutional context in which administrators find themselves.

2.4.1.1 Leadership Context

Popular and traditional views of leadership emphasize a leader's charisma and personal strength, but more rigorous models of leadership focus upon interrelationships among distributed participants (Neuman and Simmons, 2000; Schultz, 2000), a leader's ability to cope with complex change (Fullan, 2000), and whether an organization has established a culture of a continuous learning (Senge, 1990). Decision-making in schools concerning ICT is a particularly appropriate setting for analyzing how these three forces play out because change is so basic to managing this new technology. In this analysis we apply this organizational perspective to technology leadership, rather than viewing it either in terms of personality or as a set of skills (Jewell 1998/1999; Selwood et al., 2003). In a school with distributed leadership everyone applies their competencies to improving student learning (Neuman & Simmons, 2000). Consequently it is more appropriate to view technology leadership as an attribute of schools rather than individuals. This is the perspective taken in this research as we examine the relationship between school leadership and effective utilization of technology.

2.4.1.2 Change Management

Understanding the process of change is a good precursor to making appropriate decisions about how to support technology innovations. Establishing a shared meaning for individuals within a social system is important, while each individual needs to perceive that there are benefits and value in actually changing (Layer, 1995; Taylor, 1995; McNaught et al., 1999; Bates, 2000). It is important for institutions to remember that at the heart of any educational change is the staff (Fullan, 1993; Hargreaves, 1994; King, 1995; Trowler, 1998). Clark (1998) referred to this special place where academic staff reside (the department, school) as the 'heartland'.

Institutions will have to undergo a dramatic culture shift if extensive use of ICT is to be adopted by staff (Resmer et al., 1995). The culture of the school and more importantly the culture of the academic staff need to be considered when devising strategies for implementing the use of ICT for teaching and learning (Tallantyre, 1995). The environment profoundly affects academic's 'work processes, morale and productivity' (Ramsden, 1998, p199). McNaught et al., (1999) found that culture emerged as a major theme in their study. This included issues of vision and leadership at an institutional level, attitudes towards ICT and innovation, level of risk taking, allocation of resources, recognition and reward and staff motivation.

2.5 Professional Learning Organizations and Communities

The term "learning organizations" refers to an organization where people at all levels work together to strengthen their capacity to achieve and create (Senge, 1990). This concept has become a primary theme of modern management literature. Danahoe (1993) builds on Senge's concept and described the culture of a community as the interaction between individuals and groups which leads to the development of common values, beliefs, behaviors, rules, products, signs and symbols which provide ultimately the community with its cohesion whereas Sergiovanni (1993a) has contributed significantly to our understanding of concepts of community building in schools. He describes schools as formal organizations which were characterized by rationality, specialization of knowledge, a hierarchical distribution of power, rules, regulations, and set goals by which achievement was measured. He also suggested that a paradigm shift was required in the ways schools were conceptualized – from an organizational to a community perspective.

An organization's capacity is enhanced when schools are shaped into professional communities (Fullan, 1998). According to him, the three general attributes of professional communities are that teachers pursue a clear shared purpose for all students' learning and those teachers engage in collaborative activity to achieve the purpose, and that teachers take collective responsibility for student learning. He claims that successful school restructuring depends on human resources and leadership, with the assistance of certain structural conditions (interdependent work structure, small school size and school authority to act). Hargreaves & Fullan (1998) also see the importance of relationships; any educational reform strategy that improves relationships has a chance of succeeding. For them, normal policies and procedures alone will simply not work.

The effect of school culture on school improvement efforts is significant. The attitudes and beliefs of persons in the school shape that culture. Many times innovations are not put into practice because they conflict with deeply held internal images of how the world works images that limit persons to familiar ways of thinking and acting (Senge, 1990; Senge & Lannon-Kim, 1991; Kwajewski, 1997). This failure is played out in schools on a regular basis. The attitudes and beliefs of those in the school create mental models of what schooling is and how others in the school should and will respond to events and actions. It is from these attitudes and beliefs that the culture of the school is created.

A framework which attempts to marry Alvesson's (1993) multiple cultural configuration approach, Senge's (1990) learning organizations, Sergiovanni's (1993a) learning communities and Fullan's (1998) professional learning communities would be a group of people who work collaboratively and collectively towards a shared vision. An important ingredient is that the members choose to belong to such a community. The evidence would seem to be that such a framework could be effective in attempting to transform education in schools.

2.6 Transforming UAE Schools

> *Vision: Vision 2020 aspires to achieve high quality education in all schools to produce a generation equipped with basic skills in work, production, communication and citizenship, to prepare professionals equipped with creative thinking and continuing self –learning skills and able to adapt with changes and deal confidently and efficiently with the future.*
> *(Official document Ministry of Education& Youth (2000) Education Vision 2020, pp 188*

As identified earlier there have been many changes which have impacted on education both internationally and within the UAE context. Educational institutions have been forced to re-examine their organizational structures and existing practices, and to realign these structures and practices to meet the needs of Information Age learners and the society. The schools in the UAE, as many other schools around the world, have been faced with such a challenge. Consequently the leadership in the UAE responsible for education had to deal with some strategic issues in preparing its ambitious vision of transforming education in the UAE. This led to the development of an educational vision under the name of vision 2020 quoted earlier.

Some of these strategic issues are, continuous social demand for government public education, school curricula, traditional roles played by those in charge of the educational system, interest in quantity at the expense of quality, review of performance and professional status of teaching staff, central budget control and civil service regulations and the present educational environment and modern teaching.

2.7 Background of the educational system in the UAE

Education in the UAE is characterized by a rapid beginning and great demand for education. This reflects the government's obligation to spread education all over the country. There is an increasing societal demand for education and awareness of the role of education in cultural enlightenment, ability and skill development. The UAE government, since the early beginnings of the union, has been aware of education and its role in the welfare of the individual and society at large and the role it plays in continuing human development (Ministry of Education, 1999). The UAE government's orientations have led to quantitative expansion in educational services to embrace students in all education stages at a ratio higher than the ratio of population increase. After 25 years the government is able to provide primary education for all those between the age of 6 and 11. This has led to illiteracy eradication and 'Education for All' has become a reality in the UAE. This slogan is derived from Islam. Islam considers seeking knowledge to be the duty of every Muslim and this begins from the cradle to the grave [(Life-long Education) Ministry of Education, 1999; www.uaeinteract.com, 2006)].

The following statistical data indicates quantitative expansion rates in education after the union from 1972/1973 to 1999/2000 based on official statistics by the Ministry of Education.

- Number of schools increased from 132 to more than 708 (more than 5-times)

- Number of classes increased from 1288 in 1972/73 to 12504 in 1999/2000 (10- times)
- Number of students increased from 40,115 in 1972/73 to 314,942 in 1999/2000 (more than 8-times).
- Number of educational administrative and technical staff increased from 2,357 in 1972/73 to 27,493 in 1999/2000 (more than 11- times).

Decrease in class size (24.2% in KG, 26.3% in primary, 29, 2% in preparatory, 24.5% in secondary and 20% in technical schools) as a result of ensuring more school buildings. These rates rank high when compared to Arab and International standards (Ministry of Education, 1999).

The existing educational structure is a four-tier system covering 14 years of education; namely, kindergarten, primary, preparatory and either secondary or technical secondary. The secondary level is three years comprising of ages between15-18. It consists of a common first year followed by specialization in science or arts. At the end of the twelfth year students take the examination for the secondary school leaving certificate.

2.8 Status and Problems of Education

There is no doubt that quantitative expansion in education in the early days of the union that came in response to increasing societal demand for education has yielded a number of strategic issues and key problems regarding the quality of the educational system. These were not direct consequences of quantitative expansion alone but also came as a result of political, social, economic and educational challenges with emphasis on the information and communication boom. The development of information technology and the challenges it places on education is highlighted (official document Ministry of Education & Youth, 2000 Education vision2020).

a. *Fast development of information and technology as a result of the information and communication boom:* This, together with the new world system of ‘globalization’ have made high quality education and utilizing technology the only means to adapt with this world change thus making competition in the global economy possible. Many developing countries including the UAE have realized that education is the winning card in global competition. Thus more attention and care has been given to education. The UAE decided to make a drastic change in educational system development in order to make a leap in producing creative and innovative nationals who are able to construct knowledge, adapt with and make progress. The environment of the present system is unable to utilize modern technology with its interactive educational multimedia, computers, information networks and the internet services that have broken into a classroom. Introducing modern technology in education requires financing, good training, programs and introducing self-learning tools and providing the necessary resource centers to change the traditional chalk and board into interactive computers. The major concern of the Ministry of Education is to ensure the development of methods and programs that adhere to the latest international standards, with particular focus on introducing the latest IT resources at all levels of education (official document Ministry of Education & Youth, 2000 Education vision2020).

b. *Educational Challenges:* These involve drastic changes in education philosophy, objectives, content, learning means and tools. New concepts contradicting previous ones have been introduced. On top of these new concepts is sustainable, life-long education. Another is self and independent learning. A third is computer assisted learning and other technology such as multimedia. Creative learning, contemplative learning and learning for work and co-existence with other cultures are new concepts. This requires strategic changes in the educational system through comprehensive and integrated programs that aim at developing all elements of education. These elements cover objectives, policies, curricula, programs, teaching materials, methodologies, evaluation tools, operational and administration systems. This needs maximum use of ICT with the aim of achieving high quality education both quantitatively and qualitatively (Ministry of Education, 2000). All these local and global challenges necessitate a developing educational system that can adapt and overcome emerging problems, otherwise education will be in isolation from our modern age and unable to meet societal needs. Consequently a developing education system can solve societal problems by being a developmental, mobile and dynamic system (official document Ministry of Education & Youth, 2000 Education vision2020).

c. *Other Challenges:* Despite continuous review and updates, the present school curricula have not been developed with regards to objectives, content and methodologies. These curricula remain only cognitive in nature. They only promote memorization and recitation skills of learners. Thus, learners have become passive in that they take and do not give, memorize and don't think, the content of these curricula is not modern. Cognitive preparation is not enough to produce citizens aware of their rights and duties. The present curricula do not prepare learners for tomorrow and the future. They do not develop innovative creative imaginative skills. They deprive learners of their right for self-learning, individualization and creativity. Repetition, redundancy and weak readability are further defects of the present curricula (Ministry of Education, 2000; Ferrandino, 2007). Also the teacher is a prompter who fully controls the teaching/learning situation leaving no space for interaction, creativity or even innovation. The school principal sees himself/herself best in managing work. His/her sole aim is discipline and punctuality. He/she lacks the vision of institutional leadership (Ferrandino, 2007).

If we want education to change and develop, these roles have to be changed. Human resources have to be developed in a modern up-dated way. Educational research conclusions and educational technology have to be considered and utilized (Ministry of Education, 1999; Ferrandino, 2007). The attitudes of institutional administration and the teaching staff have to be changed, too. The former has to allow for on-going learning that does not end by the end of school day and the latter has to admit that the learner is able to learn by himself. To do so the learner has to learn how to learn. Thus the teacher's role then is to identify and diagnose learning problems and guide the learner to use more learning resource centers (official document Ministry of Education & Youth, 2000 Education vision2020).

d. Moreover teachers expressed dissatisfaction with their jobs due to the hard working conditions and lack of support and financial incentives. The solution to this dilemma is to provide a pack of social and financial incentives. Also teachers' preparation programs are not adequate and should be corrected to ensure effectiveness by designing and launching effective refresher training and pedagogical programs (official document Ministry of Education & Youth, 2000 Education vision2020).

e. Lastly there should also be drastic change in school construction criteria. The school building should be a functional building with all educational, architectural and engineering construction criteria considered. This building should provide all facilities including halls, modern classes, laboratories, courts and curricular and co- curricular activities halls (official document Ministry of Education & Youth, 2000 Education vision2020).

The aforementioned points are some of the most important strategic issues and the resulting problems. Through this document of Vision 2020, the educational leadership tries to demonstrate its vision and strategies to handle these problems. These problems are interactive and interrelated. Without strategic planning and effective means these problems cannot be solved. Their negative consequences will prevail and their impact on the educational systems will remain negative. They will also limit and hinder development and disperse efforts. The educational field is fully aware of these problems. This education policy document (vision 2020) provides solutions to these problems; its core involves awareness of the present issues and the problems, adoption of long term strategic objectives, designing reform plans and suggesting development means to cope with future challenges.(Ministry of Education, 2000).

2.9 Vision 2020 Principles and Strategic Pillars

On May 3, 1998 a Ministerial circular was issued urging their Excellencies assistant- under-secretaries, district directors, directors of central departments and school principles to express their opinion about a comprehensive strategy for educational development (Ministry of Education, 1999). The circular urged the addressees to provide the Ministry with their opinion on the general principles governing development in education by proposing specific development projects to be included and the status of development projects currently under implementation.

The Strategic Development Pillars aim to:

1. Increase efficiency and effectiveness of on-going in-service training.
2. Develop and direct human and capital resources so as to increase work efficiency.
3. Develop and up-grade quality in the educational system. This includes educational objectives curricula, teaching materials, teaching methodologies and tools, as well as means of evaluation so as to yield better learning outcomes.
4. Integrate, communicate and interact with societal institutions so as to make education a societal concern to satisfy the needs of society effectively and efficiently. Accordingly education will get continuous and on-going support and more contribution from all sectors in society.
5. Increase rate of emiratization both qualitatively and quantitatively and provide opportunities for national labor force to grow professionally. Various incentives will attract more talented and dedicated nationals to join in the teaching profession and encourage those actually already involved in the field.
6. Develop work conditions and work environment in the Ministry, districts and schools to deepen the sense of responsibility and accountability; develop an obligation in team-work spirit and promote understanding and assimilation of modern technology for labor force to put to good use.
7. Widening the base of decision-making and providing a well-established information and research base for development projects.

Reports and suggestions coming from educational districts, department directors and school principles stated: “The new strategy is an embodiment of the ambitions of all the educational community and their aspiration. The ministerial circular does express the real needs to develop the UAE educational system”. Some reports stressed the utmost importance of training and curriculum development. Other reports emphasized importance of reorganization and restructuring of the Ministry, leadership training, providing favorable educational environments and producing appropriate and modern educational media for the developed curricula (Ministry of Education, 1999).

According to the report of the Ministry issued through the office of Teaching and Learning, it was highlighted that the schools had made a major commitment to achieving the objectives of the teaching and learning plan (2020). This detailed plan incorporates the Ministry's vision, mission, values and goals. In addition, the plan lists the six objectives which address the Ministry's teaching and learning goals.

These objectives are:

1. Education as a drive for national development
2. productivity and cost effectiveness
3. Quality and continuous improvement
4. Education as culture and knowledge creator
5. Adaptive and responsive infrastructure
6. Societal involvement, contribution support
7. Restructured and articulated education levels to ensure integration “Changing times Changing Plans” (official document Ministry of Education & Youth, 2000 Education vision2020).

CHAPTER THREE

3.0 Impact of ICT on Schools and Educational Systems

If schools are successfully to adopt the use of technologies for teaching and learning, much more than minor adjustment in current practice will be required. Indeed the effective use of technology requires a revolution in thinking about teaching and learning. Part of that revolution necessitates restructuring schools that is, changing the way schools are planned, managed, and organized.
(Bates, 2000, p 30).

3.1 Introduction

Chapter Three identifies the specific impact that technology has had on educational institutions, the changes that have resulted and how institutions are attempting to manage these changes. This chapter begins with a description of the current climate of ICT use in education. This section is further developed into an examination of the factors affecting the adoption of ICT at both the institutional level and the individual level. The chapter also states the theoretical foundation upon which this study is based, more specifically in terms of change and innovation. The review identifies the various theories of change and how these concepts and processes impact learning environments. Rogers' (1995) diffusion of innovation theory is examined in detail. This theory will be used in formulating the researcher's model. The chapter continues to identify how ICT specifically affected the teaching and learning practices of the teaching staff. The implication of technology on the curriculum structures is also examined followed by exploring the impact of ICT on the teaching function and its contribution to student learning.

3.2 Current Climate of ICT Use

As identified in Chapter Three, there have been a number of factors which have threatened and challenged the existing practices of education, not the least being the introduction of new information and communication technologies

(ICT). According to Spender (1998), digital technology, especially online education is causing new pressures on learning outside the control of teachers. She introduces the notion that future academic staff will be 'learning managers', where their role is not to know everything , but to be able to know where to access the most relevant and appropriate information through online technologies. Fox (2000) advocates that new technologies will change what we do, our work practices and relations, our jobs and our futures' (p 241). Similarly, ICT will fundamentally change how and when students are taught (Fox, 2000).

Gillespie (1998) argues that until recently academic staff has simply employed ICT to support and enhance existing practices. He claims that in recent times we are beginning to see and experience how technology has "really changed how we teach or what is actually taught" (Gillespie, 1998, p 42). Gillespie notes that the learning features available with new technologies is a blending of the five principles of instructional computing. These principles are concerned with the view of computers as: content to be taught; a support tool for instruction; a personal productivity tool; a means of hypertext and multimedia delivery and a communication device (Gillespie, 1998). In a similar view Fox (2000; 2001), notes that these new learning opportunities have caused educators to challenge and move on from the way we traditionally think about employing technology to support teaching and learning. This move opens up an environment that provides a greater amount of learner options with much less teacher direction (Bar & Tagg, 1995).

Certainly, adopting ICT to enhance and support our existing practices and structures may give us the appearance of improving education without any real and substantial advances in student learning (Gandolfo, 1998). This view is similar to that of continually allowing innovations to occur on the periphery of the organization as this tends to prevent them from contaminating existing core functions. In other words, the existing core functions, behaviors and values of the organization are often unaffected, resulting in little change.

3.3 Factors Affecting Adoption at the Institutional Level

With such pedagogical benefits as noted earlier, one must wonder why these new and powerful information and communication technologies have not permeated to any great extent into the fabric of educational institutions around the globe. This section addresses the various factors which influence the adoption of ICT in schools as found in the research literature.

Many issues appear to surface at the institutional level, such as fragmented institutional planning (Gilbert, 1996a), where institutions fail to match the technology investment with an investment in people (Alexander, 1998; Bates, 2000). In other institutions plans are seemingly driven by ICT and not by pedagogical rationale and focus (Deden & Carter, 1996; Brown et al., 1998). The literature suggests that the lack of models for integrating ICT into teaching and learning (Schofield, 1995; Gilbert, 1996a; Northrup, 1997) and a lack of committed dedicated leadership (Middlehurst, 1995; Lan, 1997) have surfaced as a major inhibitor. There also appears to be unrealistic expectations from institutional leaders for immediate results (Bates, 2000; Macchiusi & Trinidad, 2000).

Schools are adopting ICT in teaching and learning without having altered to a significant degree existing policies (McNaught, et al., 1999), or in some cases are still attempting to run two separate systems. Lack of institutional level policy regarding recognition and rewards for effectively adopting or developing ICT materials for teaching and learning is another key factor identified by many researchers, in the lack of adoption of ICT (Martinez & Woods, 1995; McNaught et al., 1999; Bates, 2000). Certainly, one of the major concerns on this adoption factor for education institutions is the perceived lack of resources and funding (Bates, 2000; Baldwin, 1998). Human resources are stretched to the limit and teaching staff are not only asked to do more, but they are expected to do it differently (Gilbert, 1996a; Northrup & Little, 1996; Bates, 2000).

3.4 Factors Affecting Adoption at the Individual Level

Two of the key factors regarding the adoption of innovations concern the nature of change and the perception of the innovation itself. If individuals do not perceive there is value in changing or adopting an innovation, it will simply not occur (Taylor, 1995; McNaught et al., 1999; Bates, 2000).As with many innovations, even when the technology has been well established, the greatest potential is rarely achieved (Lan, 1997; Candiotti & Clarke, 1998). In a similar vein, some teachers and institutions are using technology to simply replicate their traditional practice, content and control (Barrowy & Laserna, 1997; Gillespie, 1998; Fox, 2001).This due to the fact that school teachers have rarely been shown how to integrate ICT into their teaching and learning. This also implies that teachers or instructors are not modeling effective use of ICT skills in teaching (Caverly et al., 1997; McKenzie, 2000; Trinidad, 2001).

Other identified factors affecting adoption at a more fundamental level pointed to the lack of: knowledge and skills about ICT for teaching and learning (McNaught et al., 1999); time (Baldwin, 1998;); student acceptance of the new approaches (Alexander & McKenzie, 1998; Mcnaught et al., 1999); uniform views on teaching and learning (Gandolfo, 1998; McNaught et al., 1999; Bates, 2000).

3.5 ICT Innovation in Schools & Innovation Diffusion Theories

The previous section identified evidence in the literature that ICT is not being extensively or well used in school classrooms. These difficulties in implementation are further investigated by looking at ICT innovation in schools as a branch of the extensive literature about innovation diffusion.

Change is a normal part of life, and as much a feature of the educational landscapes as any other area of society (Haddad & Draxler, 2002, p. 202). The response of individuals to change depends upon many factors, some of the most important being the perceived effect of the change, their degree of control over the change and attitudes formed concerning its nature. Extensive research literature and practical evidence is available describing the innovation diffusion process in a wide range of fields (Clarke, 2001), and this can be referenced to identify likely critical factors and general trends. In addition there is ample experience of change processes within school education. Examples include the transition from Piagetian to Vogotskian theories of pedagogy (Dunne, 1997; Maqsood, 2001), the rise of generic competency frameworks (Mayer, 1992) and current trends to re-organize school education from discipline-based structures to new essential learning (Luke, 1999). ICT is not the first technological innovation to be applied to school education: blackboards, biros have all been new introductions in the past (Kessell, 2001). Applying the lessons of these previous experiences to the specific instance of ICT in school education is slightly more problematic, since there is a diversity of experiences and contexts to consider. It will be important to consider the values and expectations of policy makers involved, as well as the implementation phases and communication channels used to communicate policy to practitioners. Particular special features of ICT into school education are the swift rate of change of the underlying technologies and the social context into which the innovation is being applied.

3.5.1 Innovation Diffusion

This study focuses on the impact of technology (termed as ICT) on teaching and learning in public high school education in the UAE. The innovation examined in this present study is ICT, and the relevant diffusion is the degree to which teachers and students at schools in the UAE have adopted ICT in their teaching and learning. According to Rogers (1995), it is important conceptually to determine the exact boundaries that define technological innovation. The study is therefore related to the general area of innovation diffusion which has an extensive literature (Surry & Farquhar, 1997; Clarke, 2001; Pelliccione, 2001p.33-35). There appears to be three important foci for relevant innovation diffusion research:

1. field dependence of critical factors for diffusion;

2. types of factors and their relative importance;
3. And the particular context of ICT in education.

The literature on *critical factors* for innovation adoption shows that these are dependent upon the field of application. Parker and Sarvary (1994) found ‘relative advantage’ was the main driver in domestic information technology innovation diffusion, suggesting it will be the nature of the ICT itself which will determine the degree of adoption. Surry & Farquhar (1997) raised the issue of whether a technology involved in an innovation is more important than the developer or its exponents. He concluded that the adopter has final control and that theories of developer based IT diffusion were deficient in that they overstated the role of technological superiority in the diffusion process. This implies that teachers will have the most significant role in determining the extent of ICT adoption in classrooms. These polarized findings illustrate the debate about some of the fundamental determinants of technological innovation. Since the opposing views come from different fields, there is reason to investigate each new instance of technological innovation separately.

In the specific field of ICT in education, Owen and Liles (1998) classified the factors which facilitated or slowed the adoption of the Internet by teachers such as accessibility of the equipment and training. The relative costs of equipment were important, as well as teacher attitudes, home Internet connections, transportation distances and difficulty (Tella & Kynaslahti, 1997). While Somekh (1998, p. 11) identified suitable transition time, perceived relative advantage, professional development and accessible infrastructure as the critical success factors for ICT diffusion in high schools. The literature thus reveals a variety of *important factors*, not all of which can be controlled in the adoption process of a technological innovation. One factor which is perceived as being under systemic control is professional development (Krasnicki, 2003). It appears that an understanding of the content of professional development and its delivery is important to maximizing efficacy of its role in the innovation adoption process.

Somekh (1998) argues that this factor is vital to managing the process of change, but has been "startlingly neglected" (p.20). Fullan & Smith (1999) agrees with the importance of the factor, but adds "good professional development by itself is not very effective" (p.10). Therefore this control factor cannot by itself determine whether a technological innovation will be adopted the other factors namely perceived relative advantage, accessible quality infrastructure and suitable transition time., are also needed for progression through the stages of adoption leading to institutionalization and permanent integration of an innovation.

The process of innovation institutionalization can depend upon the different adoption patterns of various types of staff using technology in teaching (Jacobsen, 1998). General recommendations from his study such as training, investing in IT infrastructure, and instigating a rewards system could be universal for all groups of computer users, such as the early adopters, the late developers. The merits of standardization may not be equally applicable to all these groups. The literature has therefore identified many of the critical success factors for innovation institutionalization (Nutley et al., 2002, p. 18). Much of the literature (such as the categories of implementers of Jacobsen) derives from the work of Rogers over the period 1962 to 1995, giving evidence of a well developed field of investigation upon which this study could build.

One view is that "technologies have trajectories" (Bijker & Law, 1992). However, there is a considerable literature of innovation diffusion processes that goes beyond this deterministic view. Rogers (1995) defined the process of innovation diffusion in terms of four elements. These four elements occur when an innovation is communicated through certain channels over time amongst the members of a social system.

Communication is the exchange which occurs when one individual communicates a new idea to someone else or a group of others is the core of the diffusion process. An individual adoption of innovation depends to a large extent upon the experience their peers have had with the innovation- "the heart of the diffusion process consists of modeling and initiation by potential adopters of their network partners who have adopted previously" (Rogers, 1995, p18). It is important to address the concept of interrelatedness or technology cluster when considering technological innovations. A technology cluster consists of one or more identifiable features of technology that are viewed as being closely related. Interrelatedness implies that an adopter's experience with a particular technology innovation influences that individual's perception of a subsequent innovation in the same technology cluster (Rogers, 1995).

The time dimension is involved in the diffusion process in three distinct ways. *First*, Rogers (1995) asserts that an individual's decision to adopt an innovation is not an instantaneous act. The innovation decision process encompasses the various mental stages the individual passes through, from initially becoming aware of the innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to applying the innovation and finally in confirming this process. Such an innovation decision process is basically an information seeking activity in order to decrease the individual's uncertainty. *Second*, the degree to which a member or members of a social system adopt an innovation relatively earlier than others within the same social system is defined as innovativeness. Rogers (1995) identifies five adopter categories which reflect relative innovativeness: innovator; early adopters; early majority; late majority and laggards. Jacobsen (1998) provides a useful summary of the attributes and characteristics which have been linked to the various categories. Table 3.1(on the next page) provides a brief outline of the attributes Jacobsen (1998) identifies as being associated with each particular adopter category.

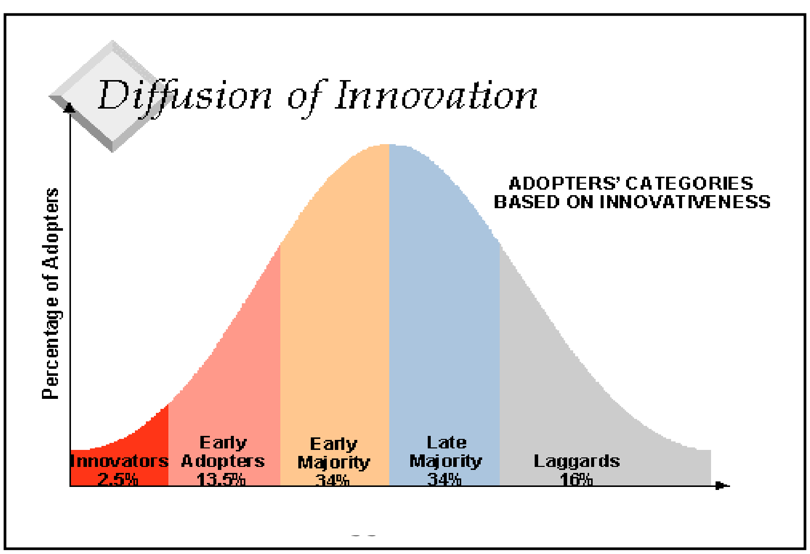
The *third* relevant aspect of time is the relative speed at which an innovation is adopted and is referred to as the rate of adoption. This rate of adoption is usually measured as the number of members of a social system that have adopted the innovation in a specific time period. Most innovations have an S-shaped rate of adoption curve, however the slope of the 'S' varies depending on the innovation. For example, some innovations are adopted more rapidly than others. Figure 3.1 (on the next page) outlines the typical rate of adoption as identified by Rogers (1995).

Table 3.1: General Attributes for Rogers (1995) Adopter Categories

Adopter Categories	General Attributes
Innovators	Pioneers and venturesome Usually part of cliques - others who share their interests. Have career security - or control over resources. Able to understand and apply complex technical knowledge to their field. Able to cope with a high degree of uncertainty - can cope with set backs. Play an important role in the diffusion process as they introduce new ideas into a system.
Early Adopters	Integrated part of the local social system - 'localities'. The greatest degree of opinion leadership - others refer to them for advice. Usually serve as role models and they assist in speeding up the diffusion process as they are not too far ahead of the average individual. Usually respected by peers. Have greater empathy, greater intelligence, a greater ability to deal with abstractions, a more positive attitude toward change and are able to cope with uncertainty and risk better than the later adopters.
Early Majority	Interact frequently with their peers. Seldom hold positions of leadership. The decision process to adopt is usually longer and may be willing to Follow but will not lead.
Late Majority	Usually the skeptical one third of the social system. Innovations are approached cautiously. Usually adopt due to economic reasons or peer pressure. They need to be convinced and need to feel that it is safe to adopt.
Laggards	Usually interact with those who have traditional values. Tend to be suspicious of innovations and change agents. Must be sure that a new idea will not fail prior to adopting.

(Jacobsen, 1998)

Figure 3.1: Diffusion of Innovation



Klopfenstein,1998).

It is important to note that saturation point has been reached when an innovation has been adopted by most or all of the members of a social system (Geoghegan, 1994).

The social system which is the fourth main element in the diffusion of innovation theory is defined as a "set of interrelated units that are engaged in joint problem solving to accomplish a common goal" (Rogers, 1995, p23). An innovation 'diffuses' within the boundary of a social system (Rogers & Scott, 1997). Individuals or groups found within a social system are not identical in their behavior – a structure (patterned arrangements of units) usually exists. Rogers (1995) notes that such a structure of social system can facilitate or hinder the diffusion process. The adoption rate or innovativeness of an individual is affected by an individual's characteristics and the nature of the social system of which the individual is a member. Alternate views to that of Rogers (1995) diffusion and innovation theory as proposed by Valente (1995), Hall & Loucks (1987) and Rebentisch (1995) are discussed later on page 38. The established behavior patterns of members within a social system are referred to as norms. These norms provide individuals with standards and rules of behavior. Similarly to social structure, norms can also impede the diffusion of innovation. Individuals who fulfill the role of change agents attempt to influence other decisions in the diffusion process. There are three main types of innovation decisions which are influenced by the social system:

1. optional innovation decisions (and individuals' choice to adopt or reject an innovation,
2. independent of others); collective innovation decisions (consensus amongst members of a social system);
3. And authority innovation decisions (made by a few individuals in positions of high status and power).

3.5.2 Critical Mass

A crucial concept in understanding the nature of the diffusion process is the critical mass, which occurs at the point at which enough individuals have *adopted an innovation that the innovation's further rate of adoption becomes self sustaining.* *(Rogers & Scott, 1997, p6).*

According to Rogers (1995), "critical mass" is the area of the diffusion curve between 10 - 20 percent adoptions. This area represents the transition from the early adopter category to the early majority. When an individual's adoption of an innovation depends on the number of other individuals in their social system who has adopted the innovation, this is called the threshold (Markus, 1987). This threshold for adoption varies for individuals within a system. For example, innovators have a very low threshold (resistance to an innovation) as they adopt the innovation first, whereas late adopters have a high threshold for adoption because their own adoption depends on the number of members in their personal network who have adopted the innovation (Rogers 1995). Critical mass operates at the system level, while threshold operates at the individual level of analysis.

The consequences of innovations are the changes that occur to an individual or to a social system directly resulting from the adoption or rejection of an innovation. Rogers & Scott (1997) also described five essential characteristics of innovations:

- Relative advantage (the innovation appears to be better than what was previously available)
- Compatibility (it matches what people already know)
- Complexity (people can understand it)
- Trial ability (something people can try in a limited way)
- Observability (potential adopters are able to see the results).

This understanding of innovation diffusion has been widely accepted as a basis for further studies. A key element in Rogers' model of innovation diffusion is the change agent, who is frequently more technically competent than his/her peers, but can still communicate the essence of the innovation to them effectively (Rogers, 1995, p. 19). Rogers describes the change agent as "a marginal figure with one foot in each of two worlds," a situation which often leads to role conflicts and problems in communication. This conflict is generally due to their technical competence and need to relate to potential adopters who have different socio-economic status, beliefs and attitudes.

An alternative to Rogers' model has been proposed by Valente (1995), Hall & Loucks (1987) and Rebentisch (1995). Valente (1995) posits a social network background for the majority of innovations, which attributes most of the diffusion process to communication links between individuals; Hall & Loucks (1987) Concerns-Based Adoption model emphasizes the necessity to pay attention to individuals and their various needs for information, assistance, and moral support and Rebentisch (1995) technology-transfer model where technology can be regarded as a combination of both the physical tool and the related know how either to make or to use that tool.

Valente (1995) also examines the role of thresholds and develops the idea of a 'critical mass' of the population who must become adopters before the innovation will become more generally adopted. "Critical mass" is the area that represents the transition from the early adopter category to the early majority (Rogers, 1995). When an individual's adoption of innovation depends on the number of other individuals in their social system who has adopted the innovation, this is called the threshold (Markus, 1987). This threshold for adoption varies for individuals within a system. Critical mass operates at the system level, while threshold operates at the individual level of analysis (Rogers, 1995, 2003).

Hall & Loucks (1987) proposed the Concerns-Based Adoption model as a diagnostic tool for effective staff development. The concerns model identifies and provides ways to assess seven stages of concern, which are displayed in Table 3 (on the next page). These stages have major implications for professional development. Professional developers who know and use the concerns model design experiences for educators that are sensitive to the questions they are asking when they are asking them. Learning experiences evolve over time, take place in different settings, rely on varying degrees of external expertise, and change with participant needs. Learning experiences for different role groups vary in who provides them, what information they share, and how they are asked to engage. For instance, addressing parents' and policy makers' question "How will it affect me?" obviously will look different. The strength of the concerns model is in its reminder to pay attention to individuals and their various needs for information, assistance, and moral support.

Traditionally, those who provided professional development to teachers were considered to be trainers. Now, their roles have broadened immensely. Like teachers in science classrooms, they have to be facilitators, assessors, resource brokers, mediators of learning, designers, and coaches, in addition to being trainers when appropriate. Practitioners of professional development, often teachers themselves, have a new and wider variety of *practices* to choose from in meeting the challenging learning needs of educators in today's science reform efforts.

Rebentisch (1995) proposed a technology-transfer model. Technology can be regarded as a combination of both the physical tool and the related know how either to make or to use that tool. Viewed in this manner technology can be decomposed into four embodiments (categories of components of process technologies) used as inputs in production processes. The basic assumption is that here will always be a minimum of all four technology components present in every process technologies (Van Egmond, 2002).

Table 3.2: Typical Expressions of Concern about an Innovation

Stage of Concern	**Expression of Concern**
6. Refocusing	I have some ideas about something that would work even better.
5. Collaboration	How can I relate what I am doing to what others are doing?
4. Consequence	How is my use affecting learners? How can I refine it to have more impact?
3. Management	I seem to be spending all my time getting materials ready.
2. Personal	How will using it affect me?
1. Informational	I would like to know more about it.
0. Awareness	I am not concerned about it.

Hord et al.; 1987

- Technoware: physical facilities (embodies in objects, e.g. machinery, equipment & tools).
- Humanware: human abilities (embodied in persons, skills & knowledge).
- Infoware: documented facts (embodied in documents, e.g. processes, procedures, specifications, observations, evaluations and relations documented in publications, blue prints & patents).
- Orgaware: organizational frameworks (embodied in institutions, management, organizational structures, logistical system).

For his research, Rebentisch (1997) divides the concept of technology into four categories. These categories were developed based on data collected in interviews by asking what kind of technology was transferred. The four categories are general information, specific information, procedures or practice, and hardware.

- General information, e.g. operations
- Specific information, e.g. processing conditions, schematic diagrams of a component or system, or materials formulations. Specific information is typically transferred as paper documentation containing data, records, or diagrams.
- Procedures and practice
- Hardware

These categories largely correspond with the four technology components described before. However, Humanware and Orgaware aren't mentioned that explicitly whereas hardware and information (both general and specific) almost perfectly correspond with respectively Technoware and Infoware. Also Rebentisch (1997) found that more complex technologies required relatively more effort to complete their transfers than did simpler technologies.

Consequently Rogers diffusion model on which the researcher focuses is well rounded as it encompasses the communication media, the time element and its effects on the diffusion process and its rate of adoption , the social system that presents the boundaries of the diffusion of the innovation. Whereas Valente's model focuses on the links between individuals to accelerate the diffusion process with emphasis on the threshold level. Hall & Loucks (1987) Concerns-Based Adoption model emphasized the individual needs and learning experiences and Rebentisch (1997) technology-transfer model focused on information processes and hardware.

Despite these alternatives, it is clear from the literature that innovation diffusion depends upon the communication of observable relative advantage and ownership (Somekh, 1998; Nutley et al., 2002).

The view point of both teaching staff and other elements of the school community need to be considered when assessing the value of ICT in schools. Thus we need to focus inwards on the role of the principals & teachers as a change agent. Moving from general theories of innovation, we need to see whether principals & teachers (in the UAE) are in terms of accommodating to ICT and what professional development is being provided to them.

3.6 The Impact of ICT on the curriculum, Teaching and Learning Practices

> *Technology is gradually transforming education and the work of the academic profession.*
> *(Baldwin, 1998, p 7).*

3.6.1 Constructivism and its Application on Technology

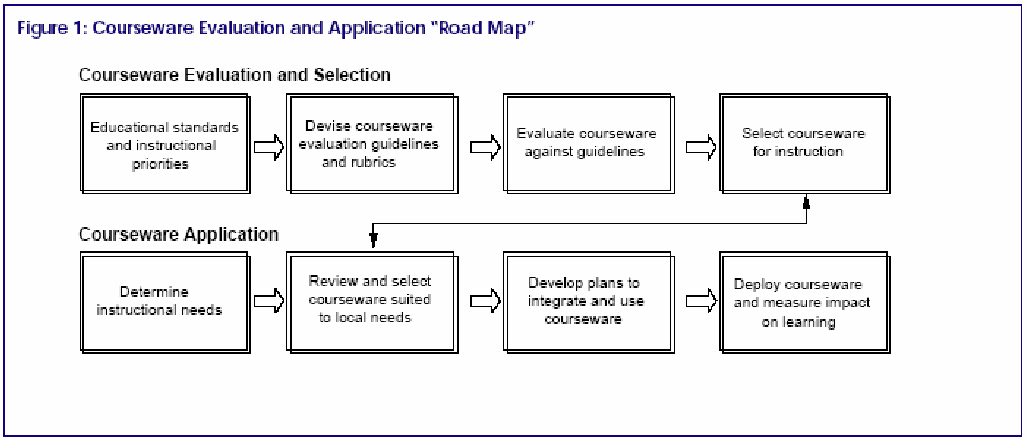
Almost all those who advocate major reforms of schooling, particularly through the use of computers, have the view that learning needs to be more informed by constructivism (Clouse & Nelson, 2000). Often arguments for school reform involve constructivist concepts such as the need for students to develop higher order thinking skills and the failure of current schooling methodologies to provide the opportunity (Herzig, 2004). In the extreme, the technologies of the information age are perceived to be an irresistible force on education (Mehlinger, 1996). Constructivism has its roots in the psychology-based traditions going back to Dewey (1966), Piaget (1970) and Vygotsky (1978). However, more recently this is supported by biological science-based theory in neuroscience (Committee on Development in the Science of Learning, 2000). Within this constructivist paradigm, information technology is not typically used to orchestrate the instructional process in a strictly "top-down" manner, but rather serves largely to facilitate student-initiated and mixed-initiative projects, inquiries, explorations, and problem-solving activities (Bottoms, 2001).

Research as in Eadie (2000), Lankshear & Snyder (2000) consistently shows that curriculum content, instructional strategies adjusted to learner needs, along with sufficient incentives and opportunities to learn are the major “keys” to effective teaching and learning. Consequently, when technology is brought into the instructional equation, it is effective to the extent that it supports and enhances these “keys”. In other words, if technology is applied to inadequate content and instructional strategies, the desired educational outcomes will be elusive.

Any examination of the impact of courseware on learning must first start with an assessment of the extent to which such resources are designed to target specific learning objectives and curriculum standards. Products that are carefully designed to support specific objectives with consideration for the research on how students learn have the highest probability of producing desired learning outcomes Cradler & Bridgforth (2002). Next courseware needs to be matched to national, state, district, or local standards. Finally, the courseware must be integrated into the teaching and learning activities of the classroom. Figure 4. 1 describes the “road map” to first evaluate courseware based on defined standards and priorities, and second, selecting and integrating courseware into instructional practice.

Cradler & Bridgforth (2002) point out that the most highly rated courseware is only effective to the extent that it is effectively integrated into instruction. A lesson learned from numerous model technology school projects, including the California Model technology schools and the Apple classroom of Tomorrow (ACOT), is that the successful integration of technology in classrooms implies a change in the underlying strategies of classroom teaching. This requires a clear vision and an implementation plan based on available resources, student needs, and school goals (Sandholtz et al, 1997; Herzig, 2003).

Figure 3.2 Courseware Evaluation and Application "Road map"



Cradler & Bridgforth, 2002

3.6.2 The Impact of ICT on the curriculum

The impact of ICT on curriculum content may be viewed in terms of:

- ✓ Declarative knowledge - describes objects and events by specifying the properties which characterize them, or 'knowing that'
- ✓ Procedural knowledge - focuses on the processes needed to obtain a result, or 'knowing how'

The use of ICT impacts on both declarative and procedural knowledge to such an extent that clearly the current curriculum and models of teaching and learning were not designed to accommodate the increasingly rapidly expanding quantity of knowledge (Riel, 1998). For example, the quantity of declarative knowledge is growing rapidly, largely fuelled by the efficiency of ICT, while at the same time ICT provides tools to more readily access that knowledge. The technology itself has added large quantities of declarative knowledge. The skills and knowledge required in society and workplaces is different now from when schools were first instituted. Rather than students requiring specific bodies of declarative knowledge they require very flexible and general sets of procedural knowledge. These tend to involve conceptual understanding, problem-solving, personal interaction, and using resources (Riel, 1998; Garrisson et al., 2001). Much of the procedural knowledge required is supported by the use of ICT.

While the impact will be evident on almost all disciplines of learning the degree will vary substantially between disciplines. However, some research has indicated that there is more variation due to the teacher than the area of the curriculum (Becta, 2002). Clearly the curriculum must remain relevant to societal and workplace needs. Ultimately school-based learning must connect with "… what people need to learn in order to participate in contemporary social, economic and cultural mainstream life" and increasingly this includes ICT-related practices (Lankshear & Snyder, 2000, p. 126).

Finally, part of the curriculum is the way in which learning is assessed. Many educators and researchers have found that a focus on rigorous paper-based external examinations and tightly prescribed learning outcomes is not conducive to teachers facilitating ICT to support learners (Eadie, 2000). This has often been one of the explanations for the reduced use of ICT by students in secondary schools compared with primary schools (Cunningham, 1992; Becta, 2002).

In order to understand the major problems in realizing curriculum change, several researchers (i.e., Goodlad et al., 1979; Travers & Westbury, 1989; Van den Akker, 2003) use an analytic framework of various curriculum representations**: the intended, the implemented, & attained.**

The competencies needed for citizens in the information society are incorporated in the *intended curriculum* which represents the rationale and goals for learning. However, there may be a gap between the needs of the information society as expressed by policy makers and the way these needs are understood by schools and teachers. Moreover, what teachers and students actually do in the classroom—the *implemented curriculum*—may be quite different. The *attained curriculum* describes the learning outcomes of students as well as, when appropriate, the learning outcomes for teachers. It is obvious that these learning outcomes are particularly influenced by what has been taught which is the implemented curriculum. One of the major challenges in realizing curriculum change is to create consistency and balance between these different curriculums representations (Van den Akker, 2003).

ICT is believed to be able to implement and facilitate the realization of the pedagogy that fits an information society (Dede, 2000; Panel on Educational Technology, 1997). However, research shows that the implementation of ICT within a curriculum is a complex and slow process (Pelgrum & Anderson, 1999). A major problem is that educational software is often isolated and not integrated with the textbooks that many teachers use (Van den Akker et al., 2003; Voogt, 2003). Moreover, many ICT applications are poorly attuned to the curriculum (Voogt, 2003). Also more practical reasons hinder the implementation of ICT. Cuban (2001), in a study on ICT use in the Silicon Valley region found that teachers hardly changed their teaching routines when using ICT. He found that big classes and 50-minute class periods hampered teachers' ability to use ICT in an innovative way. Olson (2000) argued that ICT often does not fit into the existing teaching culture and may even undermine the teacher's sense of efficacy. He found that teachers using technology therefore tend to domesticate applications so that they conform to prevalent practices.

Although it is generally assumed that ICT has high potential for improving education, research consistently has had difficulty in providing convincing evidence on the impact of ICT on student performance. This is mainly due to the fact that the use of ICT often contributes to the mastery of complex cognitive skills. These types of skills cannot be determined by means of simple, standardized tests. Only recently, however, some major studies confirm the positive results of ICT on students' performance (e.g., the Meta analysis on the effects on student writing, Goldberg et al., 2003; and the extensive literature review of Cox et al., 2004). These findings illustrate that many factors inhibit the implementation of ICT in the curriculum. In other words, there is a potential gap between the intended and the implemented and attained curricula.

3.6.2.1 Emerging Patterns

The different curriculum presentations discussed earlier on page 44 need to be assessed when implemented as a school-wide innovation (involving one or more subjects) and innovations that are limited in scope. Voogt & Pelgrum (2005) addressed this issue in their study SITES Module2. 32 cases covering 15 countries from the initial number of 174 cases covering 26 countries that was submitted for the SITES Module2 study where selected. SITES Module2 being case studies of innovative pedagogical practices using ICT (1999-2001) that was initiated by IEA (International Association for the evaluation of educational achievement).

The 32 case studies were selected because they were considered informative for a study on ICT and curriculum changes Voogt & Pelgrum (2005). The analytical framework used the curriculum presentations that were discussed on page 44, namely the intended, implemented and the attained curricula. The results of the in-depth analysis of the 32 cases showed strong indications for the existence of variation in curriculum change. A major distinction that appeared was between school-wide innovations (involving one or more subjects) and innovations that were limited in scope. Also a number of cases were oriented on single discipline – based subjects, while others seemed to be of cross-curricular nature using themes to organize the curriculum instead of academic disciplines (Voogt & Pelgrum, 2005). Also the results showed that ICT-supported innovative pedagogical practices did not concentrate so much on new content but were rather aiming at the realization of lifelong learning competencies within the existing content, or at offering existing curriculum content in a different way (Kozma, 2005).

Based on these observations three curricular foci emerge namely, *Single-subject, Thematic and School-wide Curricular Focus* and the following distinctions were made *(*Kankaanranta, 2005); Kozma, 2005):

3.6.2.1.1 The Intended Curriculum

- ✓ *The Single-subject Curricular Focus* particularly focused on improvement of the teaching of content and concepts. Important skills that were mentioned were problem solving and critical thinking. On the other hand, in the,
- ✓ *Thematic Curricular Focus*, the aim of the innovations accentuated new goals that were considered important for the information society and contributed to lifelong learning competencies (Kozma, 2005) while;
- ✓ In *the School-wide Curricular* focus the realization of new goals rated high with a strong focus on realizing education that fosters student responsibility for their own learning. These schools focused on in-depth and independent learning with curriculum content was being offered in a cross-curricular way and embedded in authentic contexts (Kozma, 2005; Kankaanranta, 2005).

3.6.2.1.2 The Implemented Curriculum

In order to realize the curriculum goals, learning environments for students were created. In all three patterns these learning environments appeared to be quite similar: Students created products or carried out a research project. Students collaborated during their project or research work and searched for information. In the innovative practices in the Thematic and School-wide Curricular Focuses students also published or presented results of their project work and were involved in self- or peer assessment. Particularly in the School-wide curricular Focus, students picked their own tasks. For an overview, see Table 3.3 Voogt (2003) on the next page.

Teachers advised and guided students, while simultaneously providing structure and keeping track of students' progress. In the Single-subject Curricular Focus, teachers also mediated content and prepared (sometimes ICT-based) instructional materials for students (Kozma, 2005; Kankaanranta, 2005; SITES M2 Projects, 2005).

This latter activity was also typical for teachers in the Thematic Curricular Focus. To realize the organizational challenges, the collaboration between teachers was quite intensive in the School-wide Curricular Focus. Such teacher collaboration was encouraged and facilitated by the schools. For instance, in an Australian primary school, teachers of a particular year level were provided with non-instructional time (see Table 3.4).

Table 3.3 Overview of student activities per curricular focus (in % and absolute).

Student activities	Single-subject (n=11)	Thematic (n=13)	School-wide (n=8)
Searching for information	63.6 (7)	76.9 (10)	100.0 (8)
Publish/present results	45.5 (5)	76.9 (10)	87.5 (7)
Problem solving tasks	54.5 (6)	23.1 (3)	62.5 (5)
Picked own tasks	27.3 (3)	46.2 (6)	75.0 (6)
Collaboration	90.9 (10)	61.5 (8)	87.5 (7)
Self-or peer assessment	27.3 (3)	53.8 (7)	75.0 (6)

Voogt & Pelgrum (2005)

Table 3.4 Overview of teacher activities per curricular focus (in % and absolute).

Teacher activities	Single-subject (n=11)	Thematic (n=13)	School-wide (n=8)
Lecture	54.5 (6)	0.0 (0)	37.5 (3)
Advise/guide students	90.9 (10)	92.3 (12)	100.0 (8)
Create structure	90.9 (10)	92.3 (12)	100.0 (8)
Design/prepare instructional materials	81.8 (9)	72.7 (8)	54.5 (6)
Monitor/assess student progress	72.7 (8)	69.2 (9)	87.5 (7)
Collaborate with colleagues	54.5 (8)	53.8 (7)	100.0 (8)

Voogt& Pelgrum (2005)

3.6.2.1.3The Attained Curriculum

The researcher will begin by focusing on outcomes for students followed by the outcomes related to teachers. A general finding throughout the three patterns was that students were very positive about the innovations. Students were motivated by the innovation and the innovation improved their self-esteem. In a majority of the cases a positive attitude towards learning and school was reported (Kozma, 2005; Kaanranta, 2005); (SITES M2 Projects, 2005).Table 3.5 on the next page presents an overview of the findings.

Table 3.5 Overview of student outcomes per curricular focus (in % and absolute).

Student outcomes/acquisition of	Single-subject (n=11)	Thematic (n=13)	School-wide (n=8)
New subject matter	90.9 (10)	46.2 (6)	37.5 (3)
ICT skills	90.9 (10)	76.9 (10)	87.5 (7)
Communication skills	9.1 (1)	69.2 (9)	75.5 (6)
Problem-solving skills	27.3 (3)	30.8 (4)	37.5 (3)
Information-handling skills	18.2 (2)	61.5 (8)	37.5 (3)
Team/ collaborative skills	45.5 (5)	92.3 (12)	87.5 (7)
Meta cognitive skills	45.5 (5)	30.8 (4)	50.0 (4)
Positive attitude learning/school	63.6 (7)	76.9 (10)	62.5 (5)

Voogt & Pelgrum (2005)

From the analysis we may infer that the acquisition of ICT skills was an important student outcome in all three patterns. It was unexpected that the acquisition of ICT skills appeared also important in the Single-subject Curricular Focus, because these skills were not part of the goals that were pursued. It is noteworthy that in all three patterns ICT skills were not learned separate from the context in which the students needed these skills.

The acquisition of collaborative skills was important in the Thematic and School-wide Curricular Focuses. It must be noted that the acquisition of communication skills was often mentioned in relation to the acquisition of collaborative skills. Subject matter knowledge was an important student outcome in the Single-subject Curricular Focus. This was expected because the reason for using ICT was to improve the teaching of content. The importance of the acquisition of information handling skills in the Thematic Curricular Focus was also not unexpected, because information handling was seen as an important skill for lifelong learning.

A general outcome for teachers in all three patterns was the development of a positive attitude towards the innovative practice, particularly because of the recognition the teachers got from colleagues in the school. The development of pedagogical skills was an important teacher outcome in many innovative practices in all three patterns, but appeared particularly important in the innovative practices that were part of the Single-subject Curricular Focus. Also the acquisition of ICT skills appeared to be an important outcome for teachers in the Single subject and School-wide Curriculum Focuses, often because of having to learn new applications. A side observation was that the fast development of technology was also a concern of quite a number of the teachers involved in the cases. They felt that continuous ICT training was necessary to keep up with the developments. For an overview, see Table 3.6 (SITES M2 Projects, 2005).

Table 3.6 Overview of teacher outcomes per curricular focus (in % and absolute).

Teacher outcomes/Acquisition of	Single-subject (n=11)	Thematic (n=13)	School-wide (n=8)
Pedagogical skills	81.1 (9)	53.8 (7)	62.5 (5)
ICT skills	72.7 (8)	46.2 (6)	75.0 (6)
Collaborative outcomes	36.4 (4)	61.5 (8)	75.0 (6)

Voogt & Pelgrum (2003)

Finally, the at-best mixed results that were obtained for the effects of the technology on learning reduced expectations for the technology (Brown & Campione, 1996; Childers, 2003), and led to a perspective that can be characterized as 'the computer as a tool'. That is, the technology can be an important component of bringing about new and better kinds of learning; but as with all tools, effective use of the technology is embedded within practices and activities that realize its functionality for specific purposes and situations. The investigation of the relationship between practices, purposes, and situations and computer-based learning technologies (in the UAE) has been the general driving force motivating the research subject. Consequently I structured my thesis to cover two main issues; the first issue being the consequences of appropriate use of new technologies on the teaching function of teachers and the second issue is the contribution of new technologies to student learning. Within each of these mains issues, the observations are, in each case, grouped around a number of main themes. Regarding the first issue, observations are grouped around: Impact on the role of teachers, Planning teaching & the assessment of learning. As to the second issue; observations are grouped around: student technological literacy, the specific learning that students achieve student motivation and the relationship of students to knowledge.

3.7 Impact of ICT on the Teaching Function

3.7.1 Impact on the Roles of Teachers

The link between technological development and the transformation of learning is clear in history. The question then is how will the participants in school-based learning adapt and apply the technology, and what models of teaching and learning will result? From the premise that "experience with computer tools can fundamentally alter teaching", Means and Olson (1995, p. 136). Means & Quellmalz (2004) argue that an important neglected reason "why computers have not altered curriculum in the manner predicted by some educators" is the "influence of traditional teaching methods and routines of practicing teachers". Means & Quellmalz (2004) conclude that, "Although critics raised numerous questions concerning the unrealized potential of computers, few looked at how traditional classroom practices affected its use" (p. 126). Collis (1989) reasons that "many elements of traditional school organization will, and should, remain regardless of its potential" (p. 17), and suggests that teachers will always need to be instructional leaders, that there is always a need for human-to-human interaction and motivation. Also Becker (1994) and Means & Quellmalz (2001) point out that it will be necessary to produce systematic evidence that the teaching practices best supported by computer-use such as discovery-based learning and problem-solving, do result in improvements in student competencies. Even if this is the case, Fullan & Smith (1999) argue that such systemic change is complex and difficult to achieve, particularly at the classroom level.

The literature consulted is virtually unanimous in stating that effective use of new technologies changes the function and work of teachers in the classroom.

Many terms are used to describe the nature and scope of this change but almost all convey at least two ideas: part of the transfer of information inherent in teaching is shifted from the teacher to the technological media Van Dusen et al, (1995); Means & Quellmalz (2001); Penuel et al. (2000); Heideman et al, (1996) and the teacher has more time to support each student in the individual process of discovery and mastery of knowledge, skills and attitudes (Dwyer et al., 1991; Russell & Dwyer, 2004).

This change, which is also influenced by other factors, leads to a different concept of teaching and learning, which become more akin to ongoing research. While it is clear that the role of teachers will continue to be critical, the composition of that role is likely to alter requiring a greater range of skills and understandings. Teachers need to be more skilled in directing students through the huge quantities of rich information (Riel, 1998). If the aim is to use ICT to involve students in more cross-discipline project-based learning, this requires teachers to have an understanding of a wider range of disciplines and learning within those disciplines (Riel, 1998; Farmer, 2003). Students will continue to need “guidance and assessment by skilled teachers” (Riel, 1998, p. 5). The impact on teaching strategies will lead to changes in the composition of the role of teachers. For example, high level access to computer support for learning tends to encourage teachers to use more cooperative group work and less teacher stand-up lecturing (Schacter, 1999). The potential of computer technology for teachers and students is broad and generally accepted but that potential needs to be realized in the classroom. To begin to consider whether that potential is being realized, or is likely to be realized we need to consider what teachers and students do in classrooms and how the technology they use relates to the tasks they complete and roles they play within the classroom environment (Miller, 2001) .

3.7.2. Planning of Teaching & the Assessment of Learning

Although the immediate planning of teaching (that includes the teacher's preparation of instructional tasks and materials for his or her students) continues to be an essential theme (Oblinger et al., 2003); Nevertheless, Kankaanranta (2005) argues that change is in the horizon as the amount of information in the world is growing at an increasing rate. For teachers and students this means that firstly, there is more to know and secondly, it is important to be able to sift through information efficiently. Computer systems provide tools for collecting information, organizing information, processing information and communicating information. Students and teachers now have to learn to use the tools effectively. There are diverse skills and technologies to adjust to and new attitudes to form.

Regarding the subject matter of what technology promises for teachers, the report prepared for the US Congress indicates that the new technologies that allow teachers to quickly "*obtain information on the availability and value of a very diverse selection of instructional resources, and also often benefit from support for their use*" (US Congress, Office of Technology Assessment, 1995, p.59). Telecommunications use by teachers, especially for email, has expanded in the last few years, and with good reason: teachers with classroom access to local or external telecommunications networks can contact other educators, experts, scientists, and practitioners to discuss issues related to their teaching practice, developments in their field, and classroom experiences (US Congress, Office of Technology Assessment, 1995).

Systems exist that link educational activities with functionalities of software. For example, in Peled et al., (1994) taxonomy, the mastery of basic knowledge is linked with drill and practice software because of software features such as extensive structuring of information for the user and programmed feedback on user accuracy in performance. At the other end of the scale, the taxonomy links educational activities involving analysis and synthesis of knowledge with open tools such as word processors because of features such as user provided content. The CSILE (Computer Supported Intentional Learning Environment) software reflects a pedagogical emphasis on participatory knowledge building by students and teachers, and is thus an open system which participants use to input and cross-reference content (Scardamalia & Bereiter, 1993). In contrast, Driscol, (2002) and before him the research project of the Cognition and Technology Group at Vanderbilt (1991) reflects a pedagogical emphasis on understanding and solving complex and applied mathematical problems, and thus is a much more structured system than CSILE with respect to the content that is presented (Cognition and Technology Group, 1996). This aforementioned arguments show that the teacher's planning for teaching requires great harmony between his or her orientation towards teaching, expected learning outcomes, and the characteristics of the technologies he or she utilizes. Hence, the likelihood of positive results is enhanced when the teacher places great importance on the development and arrangement of activities whose execution requires students to perform real work and cooperate with other students.

As with any technology, if ICT tools become prominent in schools then it is likely that assessment methods in schools will need to be reviewed. Currently most assessment is still based around the use of textbook technology and based on a factual retention approach to learning. This style of assessment is unsuited to the ICT environment and therefore other more appropriate means of evaluating student learning will need to be devised Goldberg et al. (2003). Educators are also concerned about the validity of much of the information available on the Internet. Because it is relatively easy and inexpensive to distribute information using the Internet, anyone can do so without the information being validated by anyone else. It is now more important for students to consider the validity of the source of any information they get from using the Internet Kankaanranta (2005). 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). Teachers “need support in making use of new technologies to enhance their personal work before learning to use them in their teaching” (Lankshear & Snyder, 2000, p. 121) and much of this support may be accessed more readily by using ICT (Lankshear & Snyder, 2000).

3.7.3 Energy, Hard Work and Perseverance

There is no doubt that teachers who use ICT in classrooms have to demonstrate high levels of energy, hard work and perseverance, often in the "face of considerable odds" (Lankshear & Snyder, 2000, p. 110). If they are early adopters then they are required to be resourceful and overcome many barriers to "make things work" (p. 110). Planning learning experiences involving computers takes considerable time and demands complex scheduling and resourcing. Therefore, teachers using computers in the classroom should not act in isolation from each other. They need to have access to resources which will supply ideas and material for different classroom applications. Schools need to subscribe to relevant journals and have publications which will enable teachers to gain ideas for classroom uses. Teachers within schools can also be used to provide ideas and activities to peers so that valuable uses can be identified and implemented by others (Lankashear & Snyder, 2000).

While for many teachers computer implementation may require changes in attitudes and classroom practices for most teachers, there are a number of practical skills which need to be developed. These are computer operation and classroom management skills which present an obstacle to a number of teachers. Teachers need to continually work at updating their skills and knowledge in the operation and use of ICT. This is in addition to their need to be up-to-date with curriculum content and pedagogy. It is therefore important that they be supported very carefully in practical and motivating ways. Not surprisingly a number of studies have found that, "Personal access for teachers to a computer for the purpose of preparation and planning is one of the strongest influences on the success of ICT training and subsequent classroom use" (Office for Standards in Education, 2002, p. 3). Also supportive, enthusiastic and visionary leadership has a positive impact on teachers' attitudes and behaviors (Becta, 2002).

Finally, the potential reasons for using computers have implications for teachers associated with each one. Table 3.7 on the next page matches possible implications for teachers with the potential reasons for using computers in the classroom.

Table 3.7 The implications for teachers in using computers in classrooms

potential	Implications for teacher
Dynamic learning	Students may learn outside the teacher's own area of expertise. More difficult to direct and manage student learning.
Student motivation	Students are easier to manage and direct towards the tasks. Students may be distracted by the computer from the tasks the teacher has intended
Removing tedious tasks	More satisfying for the teacher to direct less tedious tasks. Some teachers may prefer students to complete tedious, routine tasks as "busy" work.
Instruction to fit the learner	Relieves the teacher from needing to spend a lot of time with students who need extra practice, catch-up or extension work.
Extending student thinking	Student thinking may go beyond the teacher's experience or capabilities which may reduce the confidence of the teachers.

Lankashear & Snyder, 2000

3.8 The Contribution of New Technologies to Student Learning

There are a number of trials and assessments carried out in many countries such as the UK, Australia, Canada and the USA among others that address many themes related to the contribution of emerging technologies to student learning Becta (2003); Dellit (2001); Bracewell et al., (1998); Dede (1998); Aahe (2005); UNESCO (2000); Nevertheless the (the UAE lacks such trials and assessments). Since the findings of this thesis can only be the first step in a broader, long-term project, only some of these studies have been considered here. However, since all are recent, they are a summary and extension of many others. Moreover, the researcher concludes that these studies demonstrate that the potential of emerging technologies is immense, but many conditions are required for this potential to become a reality in classrooms and schools. The above mentioned studies in general focused on a number of themes, which have a direct and immediate relationship with the contribution made by ICT to student learning namely:

- Student Technological literacy
- The specific learning that students achieve.
- Motivation of students who use the technologies for learning.
- The student's relationship to learning.

Among the conditions that lead to effective use of new technologies, the following can be considered as a prerequisite: the effect of computer-based learning technologies in facilitating student learning and performance is seen only when participants have the knowledge and skill to use the technology. This observation may seem too obvious to be worth mentioning; however, many of the early investigations of the effects of computer-based learning technologies in the classroom did not deal explicitly with the knowledge and skill base necessary for the use of the technology, perhaps because of the assumed power of the technology (Seever, 1992, with the Magnet schools project), Baker et al. (1994), Gearhart & Herman, 1994, with the Apple Classrooms of Tomorrow and Becta (2002). Those studies which do deal with this issue, both for students and for their teachers, show a marked contrast in student learning achievements compared with studies that do not treat the issue.

3.8.1 Student Technological Literacy & the Specific Learning Achieved

The terms computer literacy and computer awareness are used frequently in educational circles resulting in a wide variety of definitions Walker et al., (2000). There is significant debate over many issues related to computer literacy. Even that students need to be computer literate can’t be assumed. A newer term technological 'capability' is now used to describe being able to do something with the resources of knowledge and skills to satisfy a human need or transform the world in a way that results in "improvement" (Kimbell, 1994). This is technological literacy. When the knowledge and skills are associated with computer technology then this clearly fits within the definition of computer literacy. Computer literacy is thereby a part of technological literacy (Crawford & Vahey, 2002).

The distinguishing difference between the concepts of computer literacy and computer awareness concerns the ability to use the technology. A computer literate person can use a computer effectively but may not understand its role in society nor the implications of this role. A computer aware person may have a lot of knowledge about computers but may not actually be able to use a computer. Naturally it is possible (and perhaps desirable) that a person is both computer literate and aware. In fact most computing courses incorporate objectives designed to enhance the literacy and awareness of students. Initially computer literacy can be seen in terms of the knowledge, skills and attitudes a person needs to possess. In this way a computer literate person may possess:

- ✓ **Knowledge** about systems, components, operations, capabilities and limitations,
- ✓ **Skills** in using computer systems to perform relevant tasks, and
- ✓ **Positive attitudes** toward computer use personally and in society.

The school system considers the knowledge, skills and attitudes as a formal part of its educational mission. It emphasizes the areas of specific learning achieved by students under two sub-themes; namely the specificity of learning using the emerging technologies and the development of various intellectual skills.

Crawford & Vahey (2002) pointed out that computer literacy is concerned with the way in which a person sees the computer fitting into his/her life now and in the future. It involves building up a series of useful concepts about computers so that a person wants to use computers, knows how to use computers and uses them in a useful and appropriate manner. Translated into the school environment this means that we want to produce students who use and will use computers in their lives to solve problems and complete tasks. We want problem-solving users (students) with the knowledge and skills to make the computer work for them.

In the school environment students may encounter computers in computing or non-computing courses. Many programs not designed to address computer literacy partially satisfy these objectives. The teacher is a model for the interactions that need to be handled in modern life and is a mediator of learning to relate to a machine. The peer group in the lives of students largely influences the attitudes and motivations held by students. For most students the school environment is the most important environment in which they develop attitudes and conceptions about computers. The people and experiences at school provide most students with the motivation, modeling and information conducive to computer use (Jonassen & Land, 2000).

As a result Watson (2002) concluded that the new technologies can contribute in several ways to better learning in various subjects and to the development of various skills and attitudes. The nature and breadth of learning depends on previously acquired knowledge, and on the type of learning activities using technology.

3.8.2 Student Motivation

Sasseville (2004) argues that new technologies manage to develop students' interest in learning activities, at least for the time being, and to lead them to devote more time and attention to these activities than in regular classes. Moreover, it is not too surprising that they also increase their confidence in their abilities. In turn, this confidence of the students in themselves undoubtedly explains in part the spontaneously receptive attitude that a large number of them adopt toward an activity in which technology plays a role and the perseverance that they show in accomplishing this activity Demetriadis et al, (2003). Of course a high level of motivation generally facilitates learning; but it is especially important in situations like the new technologically-based learning environments where students are more active in directing their own learning.

The substantial report among others published by the Office of Technology Assessment in 1995 confirms the motivation effect that the use of technology has on students of all ages (US Congress, Office of Technology Assessment, 1995, p. 65-66). Among the reasons that contribute to student motivation, there is the fact that technology "can be a key vehicle for stimulating learning, primarily because it creates environments and presents content in ways that are more engaging and involve student more directly than do textbooks and more traditional teaching tools." (p. 65), that it possesses an "interactive capacity" and that it allows students to take part "in activities that invite them to create and share with others" (p. 66).Guthrie & Susan (1995) points out that the attention span or concentration that the majority of students are willing to devote to learning activities is greater when they use a new technology than when they are in a traditional setting using traditional resources.

3.8.3 Relationship of Students to Learning

With the benefit of a more comprehensive inventory, it is evident from my readings of research conducted that it is difficult to talk about the contribution of new technologies to the students' genuine learning without remarking that they cause significant changes in the very way in which students approach knowledge and incorporate it into what they already know. The three themes emerged namely:-

a. Developing the research spirit Law & Chow (2002), Mckinnon et al. (1996),
b. Greater cooperation among individuals Graig (2004), Schulz et al.(2002) ,
c. More integrated and better assimilated learning Baron & Bruillard (2007), Sheppard (2003), Dwyer (1994).

Law & Chow (2002), Mckinnon et al. (1996), agree that the new technologies have the power to stimulate the search for more extensive information on a subject, a more satisfying solution to a problem, and more generally, a greater number of relationships among various pieces of knowledge or data.

Assessments of the effects of using computing technology in the classroom carried out by McKinnon et al, (1996) in New Zealand, in addition to examining learning outcomes, also examined the motivation of the students, and their attitude toward using computer technology. Results indicated that the use of the technology did contribute, with other teaching innovations, to the development and support of this intellectual curiosity and this research spirit deemed so important in the education of young people. One of the main conclusions that the researchers highlight in their study is the following: "sustained computer use enabled students to become not just "technologically literate" but it also enabled them to become producers of knowledge as they analyzed data and information and developed testable propositions." (p. 465). The authors also pointed out that through this project, "teaching and learning processes occurred which are not commonly found in traditional secondary school classrooms." (p.466). Finally, inspired by John Dewey, they noted, inter alia, that the students involved "tended to regard their work as a public activity available for scrutiny and constructive comment by teachers and peers" and that they, as well as their teachers, agreed to recognize that the "students need to be actively and, when appropriate, collaboratively involved in the construction and testing of their own knowledge" (p.467.).

Graig (2004), Schulz et al. (2002), agree that the use of new technologies promotes cooperation among students in the same class and among students or classes in different schools, near or far, for the purpose of making them more aware of other realities, accessing relevant knowledge not strictly defined in advance, and executing projects with a genuine relevance for the students themselves, and possibly for other people.

One of the trends described by Barron & Bruillard (2007) gives a broader meaning to integration of the standards inherent in cooperation between students. This trend indicates that the use of technology in the school system is likely to transform the current competitive social structure of the classroom into a more cooperative social structure. Among previous work cited in support of the author's statement is that in the Apple Classrooms of Tomorrow project (see above) and that by Scardamalia et al. (1994) and their colleagues with the Computer-Supported Intentional Learning Environments (CSILE) project. Within this fairly developed environment, "the students comment on one another's notes, telling what they find interesting and what they cannot understand" (p. 30).

The potential for simulation, virtual manipulation, rapid merging of a wide variety of data, graphic representation and other functions provided by the new technologies contributes to a linkage of knowledge with various aspects of the person, thereby ensuring more thorough assimilation of the many things learned (Dwyer, 1994; Barron & Bruillard, 2007). This was tested in one of the secondary schools of the Apple Classrooms of Tomorrow (ACOT) project; a group of students in the project was monitored from grade 9 to 12 to compare their learning with that of other graduates from the school. The results showed large differences in "the manner in which they organized for and accomplished their work. Routinely they employed inquiry, collaborative, technological, and problem-solving skills uncommon to graduates of traditional high school programs" (Dwyer, 1994, p. 8).

CHAPTER FOUR

4.0 Research Methodology

4.1 Introduction

As described in Chapter One, one of the main purposes of this research was to assess and analyze the impact of technology (termed as ICT) on instructional activities by teachers and / or students in public high schools in the UAE and develop an effective model and associated strategies for implementing ICT at high schools. This model was derived empirically from data collected across the sampled high schools as well as from practical and theoretical bases from the literature.

The study combined quantitative and qualitative methods. The overriding methodology is best described as logical positivist.

Logical positivism uses quantitative and experimental methods to test hypothetical-deductive generalization. There are two cornerstones in this approach to research. The first cornerstone is the emphasis on quantitative data. The second cornerstone is the emphasis on positivist philosophy. Regarding the first cornerstone, these methods and techniques tend to specialize in quantities in the sense that numbers come to represent values and levels of theoretical constructs and concepts and the interpretation of the numbers is viewed as strong scientific evidence of how a phenomenon works. A researcher may use archival data or gather it through questionnaires and structured interviews. In all cases, the researcher is motivated by the numerical outputs and how to derive meaning from them in terms of comparative analysis, statistical analysis, and repeatability of data collection in order to verify reliability (Easterby-Smith, 1991). This emphasis on numerical analysis is also key to the second cornerstone, positivism, which searches for causal explanations and fundamental laws, and generally reduces the whole to simplest possible elements in order to facilitate analysis (Easterby-Smith, 1991; Remenyuo et al., 1998).

Three surveys, two interview schedules and one observation protocol was developed by the researchers that contained a list of research questions to be addressed to school principals, teachers and students. These research questions sought for answers on the status of ICT in public high schools in the UAE and in consequence its impact on teaching and learning (see Appendix A).

This main research question was therefore divided into two sub-questions namely:

3. The impact of ICT on teaching
4. The impact of ICT on learning

The first research sub question was further explored from both the school and teachers perspectives to cover the:

1a. Skills, attitudes, policies and usage of ICT in schools in the UAE &

1b. The consequences of appropriate use of new technology on the teaching function.

The second sub research question was further explored to gain insight of the contribution of new technologies to student learning.

The chapter begins by outlining the arguments that underpin an approach combining quantitative and qualitative data collection, followed by a description of the research design. The various phases, procedures and instruments used in this study are also identified. The five phases are described in detail under the following headings: Phase One: Literature Review and Document Analysis; Phase Two: The Survey; Phase Three: Interview participants & class observations; Phase Four: Analysis of the Total Data Set. Also the approach taken to the triangulation of the data collection is identified in this chapter, while data management and analysis issues follow. The appropriate protocols for data storage and ethics are dealt with and the specific problems encountered during this study are noted. Finally, the chapter concludes with a summary.

4.2 Methodology

The epistemological basis for the selection of methodologies to answer the aforementioned research questions were founded upon an empiricist view of knowledge (Dilanthi, 2002, p. 183). The paradigm or world-view (Kleinman, 1980) within which the study was conducted was characterized by a reductionist approach that assumes the existence of causality chains (Dufour & Renault, 1998) and the causal principle which Research Design and Methodology underlies most scientific research (Hospers, 1973, pp. 308-320). The process of transmission from policy statement to classroom implementation does not permit strict adherence to such an experiential view, thus the assumption was made that if an innovation gains increasing levels of adoption, then there is a findable set of reasons why this may be the case, rather than accepting an ontological claim to existence *priori*. This indicated an approach which identified data of events, people, objects and their interactions as the appropriate material upon which to base the analysis, but did not put boundaries on their immediacy to the innovation diffusion process.

Methodological concerns ultimately lead to the quantitative vs. qualitative data source debate. The relative values of qualitative and quantitative methods to test hypothetical generalizations have long been debated between researchers (Cupchik, 2001). On the one hand, phenomenological based inquiry, or qualitative research, is known to use a naturalistic approach seeking to understand the social phenomena in context-specific settings. It is generally defined as the kind of research that produces findings not arrived at by means of statistical procedures or other quantification (Strauss & Corbin, 1998). On the other hand, the logical positivism, or quantitative based research, is known to use experimental methods as well as quantitative measures to test hypothetical generalizations. Qualitative research seeks causal determination, prediction, and generalization of findings and is useful when one needs to supplement, validate, explain, illuminate, or reinterpret quantitative data gathered from the same setting. Each represents a fundamentally different philosophical paradigm, and researcher decisions are based on the underlying assumptions of each paradigm. Though, essentially different; the two paradigms are not necessarily opposing each other (Van Manen, 1977).

A mixed or balanced approach (quantitative and qualitative method) is best suited for this research because they focus on the different dimensions of the same phenomenon. Descriptive surveys which could be categorized under quantitative research is concerned with information generally obtained by questionnaires and interviews with the purpose of analyzing the data to provide information about variables and usually, relationships between them. Hence, quantitative studies are undertaken to yield statistical evidence of relationships when combined with theory and literature.

Qualitative data is a source using well-grounded, rich descriptions and explanations of processes in identifiable local contexts. Qualitative research interviews were used to validate particular measures or to clarify and illustrate the meaning of the findings resulting from the quantitative study (King, 1994). Observations were used to emphasize the importance of human meanings, interpretations and interactions that would add value to the existing knowledge (Denzin, 1989; Waddington; 1994).

The extent to which the findings can be relied upon depends upon the immediacy of causes to effects for there are many steps and confounding interactions in the journey from national policy statement to teacher and student activity in the local school classroom. Greater confidence can be expected for closely related steps in the process. The warrant for this choice of method largely depends upon a positivist view within a functionalist paradigm which attempts to interpret the phenomena rather than simply describing them (Pritchard, 2004). Triangulation is a means of strengthening this warrant. Although there are various forms of triangulation, it can be the combination of methodologies in the study of the same phenomenon. Its effectiveness rests on the premise that the weakness in each single method will be compensated by the counter-balancing of another. This term is occasionally taken to refer to a broad approach which combines "multiple observers, theoretical perspectives and methodologies".

As noted by Carr & Kemmis (1988) & Kumar (1999), research can fit within three categories, “real-time”; “phase-time’; or “frozen-time”. Real-time analysis has been historically associated with experiments while phase time analysis is more suitable for determining governing structures of conditions under study. Nevertheless I have opted for the frozen-time analysis, which is a snapshot of a condition currently prevailing. Since the issue I am embarking upon is rather recent in its development, real time and phase time analysis are not very appropriate. In this sense, I will be attempting to understand the dynamics of the situation at this critical juncture, namely the initial phases of the adoption of information technology in UAE public high schools. However, since I am intending to have my research overview the situation across a number of public high schools .The case study approach is not suitable because of its narrow focus. Also, and because of time and budget constraints, a total population survey is not feasible. It is for these aforementioned reasons that I have opted for a randomized sample approach. Also although I will be conducting a literature survey, my conclusions will bear more heavily on the primary data I will compile, since the work on this issue in the context of the U.A.E. is scarce.

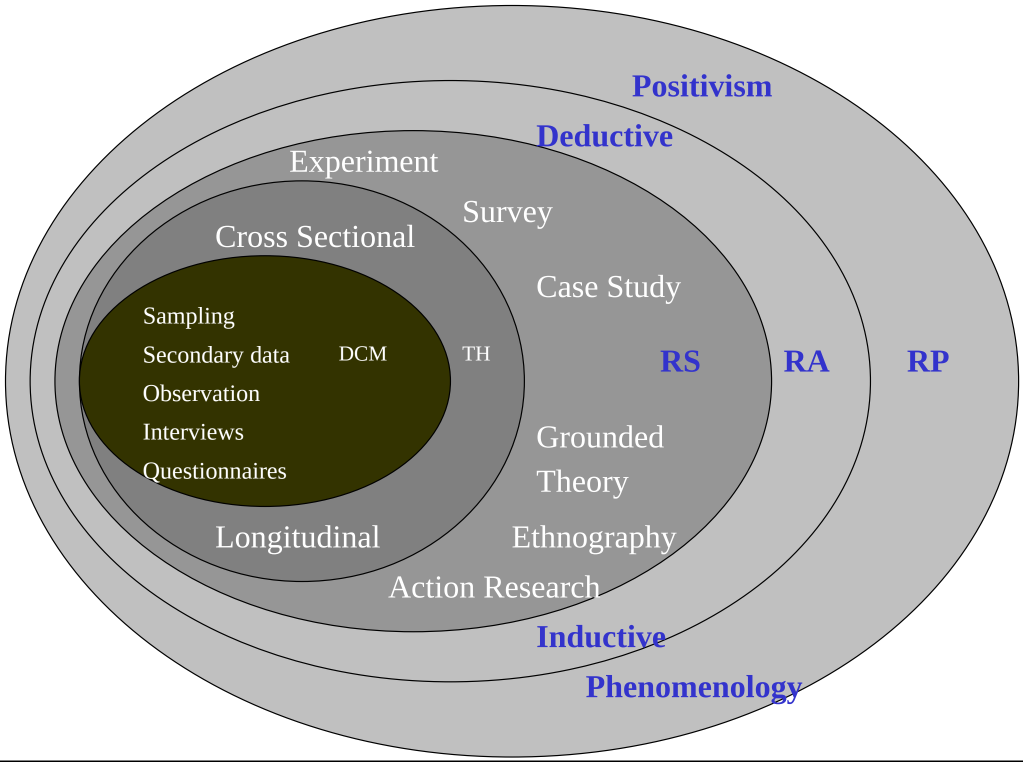
In conclusion, adopting the appropriate paradigm is thus crucial to clarify and formulate research questions and, therefore, deciding on the research methodology. Guided by this vision and based on the understanding that my research is essentially a search that requires the measurement of achievement, satisfaction and performance, it has been essential to choose the **positivist-quantitative paradigm** as the philosophical basis for this research. The results obtained by adopting this paradigm are usually more generalizable, and it is essentially a demonstration that a particular instrument in fact measures what it purports to measure and also data validity might be improved through careful sampling of items appropriate instrumentation and appropriate statistical treatments of the data. Content validity of the instruments was insured by showing that it fairly and comprehensively covers the domains or items that it says it covers. The questionnaire included questions that covered the main issues of the research objectives and are a fair representation of the wider issue under investigation. Also careful sampling of items ensured their representativeness which goes along the positivist paradigm. The researcher used some of the techniques of the qualitative research for the detail and sensitivity it affords where data validity might be addressed through the honesty, depth, richness and scope of the data achieved, the participants approached, the extent of triangulation and the disinterestedness or objectivity of the researcher.

This research, as the case in any field research, has to pass through the five stages of the research process developed by Saunders et al. (2000) and known as the ‘Onion Model’ (Fig 4.1). As shown in the figure on the next page, the first stage is the "research philosophy" which shows the positivist view of conducting research. This step helps to decide the best research approach to follow; "stage two" helps in running a deductive reasoning theory to test presumed hypothesis or questions to answer.

Having done this, it becomes easier to decide the best research approach to adopt "stage three" which in this research is the survey strategy. As a result of choosing the survey strategy it is clear that the time horizon to take is cross sectional, "stage four". The final stage is the "data collection method" that guides the researcher to adopt the questionnaire method, interviews and observations to get the desired data for the questions raised in this research.

The survey/questionnaire method is a widely used tool of data collection that allows the codification of the data gathered, which becomes very useful in statistical correlation studies. The researcher will be administering three surveys. The version to be administered to the students will be more structured, while that of the principals and teachers less so to afford room for expression of opinions.

Figure (4.1) The research process using "the onion model”



RP= Research Paradigm	RA= Research Approach	RS= Research Strategies
TH= Time Horizon	DCM= Data Collection Method	

Adapted from Saunders *et al.* (2000)

The interview method is subject oriented that will enable the researcher to form a deeper understanding of the teacher's views the administrative process that lead to the adoption of ICT. This is achieved by conducting semi-structured interviews with the Principals and teachers while indirect participant observation differs from interviewing in that the observer does not actively query the respondent. This will involve attending classes and taking notes on issues of student/ media/ teacher and presents a better insight on the actual mechanics, methods and interaction in classes between teachers and students using ICT (Diebold et al., 2000).

The researcher used statistical methods to analyze the raw data and to get the results and the findings needed to answer the research questions or hypothesis.

4.3 Ethical issues

Ethical issues may stem from the kinds of problems investigated by social scientists and the methods they use to obtain valid and reliable data. In theory at least, this means that each stage in the research sequence may be a potential source of ethical problem. These problems may arise from the nature of the research project itself; the context for the research; the procedures to be adopted; methods of data collection; the nature of the participants; the type of data collected; and what is to be done with the data (McNamee & Bridges, 2002).

Throughout the study, all precautions were taken to ensure that the research was conducted in a professional and ethical manner. The school principals were fully informed about the nature and progress of the study. Permission was sought from appropriate bodies to view any policy documents which were beneficial to this study. A researcher should be aware of the commonly accepted ethical research principle that includes matters of in formed consent, privacy, anonymity, confidentiality, betrayal and deception (Giordano et al., 2007). As Bell (2005) point out, no researcher can demand access to an organization without seeking permission from that particular organization. Furthermore, the approval process took some time but was obtained. The research questionnaire was given to the respective schools and the introduction stated clearly the aim of the research. Anonymity of participants was ensured by following a standard set of protocols for dealing with sensitive professional information namely each school was given a code and the teachers were given codes too to ensure anonymity.

Permission was granted under the conditions and guarantees presented below:

- ✓ All participants were to remain anonymous Delaine (2000). The essence of anonymity is that information provided by participants should in no way reveal their identity. The obligation to keep research data confidential is all-inclusive. It should be fulfilled at all costs. (Frankfort & Nachmias, 1992; Simons & Usher, 2000).

- ✓ All information is to be kept confidential. This means that although researchers know who has provided the information or are able to identify participants from the information give, they will in no way make the connection known publicly; the boundaries surrounding the shared secret will be protected (Kimmael, 1988; Payne, 2000).
- ✓ Participants should be offered the chance to receive a copy of the final report.

Each teaching staff member approached was asked to participate on a voluntary basis to become participants in the study and asked to give written permission of their participation. All of the interviewed participants were asked to validate interview transcripts and summaries for accuracy.

4.4 Sample selection

Care should be taken in deciding on the sample size as literature suggest that survey research should not be fewer than 100 cases in major subgroups and twenty or fifty in each minor subgroup (Borg & Gall, 1996: 194-5) . The size of a probability (random) sample can be determined in two ways, either by the researcher exercising prudence and ensuring that the sample represents the wider features of the population with the minimum number of cases or by using a table which, from a mathematical formula, indicates the appropriate size of a random sample for a given number of the wider population (Morrison, 1993: 117). One such example is provided by Krejcie and Morgan (1970) (see Appendix C).

Ross & Wilson (1997) suggest that the researcher needs to consider the extent to which it is important that the sample in fact represents the whole population in question, if it is to be a valid sample. Also the researcher will need to be clear what it is that is being represented clearly and correctly. Cohen & Holiday (1996); Schofield (1996) point out that the researcher must decide whether to opt for a probability (also known as a random sample) or a non-probability sample (also known as a purposive sample). In a probability sample the chances of members of the wider population being selected for the sample are known, whereas in the non-probability sample the chances of members of the wider population being selected for the sample are unknown. Literature references several types of probability samples namely simple random; systematic; stratified; cluster; stage and multi-phase samples. They all have a measure of randomness built into them and therefore have a degree of generalizability. Emphasis is placed on the simple random stratified method. The Simple random sampling method involves selecting at random from a list of population (a sampling frame) the required number of subjects for the sample. While stratified sampling involves dividing the population into homogenous groups, each group containing subjects with similar characteristics (i.e. Gender (Cohen et al., 2002). Consequently I opted for the stratified random sample, because it draws randomly from the wider population, and seeks representativeness of the wider population which enables the researcher to make generalizations. Such sampling methods will have less risk of bias but there is still the likelihood to have a sampling error that should be acknowledged.

My target population is twelve public high schools (containing grades ten, eleven and twelve) grades chosen at random from a list of schools using ICT given to the researcher by the Ministry of Education. The chosen schools where split by half representing Men and Women gender schools. The number of students targeted in each school was 36 chosen at random from the three aforementioned grades. The number of teachers targeted in each school was ten chosen by the principal at random from a list of attending teachers. The sample size of 435 students and 126 teachers is representative with a confidence level of 95 per cent and a sampling error of 5 per cent (Krejcie & Morgan, 1970).

4.5 Research Design

The researcher believes in the need to select those research strategies which will be the most effective in probing and hence understanding the key issues in question (Johnson & Christiansen; 2000; Olson, 2000; Wilson & Natale, 2001). Hence, the research design of this study has involved both quantitative and qualitative components. Three types of instruments for data collection were developed and used in my research, namely Questionnaires, interviews and direct observation. Certainly good research practice obligates the researcher to attempt some measure of triangulation (i.e. to use multiple methods & data sources) in order to enhance the validity of any research findings (O'Donoghue & Punch, 2003). The diagram on the following page (figure 4.2) provides a summary of the research design and specific phases.

Figure 4.2 Research design and strategies

Phase One Literature review and document analysis
Phase Two **The survey Instrument:** Design, pilot and implement to principal's, teaching staff and students At (sampled) high schools in the UAE **Quantitative;** Data will be quantified and statistically analyzed **Qualitative:** open ended questions
Phase Three **Qualitative:** Interviews principals, teaching staff. Data quantified and statistically analyzed **:** Observation in class with students and teachers
Phase Four Analysis of the total data set. In-order to derive a model which will reflect the factors that contribute to the successful adoption of ICT by high schools in the UAE. The qualitative and the quantitative data gathered in the previous phases will guide the final assertions made.

The study was divided into four phases. The outline of each phase provides a detailed account of the process and approach the researcher applied to the specific task.

4.5.1. Phase One: Literature Review and Document Analysis

A number of major writers/researchers Becta (2000; 2002; 2003), E. Rogers (1995; 1997), L. Cuban (2001), P. Senge (1991),Becker (1994; 99), Craddler (2004), Deal (1998; 2000; 2002) Dede (1998), Fullan (1992; 1993; 1999; 2000), Hardgreaves (1994; 1998), Heinich (1996; 2004), Means (1994; 2001; 2004), Pelgrum (1993; 1999; 2001); Scardamalia (1993; 1994; 2003), Sergiovanni(1992; 1993a;,b), Trinidad (1996; 1998; 2110),VandenAcker (2003), Voogt (1997; 2003) were identified from this large amount of literature which helped guide the literature search further. Chapters two, three and four examine this literature in detail. Detailed examination of theories of change and the issues that surfaced regarding the adoption of ICT in Secondary Education provided the researcher with the basis for the initial instrument design.

Relevant Ministry of Education strategic plans and policy documents were also analyzed with respect to the issues that were brought forward in the literature review. The findings from these analyses were also incorporated into the initial survey instrument. It is important to note that in such an area as Information and Communication Technology (ICT) where change is so rapid, a constant review of relevant literature was necessary throughout the research period.

Use of the internet enabled access to research from a variety of sources, as authors and institutions are increasingly releasing and publishing research information on the internet. The following are the bibliographic indexes that I researched; BEI(British educational Index); AEI(Australian Educational Index); EERA(European Educational Research association); ERIC(education resources information center) for the years spanning from 1998-2007 using the following key words. Information Technology in Education Technology Integration; Computer uses in Education; Teaching methods and ICT; Instructional Innovation; Instructional effectiveness; Computer assisted instruction; Lifelong learning; Learning processes; Educational Policy/Technology/Environment; Educational change/Improvement; Cultural awareness and education; Teacher attitudes; Teacher education; Teacher leadership/Role; Principals and modern schooling; Secondary education; Curriculum development; Student participation; Program evaluation/effectiveness.

4.5.2 Phase Two: The Survey

This phase involved design, development and validation of an instrument, the Secondary Schools Information Technology Survey (SCIT survey)- an instrument specifically designed by the researcher to establish baseline data about teaching staff, students and management at public high schools in the UAE with regards to the use & impact of ICT in their teaching and learning. Appendix A contains a copy of the full instrument. Twelve schools with their respective principals were chosen at random from a comprehensive list obtained from the Ministry of Education, half of the schools are of male gender and the other half being of female gender. From these schools, a random sample of 432 students was taken (statistically sound sample size assuming 95% confidence interval) and also 120 teachers and 12 principals.

There have been a number of useful instruments developed to measure competent use of computers in teaching, and attitudes and beliefs about computers. However, as ICT is not just about computers, the researcher needed to examine these instruments with a view to adapting some aspects of them to the special needs of this broader study. Instruments developed by Flores (2000), Trinidad & Macchiusi (1996), Trinidad (1998), Thornton (1995), Green (1992) and Brummelhuis 1999) which have been widely used by educational institutions, were carefully scrutinized. The first four instruments are information literacy instruments while the fifth investigated the extent to which schools had adopted particular pedagogical practices, using a list of questions developed by a Dutch research team involved in national monitoring of ICT in the Netherlands where the pedagogical paradigm of schools referred to emerging versus traditionally important practices (Brummelhuis, 1999). A description of the extent to which schools have implemented practices that are related to each of these pedagogical paradigms may offer important contextual information for understanding the ICT–related objectives and practices of schools (see Appendix A, PS-Q:C3, for a full list).

4.5.2.1 Designing the Questionnaire

Although questionnaires vary in their level of complexity, they are perhaps the most commonly used descriptive method in educational research (Cohen et al., 2002). If correctly constructed, they are a rapid, inexpensive method of gathering data, especially for small-scale research undertaken by one person (Bell, 2005).

Furthermore, Wellington (2000) argues that questionnaires offer considerable advantages in administration; they present an even stimulus, potentially to large numbers of people simultaneously, and provide the investigator relative ease with the accumulation of data not forgetting that they ensure the anonymity of respondents (Walonick, 2000). Taking these points into consideration and additional factors such as the amount of time available and access to sources, the questionnaire technique suited the needs of the researcher and the population under study. Similar questionnaires have been successfully used by many Arab researchers such as Al Hili (1993), El Sanabry (1993), to name a few. Nevertheless the key disadvantage of questionnaires concerns potentially low response rates. Traditionally, face-to-face interviews have been seen to be most effective in terms of securing a good response (De Vaus 1993). However, since the response to questionnaires in this study was greater than > 70%, the response rate is considered appropriate (Cohen et al., 2002). Having decided upon the primary objectives of the questionnaire via a previous literature review and pilot, the planning then involved the identification and itemizing of subsidiary topics that relate to its central purpose (Cohen et al., 2002). It was then necessary to formulate specific information requirements relating to these issues.

In line with the idea of standardization, specific questions were deemed more appropriate than general ones. This allowed greater focus upon the researcher's agenda and less susceptibility to incorrect interpretations by the respondent. Closed questions were used for easy coding and they varied between closed-ended or forced choice types of questions such as yes/no, true/false, rating and ranking and multiple choices. A Likert scale of "'strongly agree', agree', 'disagree', "strongly disagree" was used for some questions. For others "'in most case's, 'sometimes',' rarely', 'never'" or 'most likely', 'unlikely', 'never'" was used. This allowed the distinction to be made between those with strong feelings and those who only exhibited a mild opinion about the topic under discussion. The strength of this approach derives from fairly unambiguous wording of the categories. These scales are also easy to codify. 'Strongly agree' was coded 5 for positive statement and when a negative statement was used 'strongly agree' 5 were used to indicate a person strongly disagrees. Additionally, adequate spacing was used to help the respondents. The response boxes were kept to the right side to make it easier for the respondent to complete. The rationale for having a combination of positive and negative statements is that the respondents are more inclined to consider each item on its own merit (Maher, 1983). The questions were also designed to try to avoid ambiguity, imprecision, assumption and knowledge questions that the respondents may not have any understanding of. Double questions, leading questions, and hypothetical questions were also avoided (Bell 2005, p.81). The questionnaire began with straightforward, easy-to-complete questions and moved on to the more complex topics, with care taken to produce questions in a logical order (Bell 2005, p. 82). Questions were related to the preceding questions where possible to avoid confusion. All questionnaires where designed taking into account the fact that the respondents would be completing the questionnaires in their second language, consequently the English language used was kept simple and the sentences short .

4.5.2.2 Pilot study

A 'pilot test' is crucial to the questionnaire's success and reliability (Cohen et al., 2002). It also helps increase its validity and practicability (Coleman & Briggs, 2002). The main reasons being to check for clear and ambiguous questions and any misunderstandings that may arise. This was especially important since the sampled schools completed the questionnaire in their second language. To insure validity (content –construct), participants and knowledgeable people from the technical and education field discussed the first rough drafts during a meeting held in October 2006, and the revised versions of these were pre-piloted in November 2006 at one school with the participation of one principal, 12 teachers and 100 students with a return rate of 80%. Importantly, all participants were knowledgeable about the study's issues.

The student questionnaire was distributed to the students and a brief explanation was given to them by the researcher. The questionnaires were completed during their recess period and were then collected. The teachers completed the questionnaire during their noon break and the principal completed the questionnaire at the end of the day.

The results of the pilot was used, following a decision making session by participants (in December 2006) to form the final versions of the questionnaires. The instrumentation of the research consisted of three questionnaires:

1. A questionnaire for school principals
2. A questionnaire for the teachers
3. A questionnaire for the students

The responses from this pilot sample were coded and analyzed. These results dictated a number of modifications to the instrument (see Appendix A for the pilot instrument). The result showed that some structural and wording changes were required for clarity. The length of time required to complete the teacher's questionnaire was long (45 minutes). Thus modification was required but not at the expense of losing purpose of content. The questions were restructured and modified and resulted in 10 minutes reduction in respondent's time per questionnaire. The wording and the intent of the questions were clear to the pilot group. The researcher worked hard to keep the questionnaire simple in approach and language. The reliability of the three questionnaires were tested with the first batch using the whole three samples using Alpha Cronbach coefficient with results being greater than> 0.5. (Appendix E). Table 4.1on the next page contains a synopsis of the content of the questionnaires. Appendix A contains the complete questionnaires.

Table 4.1 study topics with summaries of questionnaire content

Topic		Principal questionnaire	Teacher questionnaire	Student questionnaire
Impact of ICT on teaching	**Curriculum**	• ICT related objectives of the school. • Presence of types of teaching and learning practices • ICT attainment targets • Realization of ICT related objectives	• Use of email/www for instructional purposes • Percentages of students/teachers using www • Internet related activities of students • Use of technology applications by students	
Impact of ICT on teaching	**Infrastructure**	• Needs and priorities • Perceived obstacles	• Number and types of computers • Operating systems • Processor types • Access to email/www • Number of computers not in use • Availability of peripherals • Availability of software types • Availability of software for school subjects. • Hardware and software related obstacles	
Impact of ICT on teaching	**Staff development**	• Prescriptions for teachers • Attendance by teachers • Expenditure on staff development	• Types of internal information exchange • Availability of in-house/external training courses • Staff assessment of ICT skills	
Impact of ICT on teaching	**Management and organization**	• Existence of written policies on ICT ICT-related policy measures • Principal attitudes towards ICT • Technical support infrastructure	• Priorities for external support	
Impact of ICT on teaching	**The consequences on the teaching function**	• Change in the role of teachers	• Change in the planning of teaching • Change in teacher/student role	
Impact of ICT on teaching	**Background information**	• Gender,Age,experience of principal • Own use and type of use of ICT • type of use of ICT • ears of experience with ICT	• Roles and tasks • Experience with ICT • Gender • Age	
Impact of ICT on learning	**Student Technical literacy level**			• Knowledge & computer usage
	Motivation and empowerment of students			• Attitude and benefits of technology
	Specific learning achieved			• ICT usage in school & non school related activities. • Types of access to technology • What do you like best in technology usage?

4.5.2.3 Administering the Survey

A master list was obtained from The Ministry of Education which included all secondary schools in the UAE. From this master list, a sub-sample of twelve public high schools, 432 students, 120 teachers and twelve principals emerged.

The technology survey in its revised form was administered to the entire sample at the twelve public high schools the period of January-February 2007.

The researcher placed a high level of importance on following all appropriate protocols prior to approaching staff at the high schools to complete the survey.
This involved seeking formal permission and support which encourage staff to complete the survey, yielding a higher rate. The MIS Department chair acknowledged the importance of the study and demonstrated his/her support by providing a personal letter (Appendix B.2) which was then used to accompany the researcher's letter to the various teaching staff within the high schools, informing them of the proposed study. It conveyed to the respondents the aims and importance of the questionnaire and assured them of confidentiality in order to encourage their reply and thanked the participants in advance for their cooperation (Cohen et al., 2002). As Sarantakos (1993) argues, a cover letter has been recognized as positively influencing the response rate of research studies.

The survey was administered to the principals and teachers during a non-teaching period in order to yield a higher return rate (two weeks free in January, 2007) whereas the student survey was administered to the students in the months of January and February 2007 during their recess periods. The initial response rate was N= 323 taking into consideration non participants and student absenteeism. The following phase (phase 2 – Interviews and observations) were linked and occurred concurrently.

4.6.3 Phase three: Interviews

4.6.3.1 The Interview

Interviews are essential sources of qualitative information for as Bell (2005) points out: "The way in which a response is made can provide information that a written response would conceal. Questionnaires responses have to be taken at face value, but response in an interview can be developed and clarified." (p. 135)
The interview should be a planned communication event, "conversations with a purpose" (Burgess 1995, p.102). Cohen et al., (2002) advised that open-ended questions are flexible, and allow the interviewer to probe and test the limits of the interviewees' knowledge, they encourage co-operation and help establish rapport

between the interviewee and the researcher; they allow a truer assessment of what the interviewee really believes. This was substantiated by triangulating the results of the interview to that of the questionnaire. This was possible since the same matching code was given to the school and the interviewee for both instruments. However, they do warn of the possibility that the interviewees may say what they think is required. Reviewers must question the validity of the questions asked, that is whether the questions asked measure what they are required to measure. There the problem of leading and loaded questions must be examined for bias-meanings of questions must be clear. Listening is an active pursuit but we have to recognize that we engage in selective hearing. Research evidence recommends the recording of interviews. Tape recording delays the selection process of editing extracts that occur with note taking, the researcher is more likely to record items out of context, when the interview is not heard again (Hitchcock & Hughes, 1995). Using the tape recording enabled the researcher to keep constant eye contact with the respondent and observe their body language. Developing an atmosphere that fosters trust and ease is of utmost importance not just for the interview to be worthwhile, but especially if there was the need to continue contact with the participant. At the end of each interview the researcher thanked the participant and informed each one of them about the next stage of the research (Bryman, 2004).

4.6.3.2 Designing the Interview

Two interview protocols were developed for use in the individual interviews: one for the principals, and one for the teachers. The two protocols were designed to solicit similar content and all were parallel in construction. Wording was modified to reflect role differences among interviewees. The content of the protocols was developed based on the research questions and on areas identified in the literature as relevant to the topic namely; interviewing the teacher’s will give the researcher a better insight on the effect of technology on pedagogy while that with the administrators will create a clearer opinion about the impact of technology on school curriculum and policies.

4.6.3.3 Piloting the Interview

After an initial study period, during which the research plan was designed, the two protocols were piloted with individuals in the same positions as the study participants namely (5 high school academic teaching staff that had previously completed the technology survey and one principal). The interviews were transcribed and analysed. Also feedback from the pilot interviews was used to reduce ambiguities in the interview questions, focus more on the central questions of my research, identify areas in need of additional questions, and to streamline the interview protocol and process. The pilot interview was also good training in conducting interviews. It made me reflect over my own shortcomings as an interviewer. After analysing the interview I was able to reconstruct the interview guide. The pilot and final interview protocols are located in the Appendix A. Individual interviews subsequently held with study participants lasted 30 minutes. A semi structured interview schedule (see Appendix A) was designed to allow the researcher to gain a deeper awareness of the ICT culture of each participant. Table 4.2 contains a synopsis of the content of the interview schedule while Appendix A contains the complete schedule.

Table 4.2 study topics with summaries of interview content

Topic		**Principal interview**	**Teacher interview**
Impact of ICT on teaching	**Curriculum**	• Application of technology.	• Application of technology
	Infrastructure	• Teachers' fluency in ICT usage	• Teachers' fluency in ICT usage
	Staff development	• ICT access and Professional development	• ICT access and Professional development
	Management and organization	• Leadership and strategy and ICT.	• Leadership and strategy and ICT.(Teachers vision)
	Background information	• Gender,Age,experience of principal • Own use and type of use of ICT • type of use of ICT • ears of experience with ICT	• Roles and tasks • Experience with ICT • Gender • Age
Impact of ICT on learning	**Specific learning achieved**	• ICT access and use.	• ICT access and use.

4.6.3.4 Administering the Interview

In the words of Patton (2002, p.278) the purpose of an interview was to explore what is "in and on someone else's mind" regarding their behavior, view, attitude and feelings toward ICT use in teaching and learning.

Face-to-face interviews although both time consuming and personally draining (Borg & Gall, 1996; Cohen et al., 2002) were selected over telephone calls due to the preference of participants, their key nature in determining policy and the possibility of improved openness in face-to-face interviews (Gillham, 2000) . Due to the time lapse between the survey and the subsequent interview (one month) it was important to notify the participants through a letter of the researcher's intentions (Appendix B). The letter thanked them for completing the survey and gently reminded them that they had agreed to an interview. The letter also reminded them about the purpose of the study including a request to consider permitting audio tape-recording when needed and informed them that the researcher would telephone them within a week to schedule an appointment. This approach made the initial telephone contact not unexpected. They were prepared for the call and were given time to adjust to the thought of an interview (Graham, 2005).

The interviews were conducted on a private one-on-one basis at the respective schools, helping them to be at ease to overcome apprehension and thus increase openness. All of the 72 interviews were conducted by the researcher over a period of five weeks. At the commencement of the interview each respondent was asked if they consented to audio-tape recording of the conversation, and this was done only with approval. While the interviews were conducted using the structured interview schedule, other issues originating from the interviews were followed using probes (Gillham, 2000, p. 69) such as "please explain that to me" or "how does that link to..?" The importance here was to maintain a balance between consistency and discovery (Strauss & Corbin, 1998, p.182). The interviews lasted for 30 minutes. The researcher was aware of the busy schedules of the participants and made sure that the interview did not impinge on too much of their time. At the conclusion of the interview, the respondents were given an opportunity to request a transcript for review. Only 10 requests were made and the transcripts were mailed back to the respondents within a month. It resulted in no changes to the transcript. As soon as possible after each interview, the recordings were transcribed; reviewed and edited using Dragon Naturally Speaking voice recognition software (Zick & Olson, 2001).which was reasonably fast and accurate.

4.6.4 Phase three: Observation

4.6.4.1 The Direct Observation

Renewed interest in classroom observation has reemerged as a method for understanding and evaluating instructional practices and for documenting outcomes of reform efforts (Diebold et al., 2000). In addition to student achievement measures, of teacher attitudes and expectations, and, most recently, observations of teachers' instructional practices have all been used to describe the learning environments in schools (Waxman et al., 1997; Turner & Meyer, 2000).
Classroom observations provide information about the frequency and/or duration of teacher and student behaviors and interactions in naturalistic settings (Anderson & Burns, 1989). Observational data can be used to triangulate reports of classroom practices from teachers and students (Waxman et al., 1997; Turner & Meyer, 2000). Feedback from systematic classroom observations can be the vehicle for schools and teachers to reflect on the strengths and weaknesses of the instructional practices they are using in their classrooms (Nuthall, 2004). However, classroom observations have been criticized as focusing too narrowly on academic variables (Stringfield & Teddie, 2004). The validity of classroom observations has been called into question due to reactive effects of the presence of the observer (Waxman et al., 1997). Other concerns such as the cost (time & money) of training observers and the misuse of classroom observation data have lead to more pragmatic concerns about the usefulness of classroom observation data (Waxman et al., 1997). However one of the primary concerns about classroom observations from the perspective of persons interested in improving teachers' instructional practices and student achievement involves the confidence

one can place in the representativeness of a sample of classroom observations. Rogosa et al. (1984) posed the question “Is the behavior of an individual teacher consistent over time.” (p. 1000). Lack of confidence in classroom observational data is a second important limitation of using classroom observations in educational process research (Baker et al., 1994; Waxman et al., 1997; Huitt, 2006).

4.6.4.2 Designing the Direct Observation

To gain more insight into the characteristics of innovative ICT learning environments, as well as in the changing roles of secondary school teachers in these learning environments, the researcher addressed both quantitative and qualitative aspects of ICT use in classrooms.

The operationalization of differentiation and classroom management was based on research conducted by Mooj (1987). Items with regard to lesson activities were used before by Smeets & Mooj (2001). Other items were based on results from the literature review which was carried out within the framework of this research. The operationalization led to a structured observation scheme which includes four categories of lesson variables:

1) Curriculum and didactic characteristics (whether or not specific types of ICT were used:

- Degree of curriculum differentiation
- Access to ICT (number and type of computers; location: classroom or computer room);
- Characterization of ICT use
- Social grouping of pupils when using ICT
- Percentage of pupils using ICT during the lesson

2) Teacher behavior characteristics:

- Coaching of and feedback to pupils working with ICT (five point likert-items)
- Classroom management (five point likert-items)

3) Characterization of learning environment:

- Degree of pupil – centeredness (five point likert-items)

4) Background characteristics

4.6.4.3 Administering the Observation:

In order to maximize the chances of obtaining examples of good practice with regard to ICT use, schools with above average level of ICT implementation were selected. In the selection process, advice from educational specialists, magazine articles providing information on ICT use in schools, and internet searches were taken into account (Smeets & Mooij, 2001). In four (2 girls schools and 2 boys schools) out of the twelve high schools which were selected randomly, classroom observations were undertaken. Thirty lessons were observed in secondary education classes, resulting in a total of over 22.5 observation hours. Lessons to be observed were selected after consulting the school principal.

The observer being the researcher; collected the required scores with observation sheets (refer to Appendix A).There was room for noting down more extended remarks and clarifications. The observation data was triangulated against the interviews and the questionnaire data as the same teacher and school code were used in all three instruments. The observations were completed at random times throughout the school day. The observer entered the classroom unannounced and used the coded sheets to code interactions between the teacher and students. Four repetitive observations 45 minutes each were collected for each teacher over a four day period for the same class. Each lesson was held in a computer lab with an average of 15 computers per lab/class. Observations were collected on non-consecutive days of the week. For the likert-items, alpha scale construct was carried out and Cronbach's alpha coefficients were calculated that showed an acceptable rate of reliability between 0.6-0.7 (see Appendix E) respective scales, alpha coefficients.

4.7 Data Management & Analysis

Reid's (1992) three phases of data management (data preparation, data identification, and data manipulation) provide an appropriate scaffold for the processes adopted for this study. Data Preparation in this case involved entering the coded survey responses into the SPSS (Statistical package for social sciences V13) program, transcribing the interviews, observations and interaction with key informants. The process of data identification refers to dividing text into meaningful and easily locatable sections of information (Yin, 1994). The software program SPSS was used to store and code and analyze the data generated from the School survey. The majority of the fields were number fields with the exception of a small number of text fields. The coding structure for the technology survey is located in Appendix C.

Manipulation of Quantitative data consisted of putting the quantitative data through the usual rigors of analysis relevant to the research questions. Due to the sheer amount of information collected, the open-ended questions in the technology survey required some form of quantification. However, in order to maximize the benefits of the qualitative data, the overall flavor of the data was preserved as much as possible. The responses to each question were transferred to tables using SPSS (V13). Key words and phrases were used as descriptors to establish themes which emerged from the data. The statements were then coded accordingly. The software application SPSS was used for the process of storing and coding the data. SPSS generated descriptive statistics (means, standard deviations, frequencies, percentages, minimum, maximum, correlations and reliability indices. Correlation analysis for a Pearson correlation at 0.5 & with Sig. (2-tailed) alpha significance les than or equal too<= 0.05, Cross tabulation analysis with Chi-square, Asymp.Sig. (2sided) at 0.5) and a Cronbach Alpha Coefficient with significance level greater than >0.60 were used (Allen & Yen, 2002) (see Appendix E).

The results are presented in tables containing the counts (n) supported with percentages (%), averages supported with the standard deviations (see Appendix D). The correlation was tested in four areas, first being a correlation between policy and practice regarding staff development; the second being a correlation between the presence of teaching and learning practices (emerging and traditional) and the number computers used for ICT usage in schools; the third is correlation between the realization of these practices and the number of computers used for ICT usage in schools; the last is a correlation between the policy goals of learning processes, communication and collaboration and the present and realized learning practices.

Cross tabulation was used to measure any significance between items under personal background information / socio demographic factors and the following parameters: usage of computers, value of ICT, policy goals in the development of a vision on the use of ICT in schools, attention to norms regarding internet usage, ICT literacy levels, Instructional process and use of e-mails and www., methods related to computer and ICT usage.

The researcher used Cronbach Alpha Coefficients to instrument reliability. This reliability test helped in judging the reliability of items included in teaching and learning as goals, practices, processes and statement of opinion in relation to ICT.

Data manipulation of the qualitative data in this study involved sorting, rearranging, retrieving and continual searching the data set. Verbatim transcripts of each interview provided the most appropriate database for analysis. In order to validate the written transcriptions, the researcher and a colleague listened to each tape together while reading the transcript. Errors were corrected and sentences were completed. This exercise allowed the researcher to identify any nuances in the respondent's speech — elements which are unidentifiable in the written form.

The themes and issues which emerged from the interview data were able to be quantified fairly simply as the majority of the themes and issues which surfaced were similar (data reduction and data identification). A database (using SPSS) evolved which included numerical codes and the statement's the code was linked to. This enabled the researcher to obtain a larger picture of the overall data, as well as be sensitive to the qualitative data (See Appendix C for the coding structure which evolved from the interview data). The purpose for manipulating the data in this way was to respond to the focus of the research questions.

4.8 Triangulation and Validity

In order to gain the trust of their audience conventional inquiries seek to demonstrate validity (internal and external), reliability and objectivity. Carr & Kemmis (1988) recommend four tests for the validity of an investigative approach, namely credibility, transferability, dependability and conformability. Credibility is the trickiest of these measures since it requires a premature judgment of the results to check whether they are inline with a plausible investigation of the object of study. In my opinion, the latter three constraints if proven satisfactorily achieved will insure credibility.

Bogdan and Biklen (2003, p.48) argue that when we talk of transferability we are concerned with the idea that the categories of study are conducive to comparative work across contexts. I believe this will be achieved by adopting universally accepted measures of student performance and teacher appraisal adopted from rigorous educational research methods, and similarly solid measures of adaptation to new media adopted from learning psychology.

Dependability in research as argued by Brock-Utne (1996) strives to record the multiple interpretations of, intention in and meanings given to situations and events. The focal point of dependability is "on the process of the inquiry and the inquirer's responsibility for ensuring that the process was logical, traceable, and documented" (Schwandt 2001, p.258). I believe dependability has been insured by my discussion of my theoretical framework, review of the literature the soundness of my choice of the sample schools and the sample of students and teachers from within each school to form a representative whole.

Conformability will be ensured by the fact that the object of study is not a “one –time” transient condition but can be re-approached by other researchers wishing to re-investigate the issue, the particular schools chosen and even the selected individuals. This has been insured by the researcher by leaving an audit trail of how the data was collected and analyzed. To insure validity (content – construct), Instruments developed by Flores (2000), Trinidad & Macchiusi (1996), Trinidad (1998), Thornton (1995), Green (1992) & Brummelhuis (1999) which have been widely used by educational institutions, were carefully scrutinized. Content validity of the instruments was insured by showing that it fairly and comprehensively covers the domains or items that it says it covers. The questionnaire included questions that covered the main issues of the research objectives and are a fair representation of the wider issue under investigation. Also careful sampling of items ensured their representative ness which goes along the positivist paradigm that I have adopted. Participants and knowledgeable people from the technical and education field discussed the first rough drafts during a meeting held in October 2006, and the revised versions of these were pre-piloted in November 2006 at one school with the participation of one principal, 12 teachers and 100 students with a return rate of 80%. Importantly, all participants were knowledgeable about the study’s issues.

The reliability of the three questionnaires was tested with the first batch using the whole three samples using Alpha Cronbach coefficient (see Appendix E). Reliability of the interviews was ensured by transcribing first and then analyzing the interviews. Also feedback from the pilot interviews was used to reduce ambiguities in the interview questions, focus more on the central questions of my research, identify areas in need of additional questions, and to streamline the interview protocol and process.

Validity and reliability in observations addresses the subjective and idiosyncratic nature of the non participant observation study are to do with its external validity. Researchers employ as a way of checking on the representativeness of the events that they observe and of cross checking their interpretations of the meanings of those events. In addition to external validity, non participant observation also has to be rigorous in its internal validity checks. There are several threats to validity and reliability here, for example:

- ✓ the researcher, in exploring the present, may be unaware of important antecedent events;
- ✓ informants may be unrepresentative of the sample in the study;
- ✓ the presence of the observer might bring about different behaviors (reactivity and ecological validity);
- ✓ the researcher might 'go native', becoming too attached to the group to see it sufficiently dispassionately.

To address the aforementioned points Denzin & Lincoln (1994) and later Flick (2000); suggests triangulation of data sources and methodologies. Also as the literature points out that if observational research is much more structured in its nature, yielding quantitative data, then the conventions of intra, and inter rater reliability apply. The researcher being the observer ensured that data entered into the appropriate categories consistently (i.e. intra, and inter rater reliability) and accurately. Further, to ensure validity, a pilot was conducted in one class that involved one teacher and 15 students to ensure that the observational categories themselves are appropriate, exhaustive, discrete, and unambiguous and effectively operationalize the purposes of the research. I have used a structured observation protocol that yielded quantitative data and to ensure reliability a pilot was conducted and passed a Cronbach alpha test for the likert-items with a result greater than > 0.6 ensuring acceptable reliability (see Appendix E).

Finally, the research incorporated both quantitative and qualitative data and evidence to be generated which as Wellington (2000) points out, helps us to answer the ‘why’ questions as well as the ‘what’ questions. The quantitative position involves the systematic collection of data using a questionnaire and facts from the group under study, and attempts to try to identify certain trends and attributes within the results (Wellington, 2000). The qualitative approach, on the other hand, provides more insight and validity. This is important because to ignore the way in which individuals interpret and give meaning to their world limits the potential for meaningful data to surface. Inner thoughts and feelings may not be measurable in any scientific or objective sense, but it is exactly these issues that lead to an understanding of human behavior.

Data from the three survey instruments were compared to ensure comparative analysis from the different sources and thus contribute to the validity of the research. This method is described as “methodological triangulation” (Cohen et al., 2002). However we should always keep in mind what Esterby-Smith et al. (1991a) said reminding us to be wary of glib generalizations and over-simplification of extremely complex issues. Consequently to generate a valid study Triangulation is used.

4.9 Data Storage

All original data will be kept secure for at least three years by the researcher. These data were in the form of hardcopies of documentation as well as electronic sources, stored on computer disks. The data will be clearly labeled for easy access.

4.10 Summary

This chapter identifies the research methodology adopted for this particular study. A combination of qualitative and quantitative methods were employed, however the predominant methodology is best described as a positivist approach, because of my initial beliefs that the differentiation of the student, the student teacher body, the teacher body and the variety of indicators that I will be measuring will require an attenuated description of the individual research subjects.

The research design involved five key phases which were: Literature review and document analysis; the survey; interviews and observation; and finally the analysis of the total data set. The need for triangulation is identified by using the methodological triangulation protocol. Reid’s (1992) phases of data management provided a useful scaffold for this particular study. The data was prepared, identified, and manipulated with the aid of SPSS. A synthesis of all of the data from the technology survey, interviews and observation reports enabled the researcher to develop outcomes which became invaluable in responding to the initial research questions. Throughout the study the researcher followed the appropriate protocols regarding data storage and ethical behavior.

CHAPTER FIVE

5.0 Research Results, Interpretation and Analysis

5.1 Research Question One: Results "Impact of ICT on Teaching"

Introduction

As described in Chapter One, one of the main purposes of this research was to assess and analyze, by means of statistical surveys, interviews and observation methods, the impact technology (termed as ICT) has on instructional activities by teachers and /or students in high schools in the UAE and develop an effective model and associated strategies for implementing ICT at public high schools. A number of themes have emerged from the various data sets which in turn have generated a number of findings about teaching and learning at public high schools in the UAE. The findings and the data which warrant them are summarized in this chapter. This chapter is divided into five parts where parts 5.1 & 5.2 represents the results to research questions one & two while parts 5.3 & 5.4 represents the interpretation and analysis of the these research questions and the link to the literature . Part 5.5 of this chapter also presents a model, the 'UAE Professional Learning Community Model' (UAEPLCM), which may be applied to other UAE secondary educational institutions. This model attempts to address the final research question (What is an appropriate model for future implementation of ICT into teaching and learning at high schools in the UAE?), one of the key forces driving this research.

Three surveys, two interview schedules and one observation protocol was developed by the researcher that contained a list of research questions to be addressed to school principals, teachers and students. These research questions sought for answers on the status of ICT in high schools in the UAE and as a consequence its impact on teaching and learning.

This main research question was therefore divided into two sub-questions namely:

1. The impact of ICT on teaching
2. The impact of ICT on learning

In order to answer these research questions; questions were developed (see Appendix A) to cover three dimensions, that of the school (represented by its principal and teachers); the teaching activity and environment (represented by the teachers) and the learning activity (represented by the students). In all three dimensions the status and impact of ICT were explored; status being a factor affecting impact. Results on “the impact of ICT on teaching” were explored from both the school and teachers perspectives and are presented under the following sub-sections:

5.1-A. Skills, attitudes, policies and usage of ICT in schools in the UAE:

1. Curriculum and pedagogical environment in schools. Goals and realization.
2. Attitudes and policies related to hardware and software environment in schools.
3. Attitudes and policies related to staff development
4. Management and organization (Attitudes, beliefs, policies and vision of school principals).

5.1- B. The consequences of appropriate use of ICT on the teaching function.

1. How is the role of teachers affected by ICT?
2. How is the planning of teaching affected and the assessment of learning?
3. How is the teacher student role affected?

5.2-C. Results on “the impact of ICT on learning” were explored from the students perspectives are presented under the following sub-sections:

a. What is the students’ technology literacy level?
b. Are students motivated /empowered by ICT?
c. What is the specific learning achieved?
d. Relationship of students to learning?

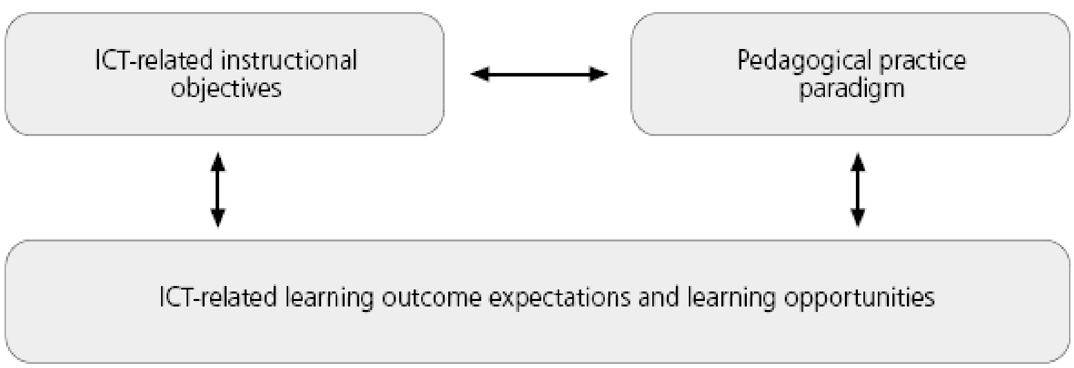
A- Skills, Attitudes, Policies & Usage of ICT in Schools in the UAE:

1- Curriculum and pedagogical environment in schools; goals and realization.

The pedagogical paradigm of schools refers to emerging versus traditionally important pedagogical practices. A description of the extent to which schools have implemented practices that are related to each of these paradigms may offer important contextual information for understanding the ICT-related objectives and practices of schools which intern relate to the impact.

Figure 5.1 presents the framework for indicators of the curriculum and ICT. In the following sections this framework is further defined in terms of survey questionnaire operationalizations and the indicators that were constructed on the basis of these questionnaires.

Figure 5.1 Frame-work for indicators of the curriculum and ICT



Pedagogical Practice Paradigm

To investigate the extent to which schools had adopted particular pedagogical practices (emerging vs. traditional, emerging being defined as student centered active and autonomous learning), a list of statements was used based on a previous research done on pedagogical practices in schools (see chapter four-methodology-p.70). These statements as well as the stem of the related question are shown in TableD1/PTC3-p. 272, Appendix D. Results in the form of averages for these aforementioned pedagogical practices are represented in table 5.1 on the next page. To ensure reliability of the construct grouped under code E (emerging) and code T (traditional) a Cronbach alpha test was passed with a result greater than> 0.5 thus insuring the constructs internal reliability. Triangulation of the results ensured the validity of the construct (Appendix E, E1). It is worth noting that the presence of traditional pedagogical practices (Mean=1.92 on a scale of 1-3) is more prevalent than emerging practices ((Mean=1.37 on a same scale) for the sampled schools. Moreover the results from the teachers' survey to the same question ascertain these results.

Table 5.1 The presence of ICT related practices

		Principals			Teachers		
Code		**N**	**Mean**	**S. D**	**N**	**Mean**	**S. D**
	Average/Emerging Pedagogical Practices	**12**	**1.37**	**.109**	**117**	**1.37**	**.109**
	Average/Traditional Pedagogical Practices	**12**	**1.92**	**.571**	**117**	**1.91**	**.498**
	Average	**12**	**1.51**	**.186**	**116**	**1.51**	**.160**

It was mentioned in the literature review (Brummelhuis, 1999) that a currently widely held belief is that the implementation of emerging pedagogical practices may be facilitated by applying ICT. A possible hypothesis that may be derived from this belief is that schools that have used ICT for a large number of years may have higher scores on the emerging pedagogical practices indicator than schools that had started only relatively recently. Conversely, this trend should not be expected for the traditionally important practices. The Pearson correlation analysis and the level of significance applied on the results (see Appendix E-Q: E) show strong support to this hypothesis: The emerging practices tends to correlate strongly with the number of years of ICT usage (Pearson correlation greater than 0.7 and alpha significance less than 0.05).

ICT-Related Instructional Objectives

In order to acquire estimates of the ICT-related learning objectives that schools had adopted, the school principals were asked two questions.

The first concerns the goals that were important in determining the current use of ICT in the schools while the second dealt with the adoption by schools of ICT-related policy goals on aspects of instruction (teaching and/or learning) (see Appendix A-Q: C2 &C7). Results presented in tables 5.2 and 5.3 indicate respectively the percentages of principals at schools where the T-items (objective traditional, C2_1 to C2_8)) and E-items (objective emerging, C7_A & C7_B) were answered with respectively 'very important' and 'yes'.

Table 5.2 Schools whose principals indicated the importance of particular instructional objectives indicated as (T)

C2: Goals followed in determining how computers are used at school	**N**	**Mean**	**S. D**
C2_1: To prepare students for future jobs.	12	2.58	.515
C2_2: To improve student achievement	12	2.42	.515
C2_3: To promote active learning strategies training courses	12	1.83	.577
C2_4: To individualize student learning experiences curriculum purposes	12	1.42	.515
C2_5: To encourage more cooperative and project-based learning.	12	2.17	.389
C2_6: To develop students independence and responsibility for own learning.	12	1.33	.492
C2_7: To give students drill and practice exercises.	12	1.58	.515
C2_8: To make the learning process more interesting.	12	2.58	.515
T-Objective Traditional-Average (1.99/3=663. %)	**12**	**1.99**	**.294**

The shaded area in table 5.2 reveals that, in secondary education, the ' important' goals (the T-items) were, amongst others, *preparing students for future jobs*, *increasing interest in learning*, *improving student achievement and making the learning process more interesting* (Mean being between 2 & 3).

The following observations can be made regarding the E-items (as highlighted in the table 5.3 on the next page).

- In the UAE very low percentages of students were at schools that were striving to make computers available to every classroom (0.08%).
- Almost 50% of the students were in schools that had adopted the objective that teachers use computers in their instructional practice.

- In 17% of the schools encouraging independent learning was an objective while all schools agreed on the use of computers as supportive learning aids (100%).
- The objective of email use was low (42%) while the use of external databases & www were adopted for a substantive majority of students attending schools in the UAE. (75%).
- Cooperation with other schools in the area of computers rated an average of 50%.

It appears that the hypothesized scale was moderately acceptable for both objectives [Traditional & Emerging], the traditional objectives (the alpha being .719) and the emerging objectives (the alpha being.64) (Appendix E, E1) thus ensuring reliability. Also the results were triangulated against that of the teachers' on the same questions with matching answers thus insuring validity.

Table 5.3 Schools whose principals indicated the importance of particular instructional objectives indicated as (E)

	Policy Goals						
	Principals				Teachers		
	N	P%	S. D		N	P%	S. D
C7_A: Learning Process	**12**	**44%**	**.241**		**118**	**42%**	**.187**
C7_A1: One or more computers available in every classroom	12	.08%	.289		118	00	.000
C7_A2: Teachers use computers in their instructional practice.	12	50%	.522		118	51%	.502
C7_A3: Encouraging independent learning with the aid of computers	12	17%	.389		118	17%	.377
C7_ A4: Students using computers as supportive learning aids	12	100%	.000		118	100%	.000
C7_B: Communication/ Collaboration	**12**	**56%**	**.308**		**118**	**58%**	**.276**
C7_B2: Students use e-mail	12	42%	.515		118	41%	.493
C7_B3: Students access external databases via the Internet/WWW	12	75%	.452		118	83%	.377
C7_B4: Cooperation with other schools in the area of computers	12	50%	.522		118	51%	.502
E-Objective Emerging-Average		**50%**				**50%**	

With regard to expectations of the ICT learning outcomes, school principals were requested to indicate from the list referred to in table 5.4 on the next page, (on the basis of the school's objectives), the skills students should have acquired by the time they had reached the end of the target grade. It is evident from table 5.4 on the next page that most principals and teachers considered it important for students to learn to operate a computer (100%). Word-processing was also a target for a substantial majority of students in most schools (100%) while the target of students learning how to make illustrations with graphical programs was considered important for about 67% of the respondents. Lower scores were marked for spreadsheet usage and writing programs while communicating via email and the use of electronic information scored high as a skills attainment requirement by students.

The overall index in table 5.4 suggests that there is a high expectation with regard to students' ICT skills in the UAE (greater than 70%).

Table 5.4 Expected skills acquired by the students

	Principals			Teachers		
C4: Skills Students should acquire by the end of the grade.	**N**	**P%**	**S. D**	**N**	**P**	**S. D**
C4_1: Operating a computer (saving files, printing, keyboarding)	12	100%	.000	118	100%	.000
C4_2: Writing documents with a word processor (typing, editing, layout)	12	100%	.000	118	100%	.000
C4_3: Making illustrations with graphical programs	12	67%	.492	118	53%	.501
C4_4: Calculating with spreadsheets programs (sheet creation, using formulas).	12	58%	.515	118	61%	.490
C4_5: Writing simple programs	12	50%	.522	118	41%	.493
C4_6: Communicating via e-mail with teachers and other students	12	83%	.389	118	81%	.391
C4_7: Sending, searching for, and using electronic forms of information	12	75%	.452	118	83%	.377
Average	**12**	**76%**	**.205**	**118**	**74%**	**.172**

ICT-Related Learning Outcome Expectations and Learning Opportunities

An issue that is related to the ICT objectives of schools (discussed in the previous section & presented in tables 5.2 & 5.3 (p. 98/99) is that of the ICT-related learning opportunities offered to students. The following categories of indicators were distinguished with regard to these opportunities (note that the indicators in this section are based on the perceptions of school principals or teacher respondents):

- Perceived opportunities for using ICT-applications;
- Perceived opportunities for using the Internet;
- Perceived ICT-related opportunities related to the emerging pedagogical practices;

• Perceived ICT-related opportunities related to the traditionally important pedagogical practices.

Perceived Opportunities for Using ICT Applications

To acquire an estimate of the opportunities offered to students for getting acquainted with several kinds of ICT applications, respondents were requested to indicate whether a typical student would have used any of the following technology applications at school by the end of the target grade (table 5.5). The results indicate that in almost all targeted schools, word-processing (100%) and spreadsheet packages (92%) were one of the most popular ICT applications.

Table 5.5 Students using a particular application (Teacher's views)

	N	P%	S. D
A12:_1: Dynamic modeling and graphical modeling of mathematical	117	00	.000
A12_2: Software for simple data manipulation and statistical analysis	117	66%	.476
A12_3: Word processing/desk top publishing	117	100%	.000
A12_4: Spreadsheet packages	117	92%	.268
A12_5: Software for learning programming skill	117	45%	.500
Index of application coverage		61%	

Similar results were found from the principals responses (table 5.4 p. 100). Data manipulation and statistical analysis software scored much higher than Software for programming. The index of 'application coverage' was equal to 61%; above average for the UAE. It is interesting to note that the percentages for some applications in table 5.5 (notably for spreadsheets) are higher than for comparable applications in table 5.4 p.100 (92%-58%). This situation seems to indicate that, in practice, certain learning activities occurred to a greater extent than might have been expected on the basis of the educational targets of the schools.

Perceived Opportunities for Using Email or the World Wide Web

In this research, a number of questions were asked that referred to access to and use of email and or the WWW for instructional purposes. Access, being related to ICT infrastructure is reviewed in the consequent section (p. 103-110). The usage of e-mail and or WWW for instructional purposes in the targeted schools in the UAE is low as only 6.84% of the students and 13.24% of the teachers use e-mail and 12.6% of the students and 20% of the teachers used the internet (see table 5.6).

Table 5.6- % of students and teachers using Internet and the WWW

	Mean
Student use of e-mail	6.84
Student use of www	12.60
Teacher use of e-mail	13.24
Teacher use of www	20.10

The principals expressed different views stated in their objectives regarding same subject matter , as they had indicated that 83% of the students and teachers should acquire the skill of using e-mail and 75% of the students and teachers should acquire the skill of using the internet (see table 5.4 page 100).

Respondents who indicated that the school used email or WWW for instructional purposes answered a number of additional questions, namely students and teachers using Internet related activities (table 5.7)

Table 5.7- Percentage of students and teachers using Internet related activities

	P%
A11_1: Communicating via e-mail with teachers within and /or outside the school for learning purposes	24%
A11_2: Communicating via e-mail with peers from other schools within and/or outside the country	50%
A11_3: Using e-mails or bulletin boards for group projects/collaboration Within the school and/or with other schools	0%
A11_4: Using external databases to retrieve and extract information from different sites across the Internet and or www.	83%
A11_5: Designing and maintaining Web sites	0%

Given the fact that the percentage of schools using the Internet/WWW was low, further statistics relating to the answers to these additional questions were considered to be insufficiently representative for sampled high schools. However, while the small sample representation needs to be kept in mind, it seems warranted to conclude that a substantial number of students and/or teachers have had at least some experience with the Internet/WWW. As can be inferred from table 5.7, the most popular use of the Internet in high schools was the use of external databases and email. Other activities, such as publishing information and designing &maintaining web sites, were not, as yet, very popular.

Perceived ICT-Related Opportunities Regarding the Emerging Pedagogical Practices

Reference is made to the pedagogical paradigm of the schools, table 5.1 p.97 showed the averages of the emerging and traditional pedagogical practices indicated by principals and teachers as being present in their schools. This same list (table D1/PTC3/Appendix D) was used when principals were asked to rate the extent to which these activities had been realized through ICT (the answer options were never, usually, and many) table 6.8 on the next page (see Appendix A-Q:C3) presents the Mean results for indicators where principals and teachers claimed that the activity, was not or moderately realized via ICT (as 90% of the Means indicated a result less than 2.5 on a scale of 3). A first observation from these tables is that extreme high Averages do not occur. However, given that the Average means reflect opinions about low and moderate *ICT contribution*, it may be argued that, a substantial number of high school principals indicated that ICT is very little used for realizing emerging pedagogical practices in the school. With the exception of students developing abilities to undertake independent learning, their involvement in cooperative learning and learning by doing indicated by a Pearson correlation greater than >0.7 (table 5.8)

Perceived ICT-Related Opportunities Regarding the Traditionally Important Paradigm

The instructional activities listed in table 5.8 on the next page (see Appendix A-Q: C3) represents activities that were seen as indicative of the traditionally important paradigm. These items are 6, 7 and 8 and indicate the Mean results for those indicators where principals claimed that the activity was realized via ICT. A first observation is that extreme high averages do not occur. However, given that the average Means reflect opinions about low and moderate *ICT contribution*, it may be argued that, a substantial number of school principals and teachers indicated that ICT is moderately used for realizing pedagogical practices in the school.

Nevertheless, it seems that the' development of skills' was perceived as moderate contributions of ICT (Mean=2.33) and shows consistency between the presence & realization of this goal (Pearson greater than > 0.5) with the exception of teachers keeping track of students activities and progress.

Table 5.8 -School principals and teachers indicated per emerging instructional practice that it had been realized with the help of ICT

		Present							Realization								
		Principals				**Teachers**			**Principals**				**Teachers**			**T**	**P**
Code		**N**	**Mean**	**S. D**		**N**	**Mean**	**N**	**Mean**	**S. D**	**S. D**		**N**	**Mean**	**S. D**	**Pearson** ***r***	**Pearson** ***r***
E	C3_1: Combining parts of school subjects with one another (multidisciplinary approach).	12	1.67	.492		118	1.66	117	1.90	.480	.515		117	1.90	.480	.184	.478
E	C3_2: Students developing abilities to undertake independent learning.	12	1.08	.289		118	1.08	118	1.15	.361	.389		118	1.15	.361	.717	.674
E	C3_3: Providing weaker students additional instruction.	12	1.00	.000		118	1.01	118	1.02	.130	.000		118	1.02	.130	.704	.(a)
E	C3_4: Organizing teaching and learning so that differences in entrance level, learning pace, and learning route are taken into account.	12	1.08	.289		118	1.07	118	1.58	.496	.515		118	1.58	.496	.231	.255
E	C3_5: Students learning to search for information, process data, and present information.	12	1.92	.289		118	1.92	118	2.24	.834	.669		118	2.24	.834	.453	.257
E	C3_9: Students being largely responsible for controlling their own learning progress.	12	1.00	.000		117	1.01	117	1.07	.253	.289		117	1.07	.253	..343	.(a)
E	C3_10: Students learning and/or working during lessons at their own pace.	12	1.00	.000		118	1.00	117	1.35	.497	.515		117	1.35	.497	.(a)	.(a)
E	C3_11: Students involved in cooperative and/or project-based learning.	12	1.83	.389		118	1.83	118	1.97	.562	.603		118	1.97	.562	.787	.775
E	C3_12: Students learning by doing.	12	1.75	.452		118	1.76	116	1.94	.498	.515		116	1.94	.498	.684	.684
Average Emerging		**12**	**1.37**	**.109**		**117**	**1.37**	**113**	**1.58**	**.304**	**.288**		**113**	**1.58**	**.304**		
T	C3_6: The emphasis I am learning is on the development of skills.	12	2.25	.452		118	2.15	118	2.40	.492	.492		118	2.40	.492	.521	.816
T	C3_7: Students working on the same learning materials at the same pace and/or sequence.	12	1.92	.996		117	1.92	117	1.71	.788	.754		117	1.71	.788	.898	.817
T	C3_8: Teachers keeping track of all students' activities and progress.	12	1.58	.515		118	1.65	118	1.97	.158	.000		118	1.97	.158	-.005	.(a)
Average Traditional		**12**	**1.92**	**.571**		**117**	**1.91**	**117**	**2.03**	**.353**	**.361**		**117**	**2.03**	**.353**		
	Average	**12**	**1.51**	**.186**		**116**	**1.51**	**112**	**1.69**	**.269**	**.250**		**112**	**1.69**	**.269**	**.308**	**.422**

C3-1/2/3/4/5/9/10/11=Emerging practices; C3-6/7/8=Traditional practices; t=Teacher & P=principal

2. Attitudes and policies related to hardware and software environment in schools.

This section describes the hardware and software infrastructure presented by the student computer ratio, the quality of the available equipment, availability of peripherals, access to the Internet, availability of software, problems and priorities with regard to hardware and software.

Hardware

Student: computer ratios

A general basic indicator of hardware availability in schools is the number of PCs (or workstations) that are available to students and/or teachers of the target grades for teaching and/or learning purposes. In the Principals survey, respondents were asked to specify the total number of computers available to students in the target grades (Appendix A-Q: B1). One indicator of the extent to which students can access hardware in a school is the student: computer ratio (total number of students per school/total number of computers available for student use in the whole school (in our case grades10, 11, and 12) (table 5.9). This ratio indicates how many students on average have to share one computer. A ratio of 10 was calculated indicating that for every 10 students there is one available computer. Furthermore, if these 10 students spend about 7 hours in lesson time per week in their school, then each student, on average, could use a computer for forty two minutes per week (see Appendix A, PS-Q: A2/B1).

A question that was of interest (especially in terms of it providing a benchmark for judging future developments) to the researcher is the use of laptop-computers. Principals were asked to estimate the percentage of students from the entire school who brought their own laptops to the school. On the average it proved to be nearly 13.3% in all sampled schools (see table 5.9). As a general conclusion, then, laptop use among students was fairly low, but it is still indicative of the need of computers that the school is unable to provide.

Table 5.9 Student: computer ratio & laptop usage

	N	Min	Max	Mean	S. D
B1: How many computers are available for use by students of grades 10, 11 and 12 in the school?	12	25	60	46.25	11.702
A2: Total number of students	12	250	700	475.83	179.112
B3: What percentage of students from the 10, 11 and 12 grades brings their own laptops to the school?	12	10	20	13.33	3.892

Hardware functionality

The student: computer ratio, although of interest to policy-makers is a rather crude indicator of the available ICT infrastructure. More illuminating for the purpose of interpreting the ICT-related curriculum indicators discussed in the previous section are indicators of the quality and (potential) functionality of the available equipment.

One potential indicator is the percentage of computers in schools that are suited for multimedia applications. Low percentages were observed as on the average 21 units were suited for multimedia that can be counted as 46% of the number of computers available in labs (see table 5.10).

Table 5.10 Hardware functionality indicators

	N	Min	Max	Mean	S. D
B11: With respect to the total number of computers from questions B4, how many are multimedia computers (equipped with a CD-ROM and a sound card)?	12	10	30	21.25	7.111
B4: List the number of fixed computers used by 10, 11 and 12 grades students for educational use in different computer rooms (Labs)?	12	25	60	44.58	12.515

The average percentage of computers equipped with different operating systems/ user interfaces helps shed light on hardware quality/functionality in the schools. The percentage of computers for each operating system's categories was calculated for each school, and these percentages were then averaged across the 12 sampled public high schools in the UAE (see Appendix A, PS-Q:B6,7,8).

The results reveal that an average number of computers (49.4%) were equipped with recent operating systems (see table 5.11).

Table 5.11 Computers equipped with different operating systems (Average percentages)

	Latest version of windows XP	Windows2000, Win NT, or Maces 7.5 and higher	Windows95/98, Win NT, or Maces 7.5 and higher
12 Schools	**49.4%**	**39%**	**24%**

Notes: Percentages per school calculated as: (Average number of particular type divided by average number of computers available at the grade range)* 100

Connections to internal networks

Another important means of evaluating the ICT infrastructure in schools is the extent to which the available equipment is connected to a network. The respondents who filled out the principal's questionnaire were asked to quantify the number of computers that are connected. (See Appendix A PS-Q: B5).

On average 36% of the computers available in labs are connected to a local network at the sampled schools. This percentage is low and does not serve in enhancing connectivity within the school, to other schools and to the internet thus it is a hindrance to the adoption of ICT in schools (table 5.12).

Table 5.12 number of networked computers

	N	Min	Max	Mean	S. D
B5: How many of the total number of computers from questions B4 are in a local network?	11	4	30	16.27	8.533

B4 referred to the number of computers available for use in the labs (16.27 of 44.58(B4))

Peripherals

The additional computer-related equipment (peripherals) available in schools for educational use is another useful indicator of hardware accessibility and functionality. Data compiled from my research showed that on the average 60% of the listed peripherals in table 5.13 were available for educational use in the targeted schools (see table 5.13).

Table 5.13 Presence of peripherals (%)

	N	P%	S. D
B15_1: Laser printer	12	100	.000
B15_2: CD-ROM driver	12	92	.289
B15_3: Devices for mentally and/or physically disabled students	12	08	.289
B15_4: Devices for digital image or video processing	12	08	.289
B15_5: Color printer	12	100	.000
B15_6: CD- Writer (CD-R, DVD)	12	92	.289
B15_7: Graphic Tablet	12	17	.389
B15_8: Video Projector	12	100	.000
B15_9: Scanner	12	100	.000
B15_10:LCD-panel	12	17	.389

Access to Communication Facilities

The Internet and WWW are probably the most visible ICT innovations of the past 10 years (Becta, 2003). The ability of citizens and schools to access the Internet is rapidly increasing. Many governments have formulated explicit plans to equip schools with access to the Internet before or shortly after the year 2000. The researcher therefore asked a number of questions in order to determine if schools had access to the Internet for instructional purposes. Those respondents who reported that the school had access to the Internet for instructional purposes were asked a number of additional questions, namely:

• The number of computers that could simultaneously access email;

• The number of computers that could simultaneously access the WWW;

On average, a relatively low percentage of the available computers in the sampled public high schools could simultaneously access e-mail and the Internet and negligible regarding the use of internet for instructional purposes (15.11%, 17.3% and 0.83%). See table 5.14.

Table 5.14 The ICT Resources in schools

	N	Min	Max	Mean	S. D
B12: Does your school have access to the Internet for instructional purposes?	12	0	1	.83	.389
B13: How many of the computers listed in questions B4 can have access to e-mail at the same time?	9	10	30	15.11	8.536
B14: How many of the computers listed in questions B4 can have access to the World Wide Web at the same time?	10	8	30	17.30	6.634

Perceived Obstacles Regarding Hardware Infrastructure

In the previous sections, a variety of indicators provided a bird's-eye view of the hardware infrastructure available in high schools (namely: student to computer ratio; hardware functionality; connectivity; peripherals & access to communication facilities) as at the beginning of 2007. However, an additional piece of information may help inform debates on future policy initiatives. This is the perception that educational practitioners have of needs and priorities regarding the hardware infrastructure in the schools (See Appendix A, Principals and Teachers survey Q: G).

The majority of principals and teachers indicated that the particular hardware problems hindering the realization of the schools' computer related goals were an ‘insufficient number of computers’ in most schools and weak infrastructure (table 5.15). These results were further confirmed by the interviewed principals where 41.7% assured us of the insufficient number equipment.

Table 5.15 Obstacles facing ICT implementation (principals & teachers) (%)

	Principals				Teachers		
	N	**P%**	**S. D**		**N**	**P%**	**S. D**
G1_A: Hardware	**12**	**100%**	**.000**		**118**	**100%**	**.000**
G1_A1: Insufficient numbers of computers	12	100%	.000		118	100%	.000
G1_E8: Weak infrastructure (telecommunications, electricity, available room space, etc.)	12	92%	.289		118	92%	.280

Other problems that were frequently mentioned were ‘not enough simultaneous access to the Internet /WWW’, ‘lack of technical assistance’, and ‘outdated school networks’ (see table 5.16) & (Appendix D-D/4 PIL4). Also 58.3% of the interviewed principals when asked as what changes could be made to technology in their respective schools to allow students’ greater benefits (see Appendix A-Q: N1) indicated the need for better networks and more computers in classes (see table 5.17) & (Appendix D-D/4PIN1).

Table 5.16 Barriers you encountered in trying to use technology schools

	N	%
1: Lack of budget	5	41.7%
2: Lack of clear IT	1	8.3%
3: Lack of support	1	8.3%
4: Lack of fluent teachers using technology	2	16.7%
5: Little teachers training	3	25.0%
6: Insufficient equipment	5	41.7%
7: Very hard to train teachers with their teaching load	2	16.7%
8: Poor network	1	8.3%

PIL4: What barriers have you encountered in trying to use technology in your school?

: We don’t have enough computers in the school to permit students to use them whenever they want.

: The connection to the internet is limited to the number of computers and lab availability.

: The network in the school is not reliable. It stops for quite a while.

: When we need help we cannot find it, Technicians are not there.

Table 5.17 Technology allocation –required change- (principals –Interviews)

	N	%
1: Better support	1	8.3%
2: See a good network my school linked with other schools	3	25.0%
3: We need a better network and computers in classes	7	58.3%
4: Have internet in school	1	8.3%

PIN1: What changes would you like to see made in your school with regard to how technology is allocated or structured?
: The school should have a better communication infrastructure. This gives us a better chance to use the Internet. Also we need more computers and a variety of software.

In order to interpret the relative magnitude of the percentages for the hardware related items, these should be compared with the percentages for the other items in the list, which included problems relating to software, instruction, and the Internet/www.

Software

The second main area of ICT infrastructure in schools dealt with software. The two main categories of software distinguished for the researcher were (i) general purpose software and (ii) school subject-specific software. The importance of this distinction was documented by Pelgrum and Schipper (1993), who showed that the integration of computers in the school curriculum was associated with the availability of subject-specific educational tool software. In other words, the more educational tool software available, the more computer use was integrated into the learning of subjects. However, the extent to which general purpose programs was available was shown to be associated with an emphasis on an informatics type of curriculum.

In order to determine which types of software were available in schools, the Principals' questionnaire respondents were asked to indicate which software items was available in schools (see Appendix A- Q:B16). Table 5.18 on the next page presents summative data drawn from answers to this question. From an inspection of this table it is seen that a high percentage of high schools (72%) possessed the type of software that was of a skills based informatics nature, while a very low percentage (36%) of the sampled high schools had software that encouraged the integration of ICT into the school curriculum. Interviewed principals were of a similar opinion as 58.3% of them when interviewed indicated (Table 5.19 on the next page) that was in the form of an "IT" course that confirms the availability of an informatics type of curriculum rather than technology integrated into the course material curriculum (Appendix A- Interviews Q: J2).

Table 5.18 Available Software for teaching and learning

	N	P%	S. D
B16_1: Word processing, desktop publishing	12	100%	.000
B16_2: Spreadsheet	12	100%	.000
B16_3: Database	12	67%	.492
B16_4: Graphics: presentation, no professional drawing	12	00%	.000
B16_5: Statistical, mathematical programs	12	42%	.515
B16_6: Programming Languages	12	75%	.452
B16_7: Tutorial programs (for self learning)	12	17%	.389
B16_8: Educational games	12	42%	.515
B16_9: Recreational games/other games	12	83%	.389
B16_10: For exam/tests/constructing tests/administrating tests	12	00%	.000
B16_11: Internet browser	12	92%	.289
B16_12: E-mail software	12	92%	.289
B16_13: Encyclopedia on CD-ROM	12	100%	.000
B16_14: Presentation software (e.g. PowerPoint)	12	92%	.289
Skills based informatics		72%	
Integrated Informatics		36%	

Table 5.19 Level of ICT incorporated in the curriculum (Principals -Interviews)

	N	%
1: It is an IT course	7	58.3%
2: It is a computer literacy course	2	16.7%
3: It is given as a separate computer course	3	25.0%
4: Students use technology in getting information	1	8.3%
5: General level	1	8.3%
6: Subject level	1	8.3%

Perceived Obstacles with Regard to Software

The majority of respondents (principals and teachers) agreed that the two main software related obstacles that were preventing the realization of the schools' computer-related goals for students was 'not enough copies of software for instructional purposes' and not enough types of software (see table 5.20).

Table 5.20 Encountered obstacles (software) (%)

	Principals				Teachers		
	N	P%	S. D		N	P%	S. D
G1_B: Software	**12**	**100**	**.000**		**118**	**100**	**.000**
G1_B1: Not enough copies of software for instructional purposes	12	100	.000		118	100	.000
G1_B2: Not enough types (variety) of software	12	100	.000		118	100	.000

3. Attitudes and policies related to staff Development

This section covers a description of indicators on staff development. The question of whether schools have adopted objectives with regard to staff development is addressed, as is the question of the extent to which facilities for training teachers are available inside and/or outside the school. Other questions deal with the perceived problems and priorities of high schools in the area of ICT-related staff development.

Introduction

An important (and maybe, *the* crucial) factor determining the extent to which technological innovations are adopted and implemented in educational practice is the teacher. The training of teachers (and the regular update of their knowledge and ICT related skills) is hypothesized to be especially important for the integration of technology in daily educational practice (Becta, 2000). In order to describe the situation in 2006, this section presents a number of indicators of staff development. First, the following question is addressed: to what extent did school principals and teachers experience the level of qualification in ICT as problematic? This section is followed by a description of the practices that schools undertook to train teachers in ICT. Finally the ratings that the teachers' questionnaire respondents gave of their own ICT-related skills are presented.

Problems with regard to staff Qualifications

Table 5.21 shows that a substantial group of school principals in many schools and teachers in those schools *saw* 'teachers' lack of training opportunities' as a major obstacle. Lack of knowledge was also an important problem in a considerable number of schools. Also insufficient time was prevalent in the result as all agreed on this aspect. The results from the Principals survey triangulated positively with that of the teachers (for the full list see Appendix A, Teachers and Principals survey, Q: G1).

Table 5.21 Problems regarding staff development in (%)

	Principals				**Teachers**		
	N	**P%**	**S. D**		**N**	**P%**	**S. D**
G1_C1: Insufficient time for teachers to prepare lessons in which computers are used	12	100%	.000		118	100%	.000
G1_D2: No time in the school schedule for using the Internet/www	12	100%	.000		118	100%	.000
G1_E5: Not enough training opportunities for teachers	12	100%	.000		118	100%	.000

P= percentage/100

Policies with regard to Staff Development

Staff development is an expensive activity, and it was therefore reasonable to expect that schools would set priorities with regard to training all (or at least some) staff members. The researcher was also interested in finding out how (for example, basic courses, regular updates, and so on) and to what extent schools had achieved these training goals.

The majority of principals (83%) and a similar majority of teachers confirmed that the use of ICT for educational purposes was a policy goal (table 5.22); Nevertheless the realization of this goal has been low as indicated by a low Pearson correlation rate of (.529) (see Table D1/PTC7.(Appendix D).

Table 5.22 Goals and the realization of Teachers Training

	Policy Goals							**Realization**						
	Principals				**Teachers**			**Principals**				**Teachers**		
	N	**P%**	**S. D**		**N**	**P%**	**S. D**	**N**	**Mean**	**S. D**		**N**	**Mean**	**S. D**
C7_C1: Provision of training for all teachers in using ICT for educational purposes	12	83%	.389		118	83%	.377	12	1.58	.515		118	1.63	.486
C7_C2: Provision of training for one or a couple of teachers to become an ICT -specialist of computers	12	100%	.000		118	98%	.130	12	1.08	.289		117	1.12	.326

P= percentage/100

Further information was solicited from school principals regarding the extent to which training was obligatory and if a substantial number of teachers had actually taken at least two courses in ICT. The questionnaire item addressing these issues is referenced in Appendix A-PS- Q: F1-F4.Table 5.23 on the next page shows respectively the percentages of public high schools whose principals answered questions F1/F3 and F2/F4 affirmatively. The percentages for the items Q: F3/4 of the question were not dependent on Q: F1/2, because it was assumed that Q: F3/4 could occur in the absence of obligatory prescriptions.

For *high schools*, it appears that the majority of principals (83%) agreed that as a policy statement teachers were asked to attend at least two basic courses. Nevertheless 17% of the principals indicated that teachers where not obliged to regularly update their ICT knowledge. It is quite interesting to note that on the average the schools where a substantial number of teachers that had attended basic ICT courses were moderate (Pearson correlation coefficient of 0.728) and whereas although it was not obligatory for teachers to go for an update a negative Pearson correlation shows that they did (Pearson= -.255) (see Appendix E, E4).

Table 5.23 Percentage of schools indicating taking computer courses & upgrades as a school goal & its rate of realization

	N	Min	Max	Mean	S. D
F1: Is it obligatory for all grades teachers to take at least two basic computer courses?	12	0	1	.83	.389
F2: Is it obligatory for all grades teachers to regularly take courses to update their ICT knowledge and skills?	12	0	1	.17	.389
F3: What is the number of teachers that attended at least two computers courses the past two academic years?	12	5	35	22.08	8.649
F4: What is the number of teachers regularly taking courses to update their ICT knowledge and skills the past two academic years?	12	5	35	16.00	9.155

The above results show that teachers agree with the principals (table 5.21 page112) on the insufficient number of courses being given to the teachers. (Appendix A TS1-Q: M4) Also when interviewed teachers indicated the presence of three important barriers (Appendix A TSI-Q: M4) with high scores, namely time constraint, limited opportunities and the lack of in-house training (Appendix D5/TM3) & (table 5.24).

Table 5.24 Barriers encountered in receiving training (teachers-interviews)

Barriers	N	%
1: Limited places	15	12.7
2: Principals support	1	.8
3: Time constraint	39	33.1
4: Policy leadership	1	.8
5: Lack of in-house training	14	11.9
6: Should be given in school vacations	1	.8

D5/Tm3: What barriers have you encountered in terms of getting the technology training you want or need?
: We have so much work to do , no time to take ICT courses and anyway there are so many of us waiting to take a course. With the schools limited budget only a few can
: If we had training in school and not outside school then maybe we have a better chance to train.

Methods of Transferring ICT-related Knowledge (E) technologies

It is known from innovation theories (Rogers, 1995; Fullan &Smith, 1999; Krasnicki, 2000) that continuous staff development is an important prerequisite for sustained implementation of change. Therefore, it seemed relevant to investigate to what extent schools had set up mechanisms for facilitating the transfer of ICT-related knowledge among teachers in the schools. Transfer may, for example, occur via working groups, the computer coordinator, newsletters, a cascade approach (trained teachers who further disseminate information within the school) and courses within the school. Alternatively, it may be left to individual initiatives within the school's informal communication network. Table 5.25 lists the percentages of school principals who indicated that each of these arrangements existed. From these tables it appears that the majority, (87%) indicated that the most prevalent arrangements involved informal contacts and courses run by external agencies (93%).

Table 5.25 The degree of transfer of ICT knowledge among teachers

	1.Via informal contacts/communication	2.Vis schools ICT working group	3. Regular item on staff meetings	4. Via a regular news letter	5. Teacher repeats external course	6. Courses by an external agency	7. Via in-school courses	8. Via computer coordinator	9. No organized structure
schools	87%	1%	8%	0%	28%	93%	8%	9%	4%

Availability of ICT Training Courses

The availability of training courses is a crucial condition for raising the ICT qualifications of staff. Therefore, a question about this topic was included in the Teachers survey (Appendix A- Q: F2). This question covered the availability of basic and advanced training courses conducted internally or externally to the schools.

The results in table 5.26 on the next page shows that with regard to the in-house training facilities, the percentages were nil as schools are not equipped to run such courses internally neither hardware wise nor the availability of technical competency to do so. In relation to the external courses, it was observed that the availability was for courses relating to basic computer-handling skills and the use of basic applications (word-processing, spreadsheets, and databases). Another finding of relevance was that relatively small groups of the Teachers surveyed (14%) indicated that external courses were available that dealt with the didactical/pedagogical principles of computer use and with subject-specific training. The availability of such courses may be hypothesized as an important factor affecting the use of ICT in daily classroom practices.

Table 5.26 available training courses

	N	Internal	External
F2_1: General introductory course (how to use a computer, principles of soft- and hardware, functions of mouse, printer)	118	0 (0.0)	118 (100.0)
F2_2: General introductory course (history of ICT, relevance, consequences of computer use, etc.)	118	0 (0.0)	118 (100.0)
F2_3: Introductory course for applications/standard tools (basic word-processing, spreadsheet, databases, etc.)	118	0 (0.0)	118 (100.0)
f2_4: Introductory course for Internet use (retrieve information send/receive emails etc.)	99	0 (0.0)	99 (100.0)
F2_5: Introductory technical course for operating and maintaining computer systems	110	0 (0.0)	110 (100.0)
F2_6: Advanced course for applications/standard tools (e.g. Advanced word-processing, complex relational databases).	10	0 (0.0)	10 (100.0)
F2_7: Advanced course for Internet use (e.g. Creating websites develop a home page, advanced use of Internet, video conferencing).	0	0 (0.0)	0 (0.0)
F2_8: Advanced technical course for operating and maintaining computers systems (e.g. Networks, special equipment)	0	0 (0.0)	0 (0.0)
F2_9: General course about didactical/pedagogical principles of computer use	14	0 (0.0)	14 (100.0)
F2_10: Subject specific training (with subject-specific learning software, e.g. Tutorials or drill and practice software)	10	0 (0.0)	10 (100.0)
F2_11: Programming course, where teachers can learn how to create their own software (also with author ware)	0	0 (0.0)	0 (0.0)
F2_12: Special course with digital video- and audio-equipment	9	1 (11.1)	8 (88.9)

Teachers' self ratings

Question I2 and F3 in the teachers technology survey linked directly to the theoretical framework adopted by Rogers (1995) in his work about the diffusion of innovations. This question was a crucial one in that it provided a picture of the teaching staff's level of integration of ICT into their teaching and learning. Question 12 asked the respondents to indicate the number of years which they had integrated ICT into their own teaching and learning practices and it was found that on average teachers used ICT for 3.5 years (AppendixD-D1/T12). Question F3 asked the respondents to rate the degree to which they had integrated ICT into their own teaching and learning practices. The questionnaire was divided into four main areas namely:

a- general area that included the software and operating systems packages;

b- Use of ICT for instructional processes;

c- Use of e-mail and the Internet for educational purposes and d- The use of presentation software. The rating is depicted in a percentage representation of an activity out of a scale of 100. This scale is divided into four parts. 1-25= very low; 26-50= low; 51-75=medium and 76-100= high.

Table 5.27 contains the percentages of teachers who answered each item affirmatively. Some general observations can be made on the basis of the data in these tables.

Table 5.27 Teacher Readiness indicators supporting ICT activities in their school

	N	P%	S. D
F3_A: General	**115**	**59%**	**.198**
F3_A1: MS-Windows	118	99%	.092
F3_A2: MacOs	118	01%	.092
F3_A3: MS-DOS	117	34%	.476
F3_A4: Word Processing	116	100%	.000
F3_A5: Databases	118	60%	.492
F3_A6: Spreadsheets	118	59%	.493
F3_B: Instructional Processes	**115**	**21%**	**.153**
F3_B1: Subject specific applications	118	23%	.422
F3_B2: Application of student progress tracking software	118	23%	.422
F3_B3: Didactical and organizational integration of computers in subjects	118	25%	.437
F3_B4: The use of specific programs for subjects	118	13%	.335
F3_B5: Evaluation and selection of instructional software	118	00%	.000
F3_B6: User of computers for individualized learning programs	116	00%	.000
F3_B7: The use of multimedia application	118	74%	.442
F3_B8: Adaptation of software to fit school purposes	117	09%	.281
F3_C: E-mail, Internet, WWW	**118**	**66%**	**.379**
F3_C1: The use of e-mail for educational purposes	118	49%	.502
F3_C2: The use of the Internet/WWW for educational purposes	118	82%	.384
F3_D: Presentation	**118**	**98%**	**.130**
F3_D1: The user of software for making presentations	118	98%	.130

P= percentage/100

Overall, it seems that the highest self-assessment of adequacy of preparation went for Ms Windows, word-processing, the use of Internet and presentation software. It is not surprising to find that these self assessments were low for the Mac operating system because the majority of schools did not use these operating systems. As indicated in table 5.27, although a moderate number of teachers indicated their readiness to use e-mail and the internet (49% & 82%). Nevertheless only 12% & 49% used e-mail & the internet for instructional purposes (see table 5.6 p. 102).

Grouping of areas of work in support of ICT revealed three clear dimensions in the self-ratings, namely a group containing the general topics (items F3-A) (exclusive item A2, Mac-OS, which was answered with 'no' by most respondents), a factor related to the instructionally related topics (items F3-B from the above list; exclusive of items B5 & B6 which was answered by no by most respondents) and usage of e-mail and Internet for educational purposes.

A first observation from this table is that 59% rated themselves in the middle range (medium) for the general category (or alternatively more technical) ICT-related activities. This percentage was much higher than for the instructionally related activities where 21% rated themselves in the low and 66% rated themselves in the middle range for e-mail and internet. These results correlate positively with results from principals survey (as referred to in the section on software, page 111) were results indicated skills based informatics type of curriculum rather than an instructional type of curriculum prevailing in high schools in the UAE. One would presume that there would be significance between the teacher's major, age, years spent as a teacher using ICT and the row items in table 5.27 in the previous page. A chi-square greater than >0.05 proved no association existed with the exception of a possible association of age and use of e-mail, www and presentation software as chi-square was less than <0.05. Also an association was there between the years spent being a teachers using ICT and skills readiness (chi-square less than <0.05).

4. Management and organization (Attitudes, beliefs, policies and vision of school principals).

i- Attitudes

School principals, because of their position in schools, can be important agents of change. With this in mind, and as observed in the previous section, principals' attitudes toward computers can play an important role in the successful implementation of ICT in education (Pelgrum & Plomp, 1993). The researcher therefore considered it important to revisit principals' attitudes toward the use of computers in high schools in the UAE. Thinking that age might have a bearing on attitude, a chi-square test was passed that refuted this assumption as the result was greater than >0.05. The attitude scale comprise of 19 items, nevertheless in-order to make the analysis more indicative the outcomes were clustered into sub-scales (see Table 5.28 on the next page). Four sub-scales and five singletons (single-item scales that are listed under other. These subscales were formulated referenced similar scales in survey done by Brummelhuis, A. C. A. ten, 1998b and Visscher, A. J. et al, 1999). The sub scales are:

1. The impact of ICT on achievement (four items: questions E1-E11-E13-E17); (EA)
2. The relevance of Internet (five items: questions E2-E3-E4-E6-E14); (EB)
3. The contribution of ICT to life-long learning (five items: questions E5-E7-E8-E9-E15); (EC)
4. The impact of ICT on school management (single item: E10) (ED); the importance of in-service training courses on computers (single item: question E12); (ED); the importance of all teachers acquiring ICT certification (single item: question E16). (ED); Government impact on ICT implementation (single item: question E18). (ED) & Media impact on use of ICT (single item: question E19). (ED).

The results for the entire attitude scale reflect the results on the four sub-scales for all schools. The internal consistency coefficient ‘Cronbach’s alpha’ showed that the psychometric quality of the four sub-scales as well as of the complete scale was satisfactory for three sub-scales (B, C &D) and unsatisfactory for sub-scale A for the UAE (with a negative result) therefore it should be removed arriving at result that the remaining subscales as well as the complete scale was satisfactory (Appendix E, E1). The reliability coefficients of the three sub-scales varied between .61 and .89. The high average Mean for the whole attitude scale for principals and teachers is indicative of a positive attitude the usage of ICT in their schools.

The results in this section matches with the results from the Principals and teachers interviews, where the majority of the principals (66.7%) indicated that ICT is a formal part of the schools educational mission since it constitutes part of the educational policy requirement (Appendix D-Q: J1-2-1). Also when asked what are the areas were they think technology is important to their school, more than 50% of the principals were of the opinion that technology widens the scope of students and prepares them for the workplace and gives the school a modern look (Appendix D Part J3).

Tables 5.28 Attitudes results

	Principals				Teachers		
The role of computers and other Information and Communication Technologies	N	Mean	S. D		N	Mean	S. D
A: The Impact of ICT on achievement:	**12**	**3.88**	**.199**		**115**	**3.98**	**.252**
E1: Students are more attentive when computers are used in class	12	4.50	.522		118	4.38	.488
E11: Computers help to teach more effectively.	12	3.75	.452		116	3.83	.498
E13: The achievement of students can be increased when using computers for teaching.	12	3.75	.452		117	3.88	.528
E17: Using computers in class leads to more productivity of students	12	3.50	.674		118	3.81	.691
B: The Relevance of Internet:	**12**	**3.85**	**.363**		**118**	**4.03**	**.341**
E2: Every school should have access to the Internet/WWW	12	4.50	.674		118	4.38	.639
E3: Every student should learn about e-mail	12	4.00	.426		118	4.17	.559
E4: Internet /WWW offer excellent opportunities for educational applications.	12	4.33	.651		118	4.47	.550
E6: All teachers should have their own e-mail address	12	3.42	.515		118	3.74	.576
E14: The use of e-mail increases the motivation of students.	12	3.00	.603		118	3.41	.630
C: The contribution of ICT to life-long learning:	**12**	**3.73**	**.412**		**116**	**3.87**	**.354**
E5: ICT can effectively enhance problem solving and critical thinking skills of students.	12	4.00	.953		118	4.12	.849
E7: ICT can accommodate student's varied needs preferences and learning strategies by providing new tools for knowledge manipulation, expression and creativity	12	3.58	.515		118	3.75	.554
E8: ICT can help teachers to attune to the learning and pace of the individual student.	12	3.50	.522		117	3.70	.576
E9: ICT should be used more by teachers to create environments for students' independent learning.	12	3.50	.522		117	3.68	.641
E15: Teachers should initiate more cooperative and/or project-based learning.	12	4.08	.669		118	4.10	.576
D: Others	**12**	**3.89**			**118**	**3.38**	
E10: ICT improves the monitoring of the student's learning progress	12	3.83	.577		118	3.97	.562
E12: In-service training courses on computers should be made compulsory	12	4.00	.853		118	4.07	.770
E16: All teachers should acquire ICT certification.	12	4.25	.866		118	4.30	.732
E18: The use of ICT is a ministry of Education Requirement	12	3.83	.577		118	3.98	.599
E19: The use of ICT is an educational Trend in the UAE	12	3.58	.793		118	3.85	.700
Average attitude towards ICT in the schools	**12**	**3.84**	**.339**		**114**	**3.97**	**.261**

Explicit School Policies (Availability of a Written Statement or Policy for the high school)

ii- Beliefs

Schools can express their interest in ICT through their school policies and, as such, develop a framework for action concerning the use of computers in their institutions (Pelgrum & Plomp, 1991). Only 33% of the principals indicated that their schools had a written policy statement regarding the use of computers for educational purposes which indicates a low percentage (Appendix A-PQ: C5).

Table 5.29 on the next page shows the percentages of schools with a written ICT policy or statement. 33% of the schools had a written ICT policy on the use of computers for educational purposes. Table 5.29 on the next page also shows that these policy statements were highest in the ‘use of computers in the current school year’ and’ Plans for staff Development ‘; Followed by ‘Plans for hardware replacement’ and ‘Plans for software acquisition’. The topics that scored low were: Internet; use of computers in the forthcoming school years; specifications for computer-related tasks and persons in charge, and equity of access.

Table 5.29 Areas covered by the policy statement

	N	P%	S. D
C5_1: Use of computers in the current school year	3	100%	.000
C5_2: Use of computers in the forthcoming school years	3	00%	.000
C5_3: Plans for hardware replacement of upgrading	3	67%	.577
C5_4: Plans for staff development with regard to ICT training	3	100%	.000
C5_5: Specifications for computer- related tasks and persons in charge	3	00%	.000
C5_6: Plans for software acquisition	3	67%	.577
C5_7: Equity of access	3	33%	.577
C5_8: Internet policy	3	33%	.577
Average % regarding ICT policy		50%	

n.b. From the Four Principals who respond Yes only three answer this question

Also in order to see in which areas this policy statement was effective and being realized , school principals responded to Q:C3 & C4 (Appendix D). From the 12 listed items, two items emerged as indicative (Pearson correlation being greater than > 0.8) namely indicating that ICT helped to a great extent in realizing these goals (table 5.30).

Table 5.30 Aspects of teaching and learning (skills) present in your school and impact ICT in realizing these aspects?

	Principals				**Principals**				**Principals**
	Presence				**Realization**				**Pearson**
	N	**Mean**	**S. D**		**N**	**Mean**	**S. D**		***r***
C3_6: The emphasis I am learning is on the development of skills.	12	2.25	.452		12	2.33	.492		.816
C3_7: Students working on the same learning materials at the same pace and/or sequence.	12	1.92	.996		12	1.75	.754		.817

Among these the skills that were predominant are those that related to operating a computer and using word, spreadsheets, graphics also, internet and e-mail rated the highest while writing programs rated lowest (50%) nevertheless the average percentage on skills was high (76%) see table 5.4 p. 100.

Development of an ICT-Related Vision

iii-Vision

The use of ICT in schools to a certain extent can be coordinated by developing a common vision regarding the use of computers within schools, and by paying attention to norms and values associated with the use of Internet and the WWW. Table 6.31 shows the data relating to these two matters. Table 5.31 indicates that at least two-thirds of the schools had developed a common vision on the use of ICT as a policy goal while only 42% indicated 'Paying attention to norms and values when using the Internet/WWW was a policy goal (table 5.31); nevertheless a chi-square test showed no significance between these variables and age as the result was greater than >0.05. As far as the realization of these goals is concerned, the following picture emerges. The majority of principals indicated that the first goal was not realized as there is no correlation between policy and the realization of the goal (Pearson correlation coefficient being less than <.8 (this supports previous results were only 33% of the principals indicated that their schools had written policy goals. It is interesting to note that a negative Pearson correlation for the second item indicates that principals are actually enforcing norms on the use of internet not caring whether this norm existed as a policy goal. The results from teacher's survey matched that of the principals' for the same question groups.

Table 5.31 Vision on the use of computers and www

	Principals				**Principals**				**Principals**
	Policy Goal				**Realization**				**Pearson**
	N	**P%**	**S. D**		**N**	**Mean**	**S. D**		***r***
C7_C3: Development of a common vision on the use of computers within the school	12	75%	.452		12	1.08	.289		.174
C7_C5: Attention to norms and values in using Internet/WWW	12	42%	.515		12	1.08	.289		-.255

Regulation of Computer-Related Activities

Table 5.32 on the next page shows the outcomes for six particular measures that schools could take to regulate (to a certain degree) computer-related activities.

The targeted high schools scored high on at least 50% of the measures.

Table 5.32- Regulation of Computer-Related Activities

	N	P	S. D
C6_1: Rewards given to teachers who use ICT	12	.25	.452
C6_2: Incentives for teachers to take ICT courses or training	12	.67	.492
C6_3: Security measures to prevent unauthorized system access or entry	12	.17	.389
C6_4: The honoring of intellectual property rights	12	.67	.492
C6_5: Restricted game playing on school computers	12	.67	.492
C6_6: Specifications of compulsory student computer-related knowledge and skills	12	.17	.389

Problems Encountered in the Realization of ICT Goals

The majority of the principals indicated that most of the reported items in table 5.33 presented a major problem regarding the attainment of their schools ICT related goals. Nevertheless the level of severity was less intense for integrating computers into instructional practices and difficulty of using ICT with low achieving students

Table 5.33 Obstacles with regard to ICT at school

	N	P%	S. D
G1_C1: Insufficient time for teachers to prepare lessons in which computers are used	12	100%	.000
G1_C2: Difficult to integrate computers in classroom instruction practices	12	92%	.289
G1_C4: Problems in scheduling enough computer time for different classes	12	100%	.000
G1_D1: Difficult to use with low achieving students	12	8%	.389
G1_D2: No time in the school schedule for using the Internet/www	12	100%	.000
G1_E1: No time in teacher's schedules to explore opportunities for using the Internet/www	12	100%	.000

B. The Consequences of Appropriate use of New Technology on the Teaching Function.

1. How is the role of teachers affected by ICT?

To be able to assess how the role of teachers was affected by the introduction of ICT a number of questions were addressed to the teachers in the teacher's survey supported by other questions covered by the interviews.

Teachers were asked to answer questions relating to the impact of ICT on some aspects of teaching and learning as shown in (App.A-TS-Q: E).

The majority of the teachers indicated that four items namely C3-2, C3-9, C3-5 and C3-11(Table 5.34 on the next page) impacted the role of teachers highly and shifted it to creating environments for students' independent learning thus shifting their role from the sole source of learning to acting as a support to students. Also ICT helped teachers to teach more effectively by using many skills and the internet (table 5.27 p.118). Home works and student achievement are shifted from unary limited scope to more group work cooperative work and project based learning. ICT also improved greatly the process of monitoring student progress and thus enabling the teacher to perform better in correcting any discrepancies regarding student achievement (table 5.34).

The results attained from interviewing the teachers when asked in question J1(Appendix A) what did they think their students did with technology; their answers varied but the subjects that had relatively high prevalence were the use of Microsoft office, Web use, Logical thinking and IT skills. Also one third of the teachers when interviewed said that ICT enhanced their students thinking process, self confidence and widened their attainment scope through the use of the internet (Appendix D-D5:TJ2). This shifted the teacher's role from an instructor to a mentor sharing the knowledge process with the student.

Table 5.34-Impact of ICT on the role of teachers

	Principals		
The role of computers and other Information and Communication Technologies	**N**	**Mean**	**S. D**
C3-2: ICT should be used more by teachers to create environments for students' independent learning.	117	3.68	.640
C3-3: ICT improves the monitoring of the student's learning progress	118	3.97	.620
C3-5: Computers help to teach more effectively.	116	3.88	.498
C3-11: Teachers should initiate more cooperative and/or project-based learning.	116	4.00	.669

2. How is the planning of teaching affected/ (Assessment of learning)?

As shown in table 5.35, on average 74% of the teachers indicated that their students' should use the ICT skills listed in the table. This means that the teachers' planning of teaching is affected in that the teacher's plan teaching the subject matter differently as they would have to include ICT skills in course attainment and they tend to use the internet and e-mail.

Table 5.35- Skills to be included by teachers in planning of teaching?

C4: Skills Students should acquire by the end of the grade.	**N**	**P%**	**S. D**
C4_1: Operating a computer (saving files, printing, keyboarding)	118	1005	.000
C4_2: Writing documents with a word processor (typing, editing, layout)	118	100%	.000
C4_3: Making illustrations with graphical programs	118	53%	.501
C4_4; Calculating with spreadsheets programs (sheet creation, using formulas).	118	61%	.490
C4_5: Writing simple programs	118	41%	.493
C4_6: Communicating via e-mail with teachers and other students	118	81%	.391
C4_7: Sending, searching for, and using electronic forms of information	118	83%	.377
Average	**118**	**74%**	**.172**

This result is further researched when teachers were asked how their planning of teaching is affected categorized into two subgroups: Learning process and communication/collaboration. As a policy, 51% of the teachers have the intention of using computers in their instructional practice and the majority of teachers expect their students to use ICT as supportive learning aids. 41% of the teachers expect their students to use e-mail and 83% of the teachers expect their students to use the Internet (see table 5.37). A low Pearson correlation of less than <0.8 ascertains that although policy and intention was there nevertheless change was very slow, indicating the goals were not realized by ICT. These results are coupled by other views from the teachers' survey namely as a high majority agreed that the role of ICT in pedagogy indicates the necessity for teachers to shift to using www, enhance problem solving skill in teaching and students their own pace in learning (tables 5.36 & 5.37).

Table 5.36-Impact of ICT on immediate planning of teaching/Learning process and communication

	Teachers			**Teachers**			**Teachers**
	Policy Goals			**Realized**			**Pearson**
	N	**P%**	**S. D**	**N**	**Mean**	**S. D**	***r***
C7_A: Learning process							
C7_A2: Teachers use computers in their instructional practice.	118	51%	.502	114	1.31	.463	.350
C7_A4: Students using computers as supportive learning aids	118	100%	.000	118	1.98	.599	.(a)
C7_B: Communication/collaboration							
C7_B2: Students use e-mail	118	41%	.493	115	1.09	.283	.239
C7_B3: Students access external databases via the Internet/WWW	118	83%	.377	118	1.66	.630	.476
Average		68.75%					

Table 5.37 Impact of ICT on pedagogy

	Teachers		
The role of computers and other Information and Communication Technologies	**N**	**Mean**	**S. D**
E4: Internet /WWW offer excellent opportunities for educational applications.	118	4.47	.550
E5: ICT can effectively enhance problem solving and critical thinking skills of students.	118	4.12	.849
E6: All teachers should have their own e-mail address	118	3.74	.576
E8: ICT can help teachers to attune to the learning and pace of the individual student.	117	3.70	.576
Average	**118**	**4**	**.638**

If ICT is to change the way teachers plan their courses and assess learning, one should revisit the skills of teachers to see if they are conversant with the appropriate skills. It is evident from the results (table-5.27 p.118) that the majority knew how to use presentation software, on the average 59% said that they have general knowledge of ICT related skills, and 66% know how to use email and www for instructional purposes, nevertheless teachers were low on instructional processes. Also teachers indicated some obstacles related to the same subject matter namely 96% of the teachers agreed that they have numerous obstacles regarding using ICT in instruction especially availing computers to different classes; 92% said they had no time to use the internet and more than 50% had issues related to resources, training and lack of skills .All of these aspects will affect the teachers planning of teaching negatively see (table 5.38).

Table 5.38- Major obstacles affecting the realization of your school's computer-related goals for students

	N	P%	S. D
G1_C: Instruction	**118**	**96**	**.094**
G1_C1: Insufficient time for teachers to prepare lessons in which computers are used	118	100	.000
G1_C2: Difficult to integrate computers in classroom instruction practices	118	92	.280
G1_C3:Not enough staff for supervising computer using students	118	92	.280
G1_C4: Problems in scheduling enough computer time for different classes	118	100	.000
G1_D: Internet/WWW/ :No time in the school schedule for using the Internet/www	**118**	100	.000
	N	**P%**	**S. D**
G1_E: Other	**116**	**.4**	**.195**
G1_E1: No time in teacher's schedules to explore opportunities for using the Internet/www	118	100	.000
G1_E2: Not enough space to locate computers appropriately	116	41	.493
G1_E4: Teachers lack knowledge of / skills in using computers for instructional purposes	118	42	.495
G1_E5: Not enough training opportunities for teachers	118	100	.000

When asked in the teachers interview (Appendix-D5/TM1) as to what changes teachers would like to see made in their school regarding the allocation and structuring of technology, a high majority indicated that there is a need for full time technical support; this result matches with the teachers answers from the survey questionnaire under Part D: ICT support and needs (see Appendix A) were teachers indicated that they spend on an average 20 hours a week for computer coordination. This time spent affects the teachers time given for planning of teaching and the quality of output as the teachers skills are limited and far below that of a specialized technical support coordinator. Two other barriers are added to these views, namely the majority of the teachers indicated that limited training opportunities and the scarcity of time for preparing ICT assisted lessons (Appendix D-D1/PTG1).

It was indicated earlier (table 5.26 p.117) that the kind of workshops available to teachers was an introductory skills nature and this was confirmed when asked in the interview (Appendix D-D5/TM4) about what has been the most useful technical workshop they had attended; more than one third of the teachers indicated it was Microsoft office suite and the other third indicated it was web applications. It is interesting to note that only 28% attended web application workshops and that none of the other workshops covered issues pertaining to the evolution of instructional practices adding to the belief that ICT was issued as additional enhancing skills.

3. How is the teacher student role affected?

In order to assess the degree to which the teacher student role is affected by the application of ICT teachers were interviewed and also classes were observed.

As a result of the interviews to question number J2 (Appendix A) as to what does technology allows students to do now that they would have been impossible before ICT was widely available in their schools. More than one third of the teachers said that it allowed their students to increase their attainment scope by using the internet and enhanced their self confidence and thinking process (Appendix D-D5/TJ2).

From the results of the classroom observation it was seen that although the average Mean of the degree of curriculum differentiation was high (4.2/5) .It is worth noting that it was very high regarding same content, learning activity and learning material given to the student (Mean >4.5) . This indicates a traditional way of teaching while the degree of individualization was lower (see table 5.39).

Table 5.39- Degree of curriculum differentiation

N: Degree of Curriculum differentiation	N	Min	Max	Mean	S. D
N_1: The same content for all pupils	24	4	5	4.50	.511
N_2: The same learning activity for all pupils	24	4	5	4.50	.511
N_3: The same learning material for all pupils	24	4	5	4.67	.482
N_4: Degree of individualization in class	24	4	4	4.00	.000
N_5: Remedial activity	24	2	5	4.29	.859
N_6: Higher level activity	24	2	4	3.33	.963

The research results indicate that computers are only available in labs and not in classrooms, on the average 44 computers were available for use of which 23 computers had new versions of operating systems (table 5.40).

Table 5.40-Computer listings and technical level

	N	Min	Max	Mean	S. D
B4: List the number of fixed computers used by 10, 11 and 12 grades students for educational use in different computer rooms (Labs)?	12	25	60	44.58	12.515
B6: How many computers listed in questions B4 are available to use by grades 10, 11 and 12 students use Latest version of windows XP?	12	10	30	22.83	8.419

The results of the class observation indicated that the majority used word processing/Spreadsheets /Games/internet browser /e-mail and encyclopedia, power point, educational Games and statistical programs. Usage was nil regarding subject specific software, drill and practice programs and tutorial programs and simulation (Appendix D-D3IP). These results were in synchronization with the answers from the principal's survey (table 5.18 p.112) where more than two thirds of the principals emphasized a skills based informatics. It was observed that although pupils were clustered in small groups which enhanced student collaboration nevertheless teachers made a big effort in walking around the classroom and coaching pupils. Medium averages presented in tables 6.41 and 6.42 showed that teachers tried to help students in their problem solving areas as well as showing a high ability in managing the classroom. Also our observation showed that the pedagogy environment is more teacher centered averaging a Mean of 3.92 than pupil centered averaging a mean=3.11 .Still the gap is not vast and can be tilted to the pupil centered setup thus becoming ICT prevalent in a course oriented manner (table 5.42).

Table 5.41- Coaching of and feedback to pupils working with ICT

S:	N	Min	Max	Mean	S. D
S_A: Coaching of and feedback to pupils working with ICT	**23**	**4**	**4**	**3.96**	**.179**
S_A1: The teacher walks around the classroom and coaches pupils	24	4	5	4.67	.482
S_A2: The teacher divides time about equally over small groups	24	3	5	3.83	.702
S_A3: The teachers helps pupils by referring to ways to solve problems	24	4	4	4.00	.000
S_A4: Teacher asks questions to help solve problems	23	3	4	3.30	.470
S_B: Classroom Management	**24**	**4**	**5**	**4.08**	**.177**
S_B1: Clarity on communication rules for pupils	24	4	4	4.00	.000
S_B2: Clarity on desired pupil behavior	24	4	5	4.21	.415
S_B3: Shows in own behavior that (s) he knows what pupils do.	24	4	5	4.04	.204

Table 5.42- Degree of pupil Centeredness

Degree of pupil Centeredness	N	Min	Max	Mean	S. D
T_A: Teacher centered	**23**	**4**	**5**	**3.92**	**.332**
T_A1: Teacher Transmits Knowledge	24	4	4	4.00	.000
T_A2: Teacher as a lecturer	24	4	4	4.00	.000
T_A3: Teacher in control	24	4	5	4.13	.338
TA_4: Focus on whole class teaching	23	2	5	3.57	1.121
T_B: Pupil centered	**24**	**3**	**4**	**3.11**	**.478**
T_B1: Pupil construct knowledge	24	2	4	2.96	.908
T_B2: Teacher as a coach	24	4	5	4.21	.415
T_B3: Pupils in control	24	2	3	2.04	.204
T_B4: Focus on collaborative learning	24	2	4	3.25	.944

5.2 Research Question Two: results "Impact of ICT on Learning"

a- Student Technology Literacy level

In response to the students' survey (Appendix A- SB1), 72.7% of the students said that their knowledge level of computer use is at the intermediate level whereas a small group (15.8%) is in the advanced category (table 5.43).

Also in response to the question asked on the number of hours students spent per week on the computer (Appendix A Q:SB2) it was reported that on the average students spend 11.9 hours which amounts to 2.4 hours per day on an average of five days a week (table 5.44). Results to question B3 show that out of this time only 52 minutes per day is spent on school related work which is rather low (see table 5.44).

Table 5.43 Level of computer use.

	Frequency	Percent
Beginner	51	11.5
Intermediate	322	72.7
Advanced	70	15.8
Total	443	100.0

Table 5.44 Computer usage by students

	N	Min	Max	Mean	S. D
B2: Approximately how many hours a week do you spend on the computer?	440	0	55	11.82	9.391
B3: Of the time you spend on the computer, approximately how much is for school-related work?	433	0	30	4.21	3.401

Table 5.45 shows that on the average students reported taking 7 academic classes, non have web sites and on the average "IT" is used as part of the curriculum in one class and as a support to the curriculum in two classes which is quite low meaning 28% of the academic classes.

Table 5.45 Student ICT Usage

	N	Min	Max	Mean	S. D
B4: How many academic classes are you currently taking?	442	0	13	6.61	1.679
B4_1: how many have a class website.	324	0	6	.51	1.220
B4_2: how many use "IT" as part of the curriculum.	419	0	9	1.11	1.309
B4_3: how many use "IT" as a support to the curriculum.	420	0	10	1.99	1.569

b- Are students Motivated /Empowered by ICT?

Table 5.46 on the next page shows that the majority of the students were happy to use more technology in the classroom; nevertheless 22.6% expressed fear of using

ICT and this is high percentage for high school students (as they are terminal students).

Table 5.46 The feeling of students concerning the integration of ICT in his classroom.

		Frequency	Percent
Valid	Sad	11	2.5
	Concerned	100	22.6
	Happy	330	74.5
	Total	441	99.5
Missing	System	2	.5
Total		443	100.0

Also the majority of students (72%) (Appendix A-Q: SB6) said that teachers often use technology in the classroom while 95% (Appendix A-Q: SB7) of the students felt that the usage of technology makes lessons more interesting. It is interesting to note that students when asked about the benefits of using the computer and internet at school scored higher on the attitudes questions than on the skills questions (see shaded areas in table 5.47/items B13-B1 & B13-9&10).

Table 5.47 Benefits of Technology

		Never	**Sometimes**	**Usually**	**Always**		
	N	**N (%)**	**N (%)**	**N (%)**	**N (%)**	**Mean**	**S. D**
B13_1: Helps me get more work completed	439	36 (8.2)	63 (14.4)	220 (50.1)	120 (27.3)	2.97	.863
B13_2: Helps me work faster	436	24 (5.5)	56 (12.8)	261 (59.9)	95 (21.8)	2.98	.753
B13_3: Improves my writing skills	432	21 (4.9)	62 (14.4)	249 (57.6)	100 (23.1)	2.99	.755
B13_4: Allows me to learn things not possible without technology	431	22 (5.1)	71 (16.5)	236 (54.8)	102 (23.7)	2.97	.779
B13_5: Helps me get better grades	431	38 (8.8)	179 (41.5)	127 (29.5)	87 (20.2)	2.61	.905
B13_6: Helps me do better on tests	430	51 (11.9)	202 (47.0)	124 (28.8)	53 (12.3)	2.42	.853
B13_7: Allows me to share my work with others	430	32 (7.4)	63 (14.7)	222 (51.6)	113 (26.3)	2.97	.841
B13_8: Makes school more interesting	431	26 (6.0)	37 (8.6)	211 (49.0)	157 (36.4)	3.16	.817
B13_9: Helps me feel more confident	430	34 (7.9)	36 (8.4)	208 (48.4)	152 (35.3)	3.11	.862
B13_10: motivated me to learn differently	429	26 (6.1)	49 (11.4)	211 (49.2)	143 (33.3)	3.10	.826
B13_11: Enables me to work at any place	430	20 (4.7)	146 (34.0)	120 (27.9)	144 (33.5)	2.90	.924

c- What is the specific learning achieved

The majority of the students (more than 75%; Appendix A-Q:SB5) said that they use computers at school for preparing class presentations, writing reports and home works and browsing the web (table 5.48). While in the non-school activities more than 50% of the students indicated using computers to email friends (table 5.49 on the next page).

Table 5.48 The school-related activities for which you use the computer at school**.**

	N	P	S. D
B9_1: writing reports	443	.86	.343
B9_2: Research purposes	443	.77	.424
B9_3: checking assignments	443	.30	.457
B9_4: e-mailing teachers	443	.32	.467
B9_5: Preparing homework	443	.84	.363
B9_6: Preparing presentations for class	442	.88	.328
B9_7: Browsing the web	442	.65	.478

Table 5.49 The non school-related activities for which you use the computer.

	N	P	S. D
B10_1: e-mailing friends	442	.54	.499
B10_2:using chat rooms	442	.37	.483
B10_3: checking movie times	441	.39	.488
B10_4: checking news	442	.47	.499

Also results in (table 5.50) indicates that more than 62% of the students have access to computers at school (Mean =2.5/4) and usually use word processing programs, 50% use the internet and 55% use spreadsheets and database programs. Their email use at school was low (Mean=1.8).

When asked what they liked best about Technology, percentages were low as there was no clear consensus about clustering the items nevertheless the highest score went to easy access to information using email and www. It was encouraging to see that 14.9% of the students believed that technology enhances their thinking power rating much higher than skills improvement (9%) (table 5.51).

Table 5.50 Access to Technology

		Never	Sometimes	Usually	Always		
	N	**N (%)**	**N (%)**	**N (%)**	**N (%)**	**Mean**	**S. D**
B11_1: … a computer at school	443	43 (9.7)	221 (49.9)	92 (20.8)	87 (19.6)	2.50	.916
B11_2: … The Internet at school for assignments and projects	443	178 (40.2)	117 (26.4)	119 (26.9)	29 (6.5)	2.00	.967
B11_3: … Word processing programs like MS-Word	443	34 (7.7)	201 (45.4)	86 (19.4)	122 (27.5)	2.67	.963
B11_4: … Graphic programs like MS-PowerPoint	443	37 (8.4)	212 (47.9)	121 (27.3)	73 (16.5)	2.52	.865
B11_5: … E-mail at school	433	198 (45.7)	139 (32.1)	79 (18.2)	17 (3.9)	1.80	.872
B11_6: …Spreadsheet or database programs like Excel	432	84 (19.4)	249 (57.6)	64 (14.8)	35 (8.1)	2.12	.809

Table 5.51 students' preferences about Technology

		Frequency	Percent
Valid	1: Improves my ability to solve home works and makes my task interesting.	58	13.1
	2: Eases access to information using e-mail and WWW.	124	30.0
	3: Improves my skills.	24	0.9
	4: Enhances my ability to perform collectively.	17	3.8
	5: Enhances my thinking power.	66	14.9
	6: Enhances my learning process thru using software and other techniques.	30	6.8
	7: Ameliorates the quality of learning.	57	12.9
	Total	376	84.9
Missing	System	67	15.1
Total		443	100.0

d- Relationship of students to Learning?

The results of my research indicated that students are motivated. More than 50% said ICT helps them feel more confident and motivates them to learn differently, 95% of the students agreed that ICT makes their lessons more interesting, 80% indicated that ICT enhances their performance and the majority agreed that ICT leads to more integrated and assimilated learning (App. D-D2/SB13-4). Also more than 50% of the students said that ICT helps them develop research spirit and the majority agreed that it allows them to share their work with others (see tables 5.47 p. 130 and 5.50 p. 132).

5.3 Interpretation and Analysis Research Question One: Impact of ICT on Teaching

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Introduction

This section will attempt to draw together the results presented in the previous section in order to provide an overall profile of the teaching staff at Schools in the UAE. The profile will reflect how teaching staff are utilizing ICT in their teaching and learning, their attitudes, aspirations and concerns. This process should give the reader an appreciation of the working environment of teaching staff at schools in the UAE thus arriving at the Impact of ICT on teaching in the UAE.

1. Curriculum and pedagogical environment in schools." Goals and realization".

In order to describe curricula in a national way, and arrive at an understanding of the impact of ICT on the curricula and the major problems in realizing curriculum change, several researchers (Pelgrum & Anderson, 1999; Dede, 2000; Cuban, 2001 and Voogt, 2003) suggest that one should make a distinction between the intended, implemented, and attained curriculum discussed in chapter four pages 40-41.

There is a strong indication in the literature for the role of ICT in supporting curriculum change. Yet this role differs to some extent among the emerging patterns of curricula Focus discussed in chapter four (p. 42-46) that made a distinction between "single disciplined-based subjects" were ICT supported a more in-depth coverage of curriculum content that seemed to foster student understanding of subject matter and improve the teaching of content and concepts) and others of a cross curricular nature (namely *Thematic Curricular Focus and School-wide Curricular Focus)* (Kankaanranta, 2005); (Kozma, 2005).

Results of my research indicates that ICT in high schools in the UAE can be categorized under the single– subject Curricular Focus (in a very narrow term) as ICT in high schools in the UAE is taught as a separate class in the labs on how to use ICT related skills and not as an interactive toolkit in teaching. The research results indicated that ICT skills were strong in the traditional objectives (66.3%)(Table 5.2 p.98) with a slight inclination towards the emerging practices with an average of 43%

for learning processes and 57% for communication and collaboration while problem solving and critical thinking came very low in the scale (see tables 5.2 & 5.3 p.98 & 99).

The Implemented Curriculum

An overview, of student and teachers activities per Curricular focus was presented in chapter four (tables 3.3 & 3.4 p. 48) as a result of a study on 32 cases from 15 countries (Kozma, 2005; Kankaanranta, 2005; SITES M2 Projects, 2005). Benchmarking my research results to that of the aforementioned study what strikes the researcher is that the UAE rated low regarding students activities in searching for information (12.6% compared to 63.6%); was almost equal in the problem solving tasks (53%) and rated lower in collaboration 72% compared to 90.9% (tables 5.52& 5.53).

Table 5.52 Overview of student activities per Curricular Focus (in % and absolute).

Student activities	**Single-subject Table 4.2p.43**	**Principals & teachers survey/results**	**Table /page/question**
Searching for information	63.6	12.6%	5.7/102/
Problem solving tasks	54.5	M=1.58/53%	5.2/98/c2-7
Picked own tasks	27.3	M=1.33/44%	5.2/98/c2-6
Collaboration	90.9	M=2.17/72%	5.2/98/c2-5
Self-or peer assessment	27.3	M=1.00/33%	5.8/105/c310

Voogt (2003)

Table 5.53 Overview of teacher activities per Curricular Focus (in % and absolute).

Teacher activities	**Single-subject Table 4.3 p.43**	**Principals & teachers survey/results**	**Table /page/question**
Design/prepare instructional materials	81.8	51%	5.3/99/C7A2
Monitor/assess student progress	72.7	M=1.63/54%	5.8/105/C3-8
Collaborate with colleagues	54.5	50%	5.3/99/C7-B4

Voogt (2003)

Also the percentage of teachers in the UAE that mediated content and prepared instructional materials for students; monitoring/assessing student progress were both lower 51%:81.8% & 54%:72.7% than that of the study while percentages were almost equal regarding collaboration (table 5.53).

The Attained Curriculum

Results from the research confirmed that of Kozma, 2005 on student outcomes. A general finding throughout was that students were very positive about the innovations, in the sense that it motivated them and improved their self esteem. In a majority of the cases a positive attitude towards learning with ICT was reported (see Table 5.54 for comparative results to the literature review presented in chapter 4, page 44). From the analysis of table 5.52, we may infer that the acquisition of ICT skills was an important student outcome, often because of having to learn new skills and applications. Although the percentage was lower than that reported in the referenced cases 76% vs. 90.9% (Table 5.54). All the other items had a higher percentage simply because those reported in the referenced case study where passing to other curricular foci namely thematic and school wide.

Table 5.54 Overview of student outcomes per Curricular Focus (in % and absolute).

Student outcomes/acquisition of	Single-subject Table 4.4 p.50	Principals & teachers survey/results	Table /page/question
ICT skills	90.9	76%	5.4/100/Av. C4
Communication skills	9.1	M=1.92/64%	5.3/99/6/c7-B2
Problem-solving skills	27.3	M=1.33/44%	5.2/98/c2-7
Information-handling skills	18.2	M=1.92/64%	5.1/97/c3-5
Team/ collaborative skills	45.5	M=1.83/61%	5.1/97/c3-11
Positive attitude learning /school	63.6	100%	5.3/99/c7-a4

Voogt (2003)

This section has shown that the presence of both emerging and traditionally important ICT orientations differed substantially in the UAE. Schools seemed to have adopted and implemented the traditional practices to a greater extent than the emerging practices. Nevertheless it is interesting to note that as far as goals are concerned (Intended curriculum) 66.3% is directed towards the traditional objectives and an encouraging 50% is directed towards the emerging practices which are ICT related. It is worth noting that the overall index (table 5.4 p. 100) suggests that there is a high expectation regarding the students' ICT skills in the UAE, nevertheless when compared to the emerging objectives low percentages indicates the need to improve the learning, communication and collaboration process.

Also it is interesting to note that 23% teachers/classes are adopting ICT (46%*50%). ICT related practices in the Intended curriculum should be increased to reach a much higher level than the percentage rate of adoption to ensure a steady un-sporadic adoption rates and outcomes (table 5.55).

Table 5.55 Realized curriculum objectives

Curriculum Objectives	Intended Curriculum (Goals)	Implemented Curriculum (Adoption)	Attained Curriculum (Outcomes)
Traditional	66.3%	64%	67.5%
Emerging	50%	46%	33%

2- Attitudes and policies related to hardware and software environments in schools.

Three large studies were chosen for benchmarking purposes to my research results; namely UK, Europe and the USA. ICT in schools survey, Becta (2004); SITES M2 project covering 21 countries (Canada, Europe, the Far East and Australia), SITES M2 (2000) and the Policy Information Report on computers and classrooms in the USA (1996).

The results of the survey show in summary that the student to computer ratio 1:10 is low compared to the UK(1:4.9), equals the average rating in the US in 1996 and the high rating in the SITES country basket. Based on a scale of 0-100, multimedia scored low (46%) which is higher than the averages for the U.S.A and slightly lower than the SITES country basket. Also it is very important to note that the computers are all allocated in labs. Also 49.4% of the computers had recent operating systems, 36% have network connectivity this being much lower than the U.K average (70.5%) and the SITES average (50%) results and equaled the US results. The low percentage for networks correlates with the result of having low access to email and www (17.3%) compared to the three study results. Peripherals scored low 60% for the UAE equaling The SITES country basket but much lower than the UK and the US. Consequently hardware functionality proved to be low this was coupled with the results from the software survey indicating that schools scored an average of 83% for skills oriented software and 17% for integrated pedagogy software which was lower than the results of all three studies. This means that the UAE has a skills based informatics type of curriculum rather than having an ICT integrated in the course structure curriculum Becta (2004); SITES (2000); Policy Information Report (1996).

Table 5.56 on the next page shows comparative results benchmarking the UAE (high schools) in relation to results from other research studies.

Table 5.56 Comparative Hardware and Software results

	SITES	US	BECTA UK	UAE
Hardware				
Student: computer ratio	Low 1:20 High 1:10	Low 1 :16 High 1:6 Av. 1:10	Av. 1:4.9	Av. 1:10
Hardware Functionality				
Multimedia	Av. 50%	25%		46%
Processors & Operating systems	Av. 33%			49.4%
LAN	Low 77% High 23% Av. 50%	Low 16% High 57% Av. 38%	Low 63% High 78% Av. 70.5%	Av. 36%
Peripherals	Low 62% High 38% Av. 50%	Low 29% High 91% Av. 54%	Low 36% High 92% Av. 64%	Low 60% high 40% Av. 50%
Internet	Av. 48%	Av. 64%	Av. 75%	Av. 17.3%
Software	Skills 81% Integrated 19%	61.5% 38.5%	99% 52% science 26% arts	83% 17%

Becta (2004); SITES (2000); Policy Information Report (1996).

3. Attitudes and Policies related to staff Development

Critical mass

This section builds on the self-perceived level of integration that the research respondents assigned themselves in the School Technology survey in order to determine a variety of issues. One of the emerging key issues was whether the use of ICT in teaching and learning had reached the critical mass stage at high schools in the UAE. The School Technology survey which was used to collect baseline data asked respondents to rate their IT integration level. This provided the researcher with a broad picture of the rate of adoption of ICT in teaching and learning of the larger sample. The rate of accuracy of each response was difficult to determine even with the inclusion of other questions in the survey to confirm accuracy. However, once the respondents were selected for the interview sub-sample the accuracy of their self rating was able to be determined through crucial questions in the interview. This confirmation of accuracy was crucial if the researcher was to eventually compare the research sample in order to allocate a School wide rating which was reflective of the wider sample - not simply individual

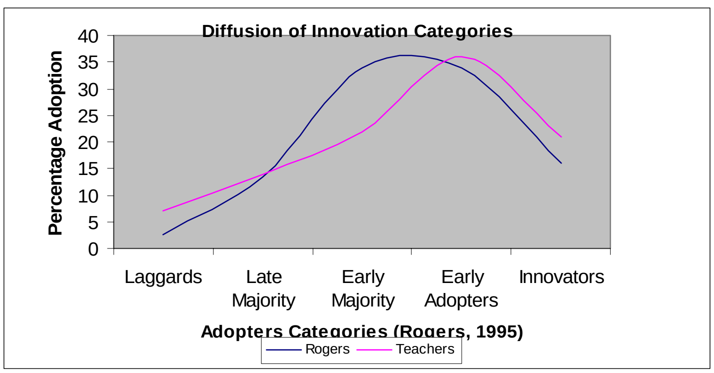
Upon revisiting the outcomes of the teachers rating of their level of ICT integration (table 5.27 p. 118) the following results are derived and tabulated in table 5.57 on the next page.

Table 5.57: Diffusion of Innovation Categories (Teachers)

Level of ICT Integration	*Rogers Diffusion of Innovation*	*Teachers' Comparison Integration Rating Individually Assigned study sample*
Very Low (laggards)	16%	21%
Low (late majority)	34%	36%
Medium (early majority)	34%	22%
High (early adopters)	13.5%	14%
Very High (innovators)	2.5%	7%

Drawing on the work of Rogers' (1995) diffusion of innovation theory it appears that the respondents of the teachers' survey mirror to a significant extent the bell-shaped curve found in Rogers' (1995) own research on innovation uptake. What does vary however is the proportion in each category. Figure 5.2 provides a comparison between Rogers' (1995) diffusion of innovation distribution and the distribution relating to the level of ICT integration in teaching and learning of the teachers' survey sample based on the data in table 5.57).

Figure 5.2 Diffusion of Innovation Categories



Rogers (1995) and Teacher's Survey Sample Under this model, for significant change to occur, a 'critical mass' of individuals need to have adopted and implemented a given innovation (Gilbert & Green, 1995; Rogers, 1995; Deden, 1998).This 'critical mass' occurs when enough individuals have adopted the innovation so that the innovations further rate of adoption becomes self-sustaining.

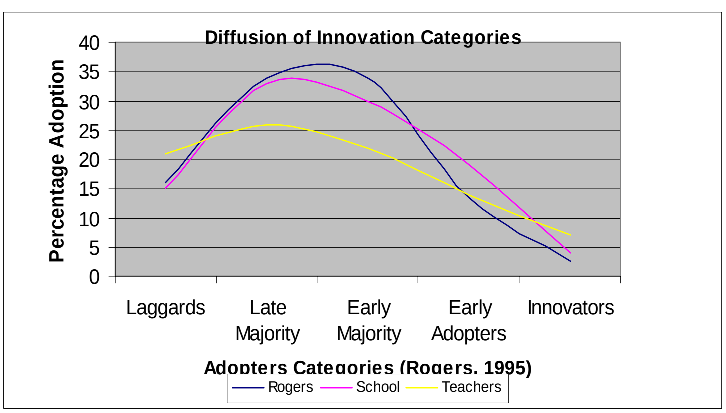
According to Rogers' (1995) typical diffusion curve, this is between 10 – 20 percent adoptions, and represents the transition from the early adopter category to the early majority. It would appear that the teaching staff from the sampled high schools has not reached the critical mass stage regarding the integration of ICT in teaching and learning however the school-wide rating was generated by examining three instruments as opposed to the one instrument (teachers' survey) to establish the level of ICT integration. One would assume that this school wide rating would reflect a more valid reflection of the research sample's integration level. Table 5.58 identifies the various diffusion of innovation categories according to Rogers (1995) and the study's individual rating as well as the school wide ratings. The school wide rating was constructed taking into consideration, skills rating level, ICT facilities and ICT support structures, training and the attitude towards the use of ICT (see Appendix C for the construct). Figure 5.3 further demonstrates the difference between Rogers' (1995) categories, the teachers and the study's school rating. Unlike the teachers' survey data results where the pattern reflected Rogers' categories, the school study respondents differ in some levels of integration.

Table 5.58: Diffusion of innovation categories (school)

Level of ICT Integration	*Rogers Diffusion of Innovation*	*Teachers' Comparison Integration Rating Individually*	*School Wide Rating Synthesis of Instruments*
Very Low (laggards)	16%	21%	15%
Low (late majority)	34%	36%	33%
Medium (early majority)	34%	22 %	30 %
High (early adopters)	13.5%	14%	19%
Very High (innovators)	2.5%	7%	4%

There are more early majority and a greater amount of respondents in the early adopter categories. This certainly reflects the situation that the adoption of ICT in teaching and learning has barely reached the critical mass stage.

Figure 5.3: Rogers' (1995) Diffusion of Innovation Categories and the Study's School Rating



What can be said, based on the evidence of this study, is that more than 60% of the study respondents are at the late majority-early majority stage of ICT adoption in their teaching and learning also it is important to establish whether this particular surveyed group has adopted ICT only at a superficial level, as suggested by Green (1996a), and McNaught et al., (1999). As identified earlier in this section, the data from the three key instruments were synthesized in order to establish the key attributes and common elements which were identified at each level of ICT integration (see table 5.59 on the next page). These common attributes were used to determine whether ICT had been adopted at more than a superficial level by individuals in their teaching and learning.

Upon close examination of table 5.59 on the next page, it appears that the majority of the study respondents in the low- medium category are using a variety of software applications for their teaching and learning. For example: word processing, spreadsheets, presentation, electronic communication tools, and Internet tools. It also appears that these applications are being used in a variety of ways in their actual teaching. The chief distinction between the medium and the high/very high category of innovators was in the way the Web-based environment was used. The medium category adopters were utilizing this environment purely for course delivery, for example passing on information, while the others had established interactive features relevant to their own teaching environment as well as course delivery. Rogers (1995) identified the key importance of targeting the early adopters (high level) as they can trigger the group to the critical mass stage. This may be the case in achieving 'critical mass'.

Prior to establishing whether the use of ICT for teaching and learning by the majority of the case study respondents has penetrated beyond any superficial level, it is important to identify what this means in terms of this study. The key question is really the following: Are teaching staff simply adopting ICT to support and enhance existing practices or has technology changed what is actually taught and how it is taught? This study has not claimed to have fully resolved such an important issue; however it appears from the evidence in the study that existing beliefs are only challenged through experience in applying the new technology. Nevertheless teachers are using the technical skills as a support mechanism as the study showed high percentages on skill and low percentages on integration.

Table 5.59: Level of ICT integration - common attributes

Level of ICT Use	Application	Attitude	Adoption
Very Low N=83	Very limited use: ▪ Basic word processing, ▪ E-mail & Internet.	▪ Feel Very Uncomfortable With Technology Itself. ▪ See very limited benefits. Frustrated with the lack of ICT skill, yet don't make any effort to attend training or improve.	▪ Extremely low ICT skill level. ▪ Very little, if any E-mail use with students.
Low N=194	Limited use: ▪ Word Processing (class handouts, outlines) ▪ E-mail & Internet use.	Are able to identify the benefits of ICT in teaching and learning for themselves and their students however many are not convinced that it is relevant to their discipline.	▪ Low ICT skill level. ▪ Students are not encouraged to communicate via E-mail.
Medium N= 186	A variety of Applications: ▪ Word Processing Software ▪ Spreadsheets ▪ Presentation Software ▪ E-mail & Internet	▪ Are able to identify the benefits of ICT in teaching and learning for themselves and their students. ▪ Fairly comfortable with ICT. ▪ Seek help through colleagues.	▪ Medium level skills. ▪ Producing some Web- based material for deliver of resources. ▪ Communicate with students electronically.
High N=58	A large variety of software: ▪ Presentation Software ▪ Internet tools ▪ Specialist Software use in Their discipline.	▪ High Interest Level. ▪ Experiment 'play' with software. ▪ Self Motivated. ▪ Resourceful – seek help rom a variety of sources.	▪ High level of ICT skills. Producing Web-based teaching material ▪ (delivery & interactive) Expects extensive use by students.
Very High N=40	Create & modify software to suit their teaching & learning needs.	▪ Extremely High level of ▪ Explores & Experiments ▪ Self Motivated. ▪ ICT 'a way of life'. ▪ Extremely Resourceful.	▪ Very high level of ICT skills. ▪ Innovative use of ICT in T&L. ▪ Exhibit strong Leadership skills - Agent for change.

N= NUMBER OF RESPONDENTS OUT OF A TOTAL SAMPLE SIZE OF 572)

The results related to staff development revealed that teachers saw a lack of adequate training opportunities and ICT-related knowledge as a major obstacle to realizing the ICT-related objectives of the schools (table 5.21 p.113). This will hinder the way teacher's plan their courses and instructional tasks as pointed out by Oblinger (2003). Schools had adopted a policy that all teachers should receive training for using ICT in their instructional practice; however it appeared that in most schools this policy had not yet been satisfactorily realized (table 5.22 p.114). Nevertheless, even in the absence of ICT-training requirements a low number of teachers had attended basic ICT courses. It seems that for most of the schools that participated in the research there is a need for additional continuous staff development regarding ICT (table 5.23 F1/F3 &F2/F4 p. 115). However, realization even of this goal is likely not to be easy given the finding that time to train and apply ICT related knowledge and the existence of training courses was, according to the perceptions of the teachers respondents, generally rather low in most school (table 5.26 p.117). For most participating schools over the next few years, the challenge will be that of determining how teachers' abilities to use ICT for instructional purposes can be improved. Nevertheless with the vast amount of information available teachers should be able to sift through information efficiently, by learning how to use computer related tools effectively. There are diverse skills and technologies to adjust to and new attitudes to form (Kankaanranta, 2005).

4. Management and Organization (Attitudes, beliefs, policies and vision of school principals and teachers).

The general conclusion that can be drawn from the results presented in this section is that, schools are doing much to develop their ICT-related policies, visions, and attitudes. However, there is considerable room for progress.

The attitudes of principals and teachers toward the use of ICT in their schools in general tended to be high (table 5.28 p.121). As far as ICT policies are concerned, the results showed that schools had developed school policy measures concerning the use of ICT within their institutions. Many schools had included about half of the policy issues listed in the survey questionnaire (see table 5.29 p.122). However, this finding has both optimistic overtones ('a considerable number of schools in the UAE are quite active in the development of ICT policies') and pessimistic overtones ('although a number of schools are relatively active, in the UAE too little is happening in this area').A similar picture emerges from the research results concerning the development of an ICT vision and its realization. Although the development of such a vision was a goal for a fair number of schools, that goal had yet to be realized in many schools (table 5.31 p.123).

Some of the problems schools faced in implementing ICT concerned the lack of resources, notably insufficient teacher time for preparing computer lessons, and not enough time to work with computers. Respondents also pointed to the mismatch between available software and instructional practices (table 5.33 p.124).Results show that considerable progress should be made in the high schools in terms of ICT attitudes and plans and the various ways of using computer technology. However, if all schools in the UAE are to benefit fully from what ICT can provide, then much still needs to be done as the literature emphasizes that change has to occur at the school, staff and class levels (Bates, 2000). Schools need to restructure rather than re-culture (Hardgrave & Fullan, 1998) and leadership should be reviewed as an attitude of schools rather then individuals (Newman & Simmons, 2000) also school staff and teachers need to be shown how they can ‘win’ by making greater use of computers. At the same time, solutions have to be found for the problems schools face when trying to implement ICT in their institutions.

B. The Impact of ICT on the Teaching Function

1. How is the role of teachers affected by ICT?

The majority of the teachers indicated that ICT (table 5.35 p.125) impacted their role of teachers highly and shifted it to creating environments for students’ independent learning thus shifting their role from the sole source of learning to acting as a support to students (table 5.34 p. 125. Also (74%) of the teachers indicated that ICT helped in teaching more effectively by using many ICT related skills and the internet (table 5.35 p.125). These results were further ascertained by the response from the teachers interviews (Appendix D-D5/TJ1) as teachers indicated the students use of technology with highest prevalence of Microsoft office, web use, Logical thinking and IT skills and one third of the teachers when interviewed said that ICT enhanced their students thinking process, self confidence and widened their attainment scope through the use of the internet (Appendix D-D5/TJ2). Home works and student achievement are shifted from unary limited scope to more group work cooperative work and project based learning .ICT also improved greatly the process of monitoring student progress and thus enabling the teacher to perform better in correcting any discrepancies regarding student achievement.

ICT changes the function and work of teachers in the classroom, by shifting the role of the teacher from a content expert to a mentor (Russell & Dwyer (2004); Schacter (1999). Consequently, my research results show that some of the teaching activity is shifted from teaching to the technology media and thus according to Means et al., 2001, the teacher can support students more effectively and the teachers role is shifted from instruction to mentoring and sharing the knowledge process with the student (table 5.34 p. 125).

2. How is the planning of teaching affected? /Assessment of learning.

Results of the research show that teachers in high schools in the UAE have high expectations regarding affecting changes in their planning of teaching and preparation of new instructional tasks were teachers would have to include ICT skills in course structures and emphasize the use of the internet and e-mail (table 5.35 p. 125). This is reflected in the results where more than two thirds of the teachers indicated that the schools policy is to enable students to use ICT related skills (table 5.35 p.125) as 51% of the respondents intended to use computers in their instructional practice and 83% of the teachers expected their students to access the internet while only 41% indicated the student's use of e-mail (table 5.36 p.126).

Results also confirm the notions visited in the literature review (ch.3 p. 53-54) were researchers (US Congress, Office of Technology Assessment (1995); Kankaanranta, 2005) agreed that ICT exposes teachers to new instructional resources & the use of e-mail increases networked cooperation with other schools and students. Nevertheless, due to many obstacles discussed in the previous section in the domain of hardware & software environments in schools (p.108) and other deficiencies regarding staff development not as much as in skills but rather in the area of instructional competencies using ICT (p117) as only 21% said that they had such skills; the planning of teaching is being transformed in a very slow manner.

On the average 68.75% of the respondents indicated that as a policy goal they intend to use ICT in learning and communication and collaboration processes (instructional tasks) meaning they have to plan their subject matter differently to include ICT skills and the use of internet and e-mail. Nevertheless the realization of these goals was low (with a Pearson correlation less than <0.8) for all items. Meaning the goals where not realized by using ICT (table 5.36 p. 126). Another deterring factor is that only a minority of 12% of the surveyed teachers said that they use e-mail for instructional purposes this might be due to the fact that only 36% of the teachers had an e-mail address (Appendix D/D/PTC7-B1). This fact also has a negative affect on their level of cooperation with other schools (indicated by a Pearson correlation less than< 0.80 (App.D/D1:PTC7-B4).

The assessment of learning methods discussed in chapter four presented by Kankaanranta (2005) and Goldberg et al (2003) are not supported by the results of my research. As very little is done regarding this area where textbooks are still being used and the shift to web based aided learning (A-A1/TA11-5) is not happening due to the lack of numerous factors. Teachers need support and time in making use of new strategies and technologies to enhance their personal work before learning to use them in their teaching Becta (2002).Thus they need skills in software use, computer management and classroom management (Becta 2002) results of my research show a high majority agreed that the role of ICT in pedagogy indicates the necessity of teachers to shift to using www, enhance problem solving skill in teaching and give the students their own pace in learning (table 5.37 page 126). Consequently if ICT is to change the way teachers plan their courses and assess learning, one should revisit the skills of teachers to see if it is supportive of ICT.

The majority of teachers knew how to use presentation software as 59% said that they have general knowledge of ICT related skills, and 66% know how to use email and www for instructional purposes; nevertheless teachers were low on instructional processes (table 5.27 p. 118) because computer systems provide tools for collecting, organizing, processing and communicating information and teachers have to learn these skills and technologies and adjust to new attitudes (Kankaanranta, 2005). Also 96% of the teachers agreed that they are confronted with numerous obstacles regarding using ICT in instruction especially availing computers to different classes; 92% said they had no time to explore new technologies such as the internet and more than 50% had issues related to resources, training and lack of skills .All of these aspects will affect the teachers planning of teaching and assessment of learning negatively see (table 5.38 p.127).

Teachers expressed their wish to see changes regarding a number of factors starting with the allocation and structuring of technology (App. D/D4-PM1). A high majority of respondents indicated that there is a need for full time technical support; this result matches that of the teachers on ICT support and needs (see Appendix D) were teachers indicated that they spend on an average 20 hours a week for computer coordination. This time spent affects the teachers allocated time given for planning of teaching and the quality of output as the teachers skills are limited and far below that of a specialized technical support coordinator. Followed by increasing the training opportunities and in-house training (table 5.21 p.113); and the need to take the workshops beyond the introductory level of skills (Appendix D: D5/TL2), as more than one third of the teachers indicated it was Microsoft office suite and the other third indicated it was web applications. It is evident from their answers that no workshops were given on the evolution of instructional practice but rather ICT was used as additional enhancing skills.

5.4 *Research Question Two: Interpretation and Analysis*

Impact of ICT on Learning

a- Student Technology Literacy level

Effective use of Technology (ICT) in facilitating student learning and performance is seen only when participants have the knowledge and skill to use technology (Becta, 2003). The student's computer literacy being knowledge, and their awareness is their ability to use the technology (Walker et al, 2000; Crawford& Vahey 2002).The research results show that more than 72.7% of the students indicated that their knowledge of computer use is in the intermediate level (table 5.43 p.130), nevertheless their awareness is low as none have websites and ICT is used in less than 2/3rds of the classes (table 5.43 p. 130).

b- Are students motivated /empowered by ICT?

ICT manages to develop students' interest in learning activities, because it creates environments and presents content in ways that are more engaging and involve students more directly than do textbooks and more traditional teaching tools (US Congress, Office of Technology Assessment, 1995). Results of the research confirms these views as 74:5% of the students were motivated (table 5.46 page 131) and 79% of them felt that ICT makes lessons more interesting (table 5.47 p.131).

c- What is the specific learning achieved?

The school system considers the knowledge, skills and attitudes as a formal part of its educational mission. It emphasizes the areas of specific learning achieved by students under two sub-themes; namely the specificity of learning using the emerging technologies and the development of various intellectual skills.

Crawford & Vahey (2002) pointed out that computer literacy is concerned with the way in which a person sees the computer fitting into his/her life now and in the future. It involves building up a series of useful concepts about computers so that a person wants to use computers, knows how to use computers and uses them in a useful and appropriate manner. Translated into the school environment this means that we want to produce students who use and will use computers in their lives to solve problems and complete tasks. We want problem-solving users (students) with the knowledge and skills to make the computer work for them.

Schools in the UAE seems to produce students with skills as the major contribution of ICT rather than skills being a tool to enhance their various intellectual skills as 75% of the students assured us of being computer users (table 5.48 p.131); with high skills level in power point & word, and a low skills level in e-mail (table 5.50 p. 132) and more than 80% of the students had a positive attitude towards the use of computers (table 5.47 p.131).

e- Relationship of students to learning

It is evident from my readings of research conducted (referenced in chapter four pages 56-62) that it is difficult to talk about the contribution of new technologies to the students' genuine learning without remarking that they cause significant changes in the very way in which students approach knowledge and incorporate it into what they already know. More than 77% of the students (table 5.48 p. 131) acknowledged the fact which ascertains the views of Law & Chow, 2002 namely that ICT helps them develop research spirit. While the majority agreed (table 5.47 p. 131) that it allows them to share their work with others which is in harmony with the literature review which emphasizes the fact that ICT allows greater cooperation among individuals (Graig, 2004; Schulz et al., 2002). Finally the majority of the surveyed students agreed that ICT allows for more integrated and better assimilated learning (table 5.47 p. 131) (Baron & Bruillard, 2007; Sheppard, 2003).

Summary

ICT has impacted the role of teachers and changed it from mentoring to that of sharing the knowledge process with the students. Also this new attitude towards pedagogy has enhanced the students’ thinking process, increased their skills coverage and widened their attainment scope thru the use of internet. It is interesting to note that the teacher/student performance was greatly improved. Although teachers had agreed that ICT affected the planning of teaching as they now need to include ICT related skills in their course materials and in the way they expect their students to present their feedback on the learning process such as presentations and wider homework solving skills. Nevertheless, the policy goals and desires of the teachers vary on the realization scale in the UAE.

Research results confirmed the assumption that ICT affects the teacher/student relationship and role as both giver and receiver of knowledge. The observations and survey results show that ICT manifested this impact in that it increased the students' attainment scope. Although students use more ICT related skills nevertheless it covers only 28% of their academic classes. Students are clustered in groups and teachers help groups rather than each student nevertheless teachers managed classes effectively although it differed from a normal class configuration. It is not surprising to see that the results of the observations show that schools in the UAE are still teacher centered as the emerging ICT related pedagogy is low.

It was interesting to note that attitude questions scored as high as skills related questions. The research results showed that incorporating ICT into the teaching and learning process is also an attitude matter which should be incorporated in the school. More than three quarters of the students were happy with using technology in the classroom and confirmed that ICT increased their confidence and motivation in the subject matter. It was encouraging to see that 15% of the students believed that technology enhances their thinking power rating much higher than skills improvement (9%).

One of the key research questions for this study was:

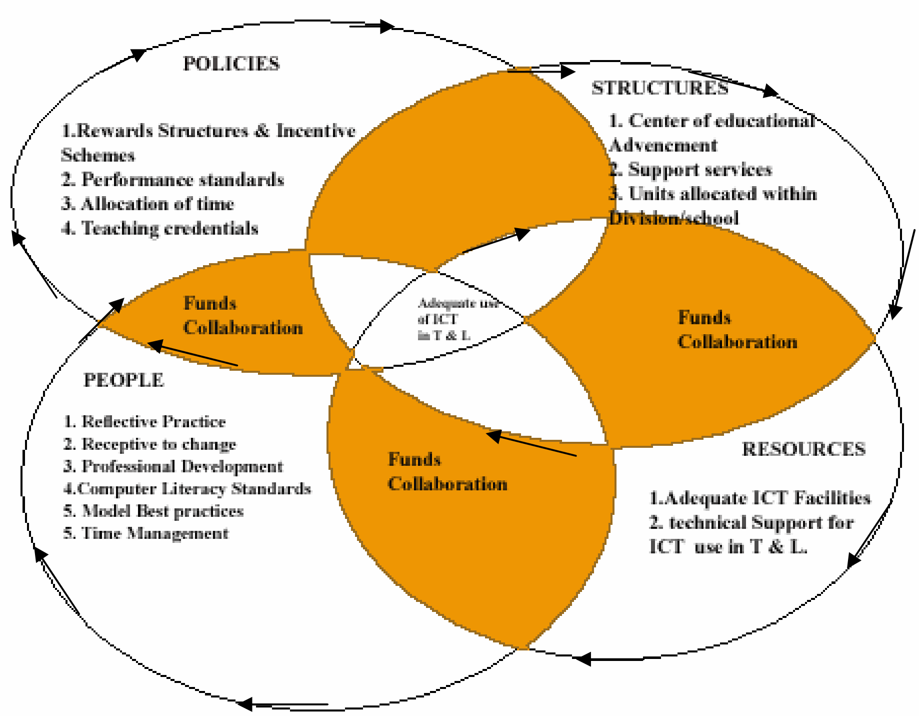
5.5 What is an appropriate model for future implementation of ICT into teaching and learning at high schools in the UAE?

Based on the extensive data derived from this research, it is apparent that if high schools are to meet the needs of the Information Age, major transformations need to occur in re-conceptualize the very roots of higher secondary educational institutions. If high schools are to survive in the future the evidence is that they need to view themselves as a professional learning community. The key principles of a professional learning community encompass a number of characteristics which have been derived from the individual work of Alvesson (1993), Senge (1990), Sergiovanni (1993a), Fullan (1998) and Palliccione (2001). One of the key characteristic is that the culture of such a community is configured by multiple cultures where individuals may

principally identify with the school and the wider professional community. Such a community is seen as open and dynamic by the very fact that each individual brings with them certain cultural characteristics which in turn influence the community.
The research results indicate that in order to be effective as a professional learning community, members within the community should have a shared vision, where all are collectively responsible for achieving the vision. This shared vision is clearly presented in the goals of both the teachers and the principles (tables 5.3, 5.8, 5.22, 5.28, and 5.31/pages 99, 105, 114, 121, 123); nevertheless the implementation of this shared vision was minimal.

The suggested model is the UAE Professional Learning Community Model (UAEPLCM). Figure 5.4, is a representation which was empirically derived from the data obtained in this study for the purpose of answering the specific research questions, the numerous issues which have arisen from the emerging themes and relevant contemporary theory on change and innovation.

Figure 5.4 UAE Professional Learning Community Model



The constituents of this model are explained in the next paragraph. This model will attempt to provide key principles and elements of a professional learning community which may be applied to other secondary educational institutions in the UAE. This model proposes certain elements which reflect school and individual commitment implying that it is only when there is a synergy between these forces that real change can occur and be sustained. The model suggests that such a professional learning community will be better able to meet the demands of the Information Age, apply ICT into teaching and learning as well as respond to other changes the future may bring. The following sections expand on the characteristics and implications of the suggested model.

The Model

The UAE Professional Learning Community Model (for high schools) is made up of four major components – Policies, Structures, Resources and People, as seen in Figure 5.4 p.151. Each component has key elements which make up that particular component. One of The basic principles of this particular model is that each component is unable to stand alone and needs strong support from the others if the adoption of ICT for teaching and learning is to occur. The common elements which drive the model are adequate funds, the allocation of time for collaboration, and strong leadership. The model is cyclical in nature hence the arrows are going in the same direction. Each major component is constantly feeding into the other components and is directly susceptible to and strongly influenced by global and local factors. This is an extremely important feature, as such a professional community needs to be constantly aware of their environment and act accordingly. The community's boundaries go far beyond the institution's walls. A professional learning community needs to be reflective not reactive. Ultimately the adoption of ICT for teaching and learning can be achieved successfully if these components, principles and elements are in place Pelliccione (2001).

A number of components involving school policies, structures, and resources espouse the secondary educational institutions commitment to developing a professional learning community. Major components will be addressed, followed by the specific elements of the model.

Policies

As identified in the figure 5.4 p.151, school policies are one of the four major components which need to be in place to give a correct beginning to the unwinding and synchronization of the other three components of the model with emphasis on establishing reward schemes, allocation of time and emphasizing teaching credentials.

The result of the research revealed that policy matters need further implementation in three main areas namely:

1. Policies related to hardware, software and application usage.
2. Policies related to staff development.
3. Policies related to management and organization.

1. <u>Policies related to Hardware, Software and Application usage:</u>

The research results showed low percentages regarding the implementation of hardware policies (tables 5.10-5.20 p.107-112). Three large studies were chosen for benchmarking purposes to my research results; namely UK, Europe and the USA. ICT in schools survey, Becta (2004); SITES M2 project covering 21 countries (Canada, Europe, the Far East and Australia), SITES M2 (2000) and the Policy Information Report on computers and classrooms in the USA (1996).

The results of the survey show in summary that the student to computer ratio 1:10 is low compared to the UK(1:4.9), equals the average rating in the US in 1996 and the high rating in the SITES country basket. Based on a scale of 0-100, multimedia scored low (46%) which is higher than the averages for the U.S.A and slightly lower than the SITES country basket. Also it is very important to note that the computers are all allocated in labs. Also 49.4% of the computers had recent operating systems, 36% have network connectivity this being much lower than the U.K average (70.5%) and the SITES average (50%) results and equaled the US results. The low percentage for networks correlates with the result of having low access to email and www (17.3%) compared to the three study results. Peripherals scored low 60% for the UAE equaling The SITES country basket but much lower than the UK and the US. Consequently hardware functionality proved to be low this was coupled with the results from the software survey indicating that schools scored an average of 83% for skills oriented software and 17% for integrated pedagogy software which was lower than the results of all three studies. This means that the UAE has a skills based informatics type of curriculum rather than having an ICT integrated in the course structure curriculum Becta (2004); SITES (2000); Policy Information Report (1996).

The literature linked the integration of computers in the school curriculum to the availability of subject specific software (Pelgrum & Schipper (1993) p.110). The research results showed low integration of computers in the curriculum as only 36% confirmed the use of subject specific software and 72% of the respondents indicated that the implemented software was of a general purpose nature (tables 5.18 & 5.19 p.112).

2. <u>Policies related to staff development</u>:

If the schools have made a major commitment to achieving the teaching and Learning Plan (2020) discussed in chapter two; then one of the important factors to achieve this plan is having academic staff who are competent ICT users that will willingly integrate ICT into teaching and learning. This necessitates a significant change in teaching methods and for this change to occur, a "Critical mass" of individuals need to have adopted and implemented a given innovation so that the innovation's further rate of adoption becomes self-sustaining (Gilbert & Green, 1995; Rogers, 1995; Deden, 1998).

The research showed the following results in the area of developing competent ICT users. Although 83% of the respondents indicated that a policy was in place for staff development not enough was done in this area as indicated in table 5.22 p.114. The majority expressed their concern in implementing a clear training policy (table 5.22 p.114) and indicated a need for a policy that had clear milestones for continuous staff development (table 5.23 p. 114) with emphasis on in-house training policies (table 5.24 p. 115). The data from this research and the relevant research literature (Ramsden, 1998; McNaught et al., 1999; Bates, 2000) have clearly indicated the need for any model to incorporate policies encompassing effective <u>reward structures and incentive schemes</u> which value teaching. This is especially important if ICT is to be integrated effectively into teaching and learning – as the findings of this study have clearly shown that the use of ICT in teaching has actually contributed to an increase in the overall workload of teaching staff (table 5.38 p.127) and teachers had little time to train in ICT and apply their knowledge to reach a "critical mass" (table 5.26 p. 117). This will be further discussed under the people component of this model. .

As a direct result of this study it is suggested that a policy needs to be formed which advocates the conceptualization of a Teaching and Learning Performance Index (TLPI). The (TLPI) could include such dimensions as: receiving a teaching award; being responsible for co-coordinating a unit, which involves incorporating web-based resources in units; developing stand alone online units; mentoring colleagues in a way which helps them to integrate ICT into their teaching and learning; attending professional development sessions aimed at increasing the use of ICT for teaching and learning. There can also be a policy of providing awards such as establishing Innovative Teaching Practice (ITP) Awards that will enhance and impact positively the use of ICT in teaching and learning in high schools and will clearly indicate that the school system is trying to encourage and promote good teaching practice and initiate change.

The research results indicated that 92% of the respondents expressed difficulty in integrating ICT into instruction (table 5.38 p.127). Also 92% of the students expected teachers to have ICT skills and incorporate ICT in their teaching (D-D2/SB6) and the majority of the academic staff expected students to be competent ICT users (tables 5.5; 5.7 p.101- 102). Consequently to this end, high schools in the UAE need to begin to set computer literacy standards for academic staff as well as for students (performance standards). These standards are adapted from the work of Pelliccione (2001) on the implementation of innovation technology in Australia but have been amended in light of the research results to incorporate some provision of practical guidelines that suits the high schools in the UAE. It is crucial that these competencies are constantly revisited and monitored to determine whether the benchmarks reflect the School's current vision and strategic plan. These standards should be based on the needs of the current environment and, as indicated by this survey, focus on the early majority group of adopter categories (chapter three pages 31-41). Specific to high school teaching staff, the following minimum performance standards are suggested in table 5.60. These standards deemed important as results of my research indicates that only 59% are performant in general purpose software, and only 51% can use ICT for instructional purposes (table 5.36 p. 126). Also only 49% use www for instructional purposes with no notion of web based development and a limited number (12%) use e-mail (Appendix D-D1TA1-TA4).

Recently UAE is requiring that teachers attain an ICDL certification, nevertheless this basic skills certification lacks web based development tools and practices. Results of my research indicated a positive attitude of teachers towards ICT (table 5.28 p.121); nevertheless teachers cannot identify the benefits for them in using ICT (table 5.25 p. 116). Attitude is important but the rate of adoption is crucial and my survey results show it being low for ICT related activities (Emerging practices, table 5.8 p. 105).

Table 5.60: Minimum performance standards for teaching staff at high schools

Application	***Attitude***	***Adoption***
Staff at high schools will be able to utilize the following applications: ✓ ***Word-processing*** ✓ ***Electronic Communication*** ✓ ***Spreadsheets*** ✓ ***Presentation software*** ✓ ***Web Browsers*** ✓ ***Web based Development Tools***	*Teaching Staff at high schools will be:* ✓ *able to feel comfortable with the technology itself.* ✓ *Able to identify the benefits of utilizing ICT in their teaching and Learning process.* ✓ *Resourceful-Able to seek information from a variety of sources.* ✓ *Reflective- in the use of ICT.*	*Teaching Staff at high schools will be able to:* ✓ *Communicate with students and colleagues electronically.* ✓ *Encourage and promote the use of ICT through developing Web-based material for delivery of resources as well as initiate real learning, and set Web-based assessment tasks.*

Setting computer literacy standards is the easy part, what is more difficult is the subsequent enforcement and monitoring. One way of achieving this could be through the yearly review that all staff is required to undertake with their principals.

Computer literacy standards for students are also required to reflect the needs of the environment and the reflective performance standards for teaching staff at the School. An example of a set of potential performance standards for students at schools are identified in table 5.61 setting a common core computer literacy unit for high school students would begin to work toward ensuring that these performance standards are achieved by the students at Schools.

Table 5.61: Minimum performance standards for students at high schools

Application	***Attitude***	***Adoption***
Students at high schools will be able to utilize the following applications: ✓ ***Word-processing*** ✓ ***Presentation software*** ✓ ***Web Browsers*** ✓ ***Web based Development Tools***	*Students at high schools will be:* ✓ *able to feel comfortable with the technology itself.* ✓ *Able to identify the benefits of utilizing ICT in their teaching and Learning process.* ✓ *Resourceful-Able to seek information from a variety of sources.* ✓ *Reflective- Utilize ICT when and where appropriate.*	*Students at high schools will be able to:* ✓ *Communicate with students and colleagues electronically.* ✓ *Utilize multimedia software to support and express their ideas, thoughts and concepts.* ✓ *Utilize web based environments created for them to aid the process of teaching and learning.* ✓ *Create Web based resources as a way of expressing their ideas and thoughts.*

Time allocation for teaching in an ICT mode

A great deal of time and effort is needed as individuals try to make the transition from paper to electronic learning environments, (face-to-face, online) and this can only occur once academic staff have worked in such an environment and have become reflective about their own practice over a period of time. One of the specific concerns which have arisen through this strongly suggests that the time required creating, maintaining and teaching in an ICT integrated environment needs to be factored into the teaching allocation of individual staff (table 5.33 p.124). The literature emphasizes the fact that teachers have to demonstrate high levels of energy, hard-work and perseverance. As early adopters, they are required to be resourceful and overcome many barriers to "make things work". Planning and learning experiences involving ICT takes considerable time and demands complex scheduling (Lankshear & Snyder, 2000, p.110). Also Starweather & Clark (1999) in their study where he used study groups and interviews to assess the attitude of educators to ICT, among other results, identified "lack of time" as the main barrier which hindered the full use of ICT resources.

Teaching induction program

One of the criteria for new appointments at the Schools in the UAE is the completion of an (ICDL) certification. It has become clear that the successful completion of an (ICDL) certification does not necessarily mean that the individual is able to teach in a high school environment. In particular, the survey data indicated that a high level of ICT skills did not necessarily equate to a high level of ICT integration into teaching and learning. These respondents admitted that they felt quite competent when utilizing ICT for themselves. However were unable to integrate ICT effectively in their teaching (p. 138/139). If new staff entering the School or existing staff do not have teaching credentials then perhaps the School needs to recommend that each new academic staff member complete a comprehensive teaching induction program as the results of the research results indicated low percentage (21%) in using ICT for instructional purposes (table 5.27 p.118) with similar low percentages for both the use of the internet and e-mail for instructional purposes (table 5.6 p. 102). The Ministry of Education (MoE) may introduce such courses and leave it up to the individual to attend these sessions. Part of such an induction could include assistance in the use of

ICT in teaching and learning and could also make the participants aware of the computer literacy standards expected of them.

<u>ICT access to reflect flexible needs</u>

As the adoption of ICT becomes part of the overall working culture of the School, the School's remote access facilities and policies relating to these facilities, need to be continually monitored and adjusted in order to reflect the specific working needs of the teaching staff. The data in this study clearly indicate hat the reputation of the remote access facilities at schools are very poor (table 5.15 p.110).

3. <u>Policies related to Management and Organization</u>:

Schools can express their interest in ICT through their school policies and, as such, develop a framework for action concerning the use of computers in their institutions (Pelgrum & Plomp, 1991). Only 33% of the principals indicated that their schools had a written policy statement regarding the use of computers for educational purposes which indicates a low percentage (Appendix A-PQ: C5).

These policy statements (table 5.29 p.122) rated:

Highest in the:

- Use of computers in the current school year
- Plans for staff development with regards to ICT training

Medium in:

- Plans for hardware replacement and upgrading
- Plans for software acquisition

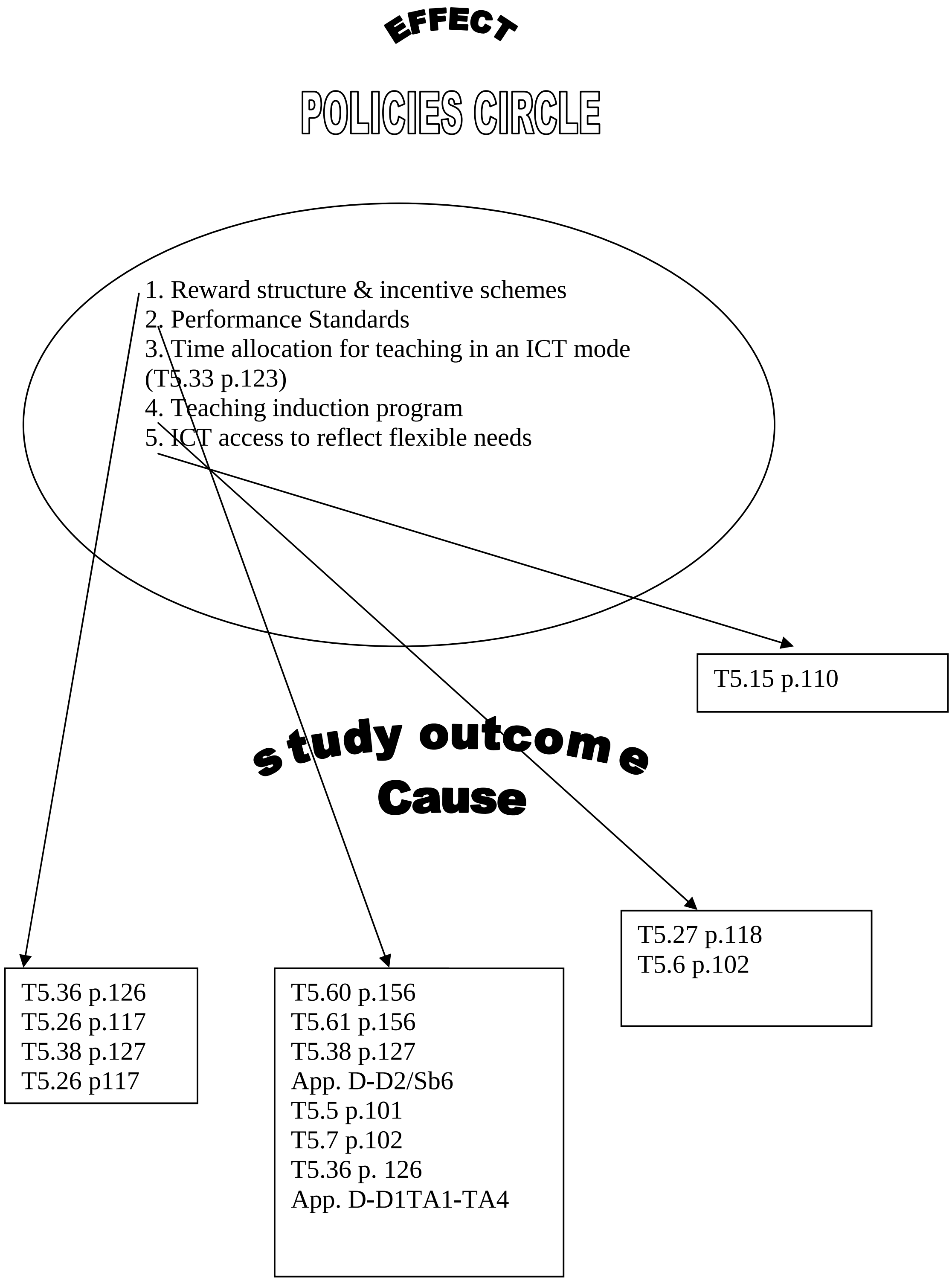
Low in:

- Equity for access
- Internet policy

And Nil in:

- Use of computers in the forthcoming school years
- Specification for computer – related tasks and persons in charge.

Figure 5.5 Relation of the Policy Model to the Study Outcomes



Structures

Another major component of the UAE Professional Learning Community Model is summed up by the term "Structures". In the words of Ramsden (1998) "After the culture is right, then the structure can be improved. However this model strongly suggests that the culture of this community will more than likely adopt ICT if certain structures, resources and policies are in place. The key elements in the structure component of the model are: a strong teaching and learning presence; a separate body for ICT in teaching and learning and one for technical support service; individual support units located within District/Schools; and a team-based approach is adopted. The structure and resource components in this model are very closely linked. These themes will be expanded in the following paragraphs with reference to the literature.

Center of Educational Advancement (CEA) - Strong teaching & learning presence

The Office of Teaching and Learning at MoE should be effective in promoting strategies and initiatives designed to enhance the quality of teaching and learning conducted at the Schools, and support these initiatives by strategically creating structures and resources which would guarantee their success. For example, the ITP awards and the professional development courses can be some of the initiatives with the appropriate structure to support these initiatives being the Centre for Educational Advancement (CEA).

Support services

As indicated earlier it is suggested that the Office of Teaching and Learning should establish the CEA, a key branch which will be responsible for staff development, educational media support. The data collected in this study indicate that the successful adoption of ICT is also strongly dependent upon the accessibility of specific support structures (Appendix D/D1PTD2).These support needs fell into two discrete categories: technical development and professional development. Support services are needed as the research results indicated that teachers' readiness to use ICT was medium to low because 59% of the teachers indicated having general ICT skills, 66% know how to use e-mail & www for educational purposes and only 21% use ICT for instructional processes. Also 96% said they had obstacles using ICT for instruction , the main reasons apart from lack of hardware was the insufficient time to explore new technology and issues related to resources, training and lack of skills (table 5.38 p.127). Technical support is needed as 90% of the respondents indicated a need for full time technical support, also the majority indicated that on the average 20hours /week are used from their time for computer coordination even though their skills are limited and with the presence of technical support this time is shifted to ICT training in teaching and learning and thus the level of computing performance and guidance can be upgraded in the schools (Bates, 2000) (Appendix D5/TM1& p.127, D/D4-PM1 & Appendix A-D:ICT & p.127).

The literature point out to the fact that ICT gives access to information to support teachers in trying new strategies, thinking, reflecting on practice, and engaging with new material (Committee on Developments in the Science of Learning, 2000). Teachers "need support in making use of new technologies to enhance their personal work before learning to use them in their teaching (Lankashear & Snyder, 2000, p.121). In a similar vein, some teachers and institutions are using technology to simply replicate their traditional practice, content and control (Barrowy & Laserna, 1997; Gillespie, 1998; Fox, 2001). This due to the fact that school teachers have rarely been shown how to integrate ICT into their teaching & learning (McKenzie, 2000; Trinidad, 2001). Also McNaught at al., 1999 pointed out that one of the important factors affecting adoption ICT at a more fundamental level is the lack of knowledge and skills about ICT for teaching and learning.

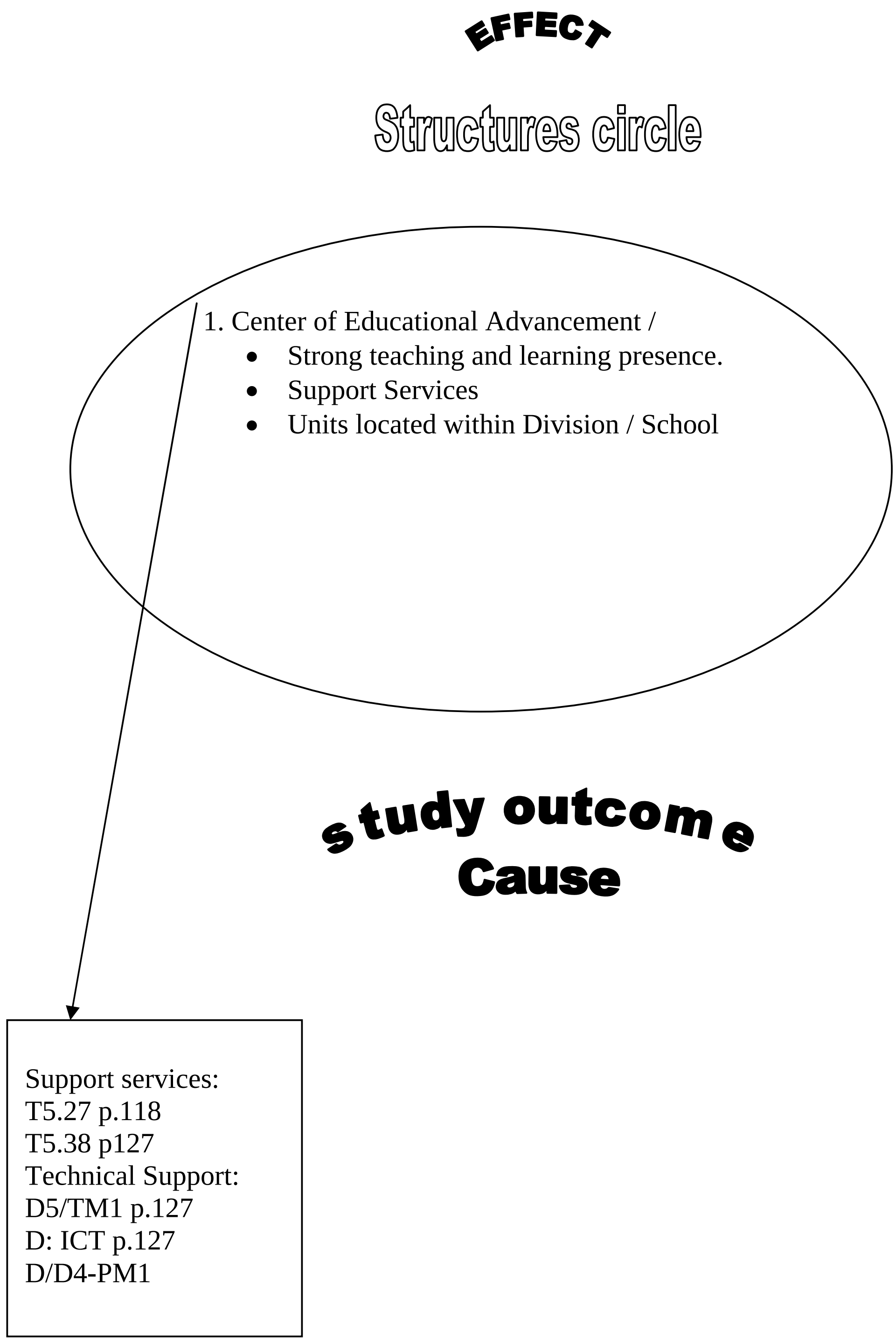
Specific roles for each support system will be clearly identified in the resource component of this model (p.163). Separating the two services appears to be the best way to meet the support needs required to adopt ICT in teaching and learning.

Units located within Division/School

Schools cannot promote the use of ICT in teaching and learning without providing adequate support and, as more people adopt ICT, the support needs are simply going to increase. It would seem that the project team model advocated by Bates (2000) could assist with many of these support issues and strengthen the use of ICT at the staff and class levels where the actual teaching occurs. These support needs in the case of high schools in the UAE may involve a very large centralized body (The Office of Teaching and Learning), which should provide an extensive range of School wide services through the CEA. In addition however it also needs to provide support at a local level perhaps by creating small flexible learning units housed within each large

School or a group of schools within educational districts. Each unit could be comprised of one technical support person (1:25 staff utilizing ICT for teaching) and one educational technologist (1:50 academic staff), a ratio suggested by Bates (2000).

Figure 5.6 Relation of the Structures Model to the Study Outcomes



Resources

The effective use of ICT in teaching and learning can be strongly encouraged through the provision of certain resources, being one of the major components of the UAE Professional Learning Community Model.

Adequate ICT facilities

The data, particularly that collected through the Survey reports, indicate that inadequate facilities have a strong affect on the morale and productivity of academic staff. If teaching staff are to integrate ICT into their teaching and learning they require appropriate hardware and software which meet these needs (tables 5.15 & 5.20, p.110 & p.112 and tables 5.10-5.14 p.107-109) and policies that enhance the use of ICT in teaching and learning. The literature strongly points to issues that surface at the institutional level, such as fragmented institutional planning (Gilbert, 1996a).

Remote ICT access in teaching spaces

If ICT is to be seen as an integral part of the teaching and learning process at high schools then the Schools must provide ample computer access and projection facilities in all teaching classrooms. Furthermore, if ICT is to be integrated into the very culture of this process then the School needs to become serious about reconfiguring many of the classrooms to facilitate computer access (provide network connections, fixed or wireless). Research results indicated that courses are given in labs (p.80) and 72% of the teachers indicated the software used is skills based and only 36% indicated the availability of software that might encourage the integration of ICT into the school curriculum (table 5.18-5.19 p.112)

Technical Support for ICT use in Teaching & Learning

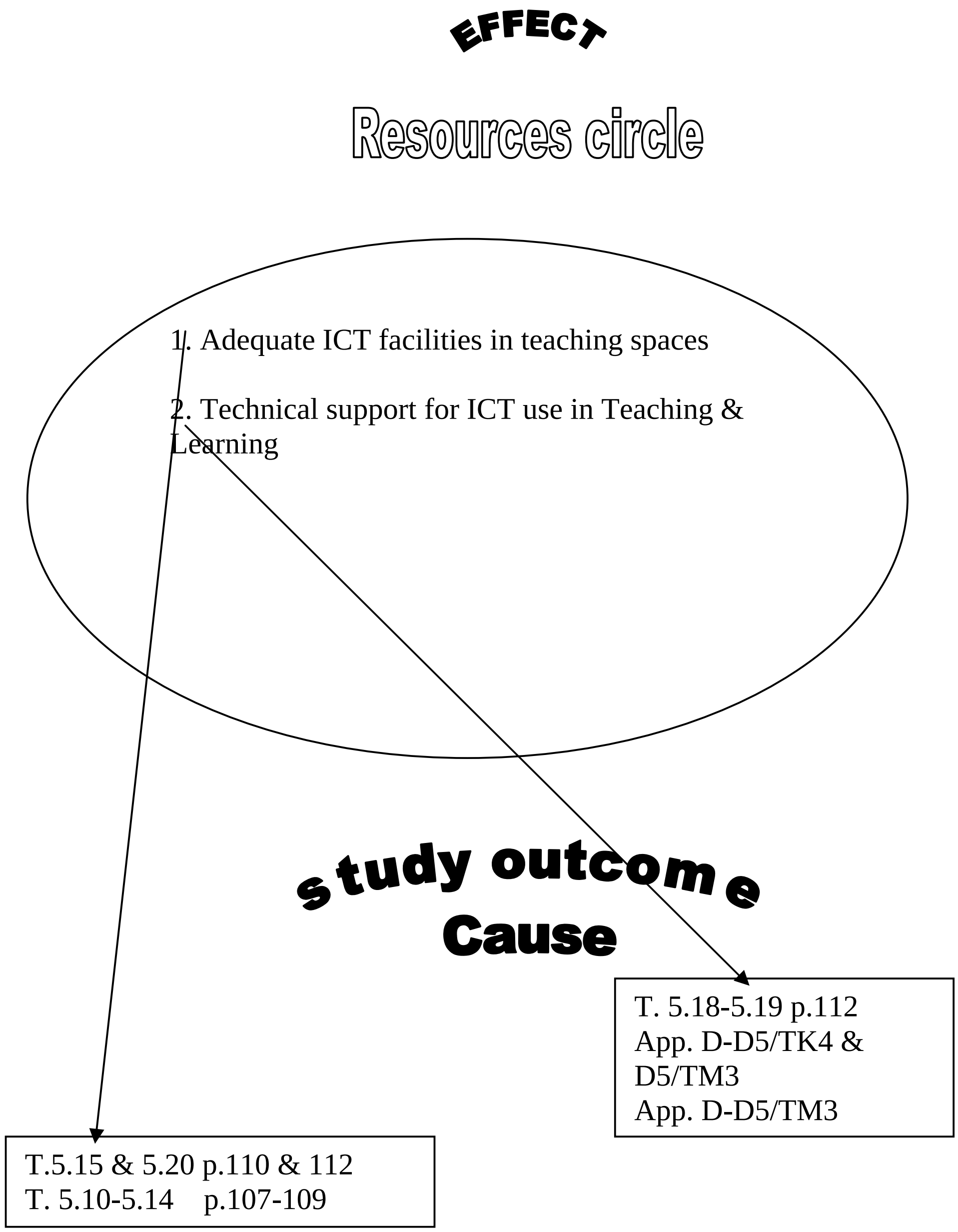
It has been clearly documented in this study, that for effective use of ICT in teaching and learning, high quality technical support is crucial (Appendix D-D5/TM1). More importantly the evidence from this study is that such technical support needs to be sourced within the School and that the people who are providing the service need to adopt a more ‘humanistic’ approach to those they are helping. The range and varied use of ICT across the School also calls for different levels of ICT support.

The research has clearly documented that the effective integration of ICT in teaching and learning involves a great deal of time and effort for individual staff, not to mention making others aware of the potential of ICT, asking them to change their existing practices and teaching them new skills(Appendix D-D5/TK4 &D5/TM3).

As indicated earlier in this chapter, one can currently imply that, the CEA maybe responsible for professional development & educational media support (p.149). These functions of the CEA are certainly important to the advancement of ICT in teaching and learning, however in order to be more effective a CEA representative needs to be located within a group of schools. Another option would be that the CEA representative could be an existing academic staff member in the School who has successfully integrated ICT into their teaching and learning and would be able to assist others. This staff member could be seconded into such a position for a period of not less than two years. The School would have to recognize this as a valuable contribution and would have to provide some incentives for staff to apply for such a position.

Perhaps utilizing the Teaching & Learning Performance Index scheme, bonus points could be allocated to people who would take on such a role. Having an internal staff member perform such a role would be valuable as any resistance to them in their role as a change agent would be less than that of an outsider - the data clearly reflected that targeted in-house sessions were preferred to the one-off sessions conducted in a different environment with others at various levels and from other disciplines (Appendix D-D5/TM3).

Figure 5.7 Relation of the Resources Model to the Study Outcomes



People

If individuals do not perceive there is value in changing or adoption of innovation, it will simply not occur (Taylor, 1995; McNaught et al., 1999; Bates, 2000). At the individual level, teaching staff need to demonstrate their commitment as members of a professional learning community. First, by viewing themselves as professionals and participating in the following key practices – reflective practice, receptivity to change, positive attitude toward ICT, work toward teaching credentials, maintenance of computer literacy standards, attention to professional development, model best practice. The final component, “People”, is once again a vital component in the development of a UAE Professional Learning Community Model.

Reflective practice

Engaging in reflective practice is commonly viewed as an important part of the professional development of all teachers and hence a key element of this component. The research data has demonstrated that not many of the School’s teaching staff involved in this study was truly reflective about their use of ICT. The evidence is that through use of and reflection about ICT, teaching staff can integrate ICT in a manner which encourages deep and meaningful learning and reach a "critical mass" (Gilbert & Green, 1995; Rogers, 1995; Deden, 1998).

Receptive to change

There is a real need for individual teaching staff to develop a sense of professionalism by questioning their own receptivity to change and personal attitude toward the adoption of ICT. This is vital as nearly the majority of the survey sample at high schools indicated that they needed to see a proven need for ICT in their own discipline (Appendix D-D1/TA1-TA4). Questioning one’s receptivity to change and attitude will only occur through an awareness of the change process and sensitivity to the needs of the environment (Lan, 1997; Candiotti & Clark, 1998).

Professional development

Time is a precious resource and individual staff needs to continue to be resourceful as they have shown in the past, and engage in appropriate professional development activities (Baldwin, 1998). Becoming part of a professional learning team is an effective way of creating an ongoing support structure which builds in professional development for the integration of ICT into teaching and learning. It is important that staff recognize the need for ongoing professional development and with the help provided by the School continue to participate in such activities as conferences, training sessions, and workshops and show case demonstrations. Research results show the transfer of ICT knowledge to teachers through standard sources and mechanisms are either non existent or minimal (table5.25 p.116). The literature emphasizes that telecommunications used by teachers enhances contact to other educators, experts, scientists, and practitioners to discuss issues related to their teaching practice, developments in their field, and classroom experiences (US Congress, Office of Technology Assessment, 1995).

Computer literacy standards

My research results showed that, high schools in the UAE need to begin to set computer literacy standards for academic staff as well as for students. These standards require the provision of practical guidelines. It is crucial that these competencies are constantly revisited and monitored to determine whether the benchmarks reflect the School's current vision and strategic plan. These standards should be based on the needs of the current environment and, as indicated by this survey, focus on the early majority group of adopter categories (chapter three pages 31-41). Specific to high school teaching staff, the minimum performance standards is suggested in table 5.61 p.155. These standards deemed important in defining the application standards of teaching staff as results of my research indicates low or minimal applications performance where only 59% are performant in general purpose software, and only 51% can use ICT for instructional purposes (table 5.36 p. 126). Also only 49% use www for instructional purposes with no notion of web based development and a limited number (12%) use e-mail (Appendix D-D1TA1-TA4). Consequently the suggested standards can be closely linked to an individuals self assessment of their ICT skills, attitudes and application and followed by designing a realistic plan of attack which would enable the individual to best achieve this plan. The CEA representative could aid in this process. The most important belief is that the individual recognizes the need for such standards.

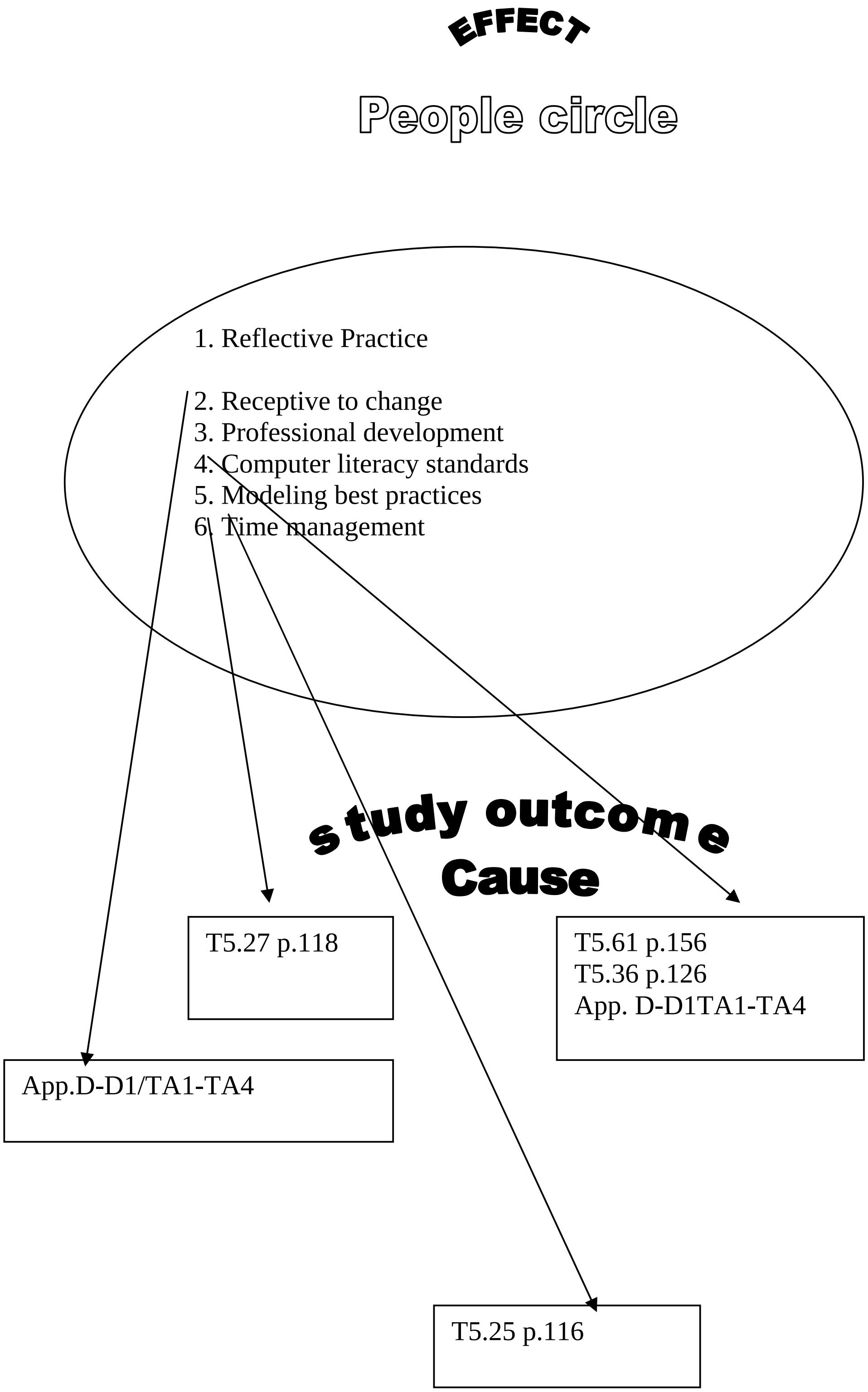
Modeling best practice

A powerful tool in this specific area of professional development is the modeling of effective use of ICT in teaching and learning. The Innovative Teaching Practice Awards are a useful start in this area; however Schools need to tap into as many sources of innovative practice as possible. As the literature suggests that the lack of models for integrating ICT into teaching & learning have surfaced as a major inhibitor to the use of ICT in teaching & learning (Schofield, 1995; Gilbert, 1996a; Northrup, 1997).

Time management

What appears to be happening at the School is that academic staff is opting to combine the two environments of face-to-face and ICT oriented skill based pedagogy, in order to cater for various learning styles and to meet individual needs. The lure of providing an environment which enables easy communication between staff and students, as well as providing effective course management facilities has also strongly influenced their selection. This combination also gives rise to an increase in workload. Academic staff is adopting an ICT skills based environment to complement their already existing face-to-face unit without having altered the amount of time allocation to their face-to-face sessions (table 5.27 p.118). Academic staff at Schools need to manage their time more efficiently and effectively and determine how best to spend their time (face-to-face and ICT skills based).

Figure 5.8 Relation of the Peoples Model to the Study Outcomes



Final Comment

This study has attempted to examine the adoption, use & impact of ICT in teaching and learning across sampled high schools in the UAE. From these data sets a model called the UAE Professional Learning Community Model has been introduced. The data collected in this study indicates that high schools in the UAE have demonstrated their commitment to the use and encouragement of ICT in teaching and learning though nevertheless the realization of this commitment was low. A number of initiatives can be implemented to enhance this process. For instance, the establishment of the Center of Educational advancement (CEA) under the Office of Teaching and Learning can offer a variety of professional development courses established for high school staff which personifies the schools commitment. The introduction of the Innovative Teaching Practice Award (ITP) program at schools can be initiated by the Office of Teaching and learning to provide recognition and reward for exemplary teaching by individuals, teams and Schools.

Many of the teaching staff at the sampled high schools involved in this particular study has clearly demonstrated their commitment to the adoption of ICT in their teaching and learning. Through the data derived from the various instruments the researcher was able to identify the factors which hindered the adoption of ICT at an individual level; time, skills, resources, facilities, technical support, software support, recognition, reward structures, a favorable attitude, and perceived benefits. These outcomes are consistent with previous studies of educational environments (Baldwin, 1998; McNaught et al., 1999; Bates, 2000; Fox, 2001).

The problem high schools face today and in the future will not just be about creating strategies to encourage the adoption of ICT in order to achieve a preconceived ‘critical mass’ – the challenge will be how to keep up with the demands these changes place on the overall system. How will high schools provide the appropriate infrastructure and support for academic staff to continue integrating ICT effectively in their teaching and learning? If this support is not provided teaching staff will simply return to what they know works for them (Fullan, 1992b).

The study has identified that commitment needs to come from two levels – the school and the individual – and if this does not occur, the school will be faced with individual staff feeling frustrated and unsupported. If individuals are unable to commit to their role in developing teaching and learning using ICT then the school may not be able to meet the needs of the current environment, hence putting at risk the teaching quality of the whole school. This study has clearly shown that it is only through the synergy of school commitment and individual commitment that real change can actually take place, the change in this case being the adoption and impact of ICT on teaching and learning practices. The strategies suggested by the participants in this study and formalized by the empirically derived model can be the beginning of the journey to teaching professionalism at the high school level.

CHAPTER SIX

6.0Conclusion

6.1 Introduction

This chapter summarizes the results of the research with respect to the impact of Technology (ICT) on teaching and learning in high schools in the UAE. These results also shed insight on the impact of ICT on curriculum and pedagogy, ICT infrastructure, staff development, management and organization, teaching function and student learning. The implications of these findings are discussed with reference to the policy actions being taken by the participating schools.

Reflections are offered for the present and future policy issues posed by the challenges of rapidly evolving ICT.

Four systemic aspects are recognized as most essential to describing and comparing ICT-related activities in education. They are:

• **Curriculum and pedagogy:** Included here are ICT-related objectives and pedagogical practices employed in schools across various subjects, not just informatics. A most important question within this aspect is: to what extent have the goals and practices been re-directed to satisfy the holistic incorporation of ICT in teaching and learning in the UAE and other requirements of information societies?

• **Infrastructure:** The information infrastructure consists not only of hardware and software but also of support services to maintain them. The latest and most pressing development in this respect is the emergence of networks, particularly the Internet.

• **Staff development:** Because ICT has been evolving at such a rapid pace, the challenge of developing ICT skills, both technical and pedagogical, of principals and teachers looms large. Programs for professional development of these skills require funding, facilities, incentives, and setting of priorities.

• **Management and organization:** Leadership for successful ICT integration requires not only budgets but also policies and other actions to ensure that the ICT programs are guided and implemented with the understanding that comes from evaluating the interim results of these programs.

• **The impact of ICT on the teaching function and on Learning:** Included here is information about how ICT affected the role of teachers, their planning of teaching and the assessment of learning .Also the students technology levels were pursued as well as seeking answers on motivation and empowerment levels as a consequence of using ICT. Information was sought as to the specific learning achieved, the development of intellectual skills and whether ICT contributed in the way students approached knowledge.

6.2 Summary of Main Findings

Curriculum and Pedagogy

A unifying theme of this entire study has been the emergence of a new paradigm for learning and teaching. In many different educational systems, shifting goals and pedagogical practices have been observed, which we have called the 'emerging paradigm' or as Rogers (1995) says the Innovation which in our case is the implementation of ICT. This paradigm is grounded in the growing need for information in the society at large and for life-long learning in particular. In this section we focus upon the instructional practices that are consistent with this paradigm—those that are called 'emerging practices' (discussed in chapter five). The emerging pedagogical practices emphasized individual students taking responsibility for their own learning, including self-pacing and searching for information. Cooperative learning and project based learning were included in the composite scores used to measure the degree of support for emerging practices.

The most important finding was that emerging pedagogical practices were not playing a significant role in high schools in the UAE. The school principals indicated average presence of emerging practices for all high schools (chapter five p.134-136). Also research results show that there is an urgent need to improve learning & communication and collaboration processes.

Another noteworthy finding was that more than half of the teachers indicated that the schools had e-mail and www access for at least the past two years and the majority of school principals indicated the existence of policy goals to use e-mail and www. Nevertheless teachers and students were not using it as part of their instruction process (table 5.39 p.128).

While the researcher found evidence of support for ICT, the reality is that these new practices have not permeated the curriculum as only 23% teacher/class implemented ICT in the curriculum. The students may be learning word-processing and spreadsheets in their informatics classes, but they are not necessarily using educational software in their other classes. In the UAE a few teachers were attempting to integrate technology tools into their teaching of various subjects. Only in rare instances was this pedagogical practice widespread (tables 5.53-5.54 p.135-136).

Infrastructure

As reported in chapter six, nearly all of the sampled schools had initiatives to provide all high schools with ICT. For example as a national initiative, The MoE had promised that ‘each school will be equipped with adequate hardware and software’, ‘ equipping schools with adequate ICT resources’ and connection in every school and a relatively high density of computers in relation to students.

The percentage of computers at schools that are multimedia-ready is an increasingly used indicator of whether or not the installed base of ICT is adequate for contemporary applications. In the UAE, the results show a low computer to student ratio and the average percentage of multimedia ready computers in secondary schools was 46%. One implication of these findings is that improved policies on ICT renewal or replacement are needed in most educational systems.

The Internet is the most dramatic new aspect of school information infrastructure. According to the research results, more than one-third of the sampled schools had the intention to equip schools or their students with access to the Internet. This policy is inline with that of the MoE’s vision 2020, where the UAE has a five-year strategy starting in the year 2000 to ensure that all schools would be connected to the Internet by the year 2005. Nevertheless the survey results indicated that only 36% of the sampled high schools had been connected.

Staff Development

By building infrastructure in schools, the hope is that students will be able to use ICT and benefit from it. However, even with a costly infrastructure, an effective environment for learning with the aid of ICT may not be realized due to inadequate staff support, which is likely to be a consequence of insufficient staff development. Research results showed that the teaching staff from the sampled high schools have not reached the critical mass stage regarding the integration of ICT in teaching and learning as not enough individuals have adopted the innovation therefore the innovations further rate of adoption is not self-sustaining. This was ascertained by the school wide rating.

As reported in Chapter 5, the researcher found nearly all principals agreeing that their goal was to provide all their teachers with an opportunity to develop their abilities to use ICT; however only about one-fifth agreed that they had actually realized this goal. This surprisingly large gap between desire and implementation identifies a major weakness in the ICT-related strategies of most secondary educational systems.

The UAE was found to be providing very little teacher preparation in ICT relative to what would be needed for them to accomplish the goals of integrating ICT into their daily instruction. It would seem that many policy decision-makers do not realize that for their investments on infrastructure to be effective, comparable investments are needed for development of teacher skills in the technical and pedagogical aspects of ICT.

As noted in chapter six, some schools had mandatory ICT course requirements for teachers. The survey found another surprising pattern across many schools, namely that few teachers were actually taking basic ICT courses even when they were not mandatory. However, this pattern was reversed for continuing staff development.

Thus, it seems that teachers are willing to attend some introductory ICT courses, but are eager to continuously refresh their ICT knowledge and skills.

Another important finding was that not only were teachers experiencing problems related to receiving adequate opportunities for ICT skills-related professional development, their preparation in instructional processes was poor too. In almost all schools relatively few teachers said they were prepared for applications needed to integrate ICT into instruction.

Management and Organization

Management and organization is a policy matter generally left up to local school leadership. The main themes of management and organization in this study were vision of the Leadership and the establishment of ICT-related policies. Principals were asked if their ‘school had developed a common vision on the use of computers’. Almost all of them indicated that their school had a goal for such a vision, but quite a few said that this goal was realized.

The principals in general tended to have favorable attitudes toward ICT, but this was often not translated into managerial action. The principals were asked if their school had explicit policies on a variety of different ICT-related matters, and in some schools only a very small percentage had such policies. The same pattern was true for taking measures to prohibit access to adults only material. There are specific steps that can be taken, both technical and ethical, to minimize problems in areas related Internet access. In schools that are utilizing ICT extensively in many subjects, such steps are generally necessary to reduce the likelihood of serious problems developing. These findings signal that managing the Internet is an emerging demand for schools. This management requirement is not so much a matter of resources or equipment but rather a social concern. It is very easy for students and teachers to use the Internet inappropriately, so policies have to be established to define acceptable boundaries and the consequences for crossing such boundaries.

Impact on Teaching and Learning

The research results as discussed in chapter six indicated that the majority of respondents agreed that ICT has impacted the role of teachers and changed it from content expert to that of mentor thus sharing the knowledge process with the students. Also this new attitude towards pedagogy has enhanced the students' thinking process, increased their skills coverage and widened their attainment scope thru the use of internet. It is interesting to note that the teacher/student performance was greatly improved.

Although the majority of teachers had agreed that ICT affected the planning of teaching as they now need to include ICT related skills in their course materials and in the way they expect their students to present their feedback on the learning process such as presentations and wider homework solving skills. Nevertheless, there was a mismatch between policy and implementation as the policy goals and desires of the teachers was very low on the realization scale in the UAE. Very little is being done in the UAE regarding the assessment methods, as teachers need support and time in making use of new strategies and technologies to enhance their personal work before learning to use them in their teaching.

Schools in the UAE seem to produce students with skills as the major contribution of ICT rather than skills being a tool to enhance their various intellectual skills. It was interesting to see that attitude questions scored as high as skills related questions. The research results showed that incorporating ICT into the teaching and learning process is also an attitude matter which should be incorporated in the school. More than three quarters of the students were happy at the use of technology in the classroom and confirmed that ICT increased their confidence and motivation in the subject matter. It was encouraging to see that 15% of the students believed that technology enhances their thinking power rating much higher than skills improvement (9%).

Research results confirmed the assumption that ICT affects teacher/student relationship and role as both giver and receiver of knowledge. The observations and survey results show that ICT manifested this impact in that it increased the students' attainment scope, although students use more ICT related skills nevertheless it encompasses only 28% of their academic classes., students are clustered in groups and teachers help groups rather than each student nevertheless teachers managed classes effectively although the differed from a normal class configuration. It is not surprising to see that the results of the observations show that schools in the UAE are still teachers centered as the emerging ICT related pedagogy is low.

6.3 Contribution of the Research

The research reported in this thesis is important for the following reasons:
First, the study is based on a holistic approach rather than unrelated pieces of information. This holistic approach referred to policy, practice, social and cultural perspectives, curriculum and management environment. This study gathered data directly from schools giving it a firm foundation.

Second, this study should be of particular interest to those policy makers at secondary schools who intend planning for the adoption of ICT in a practical way to enhance teaching and learning at their school. This study develops a practical model, which promotes the adoption of specific strategies over others. The recognition and adoption of a particular model and subsequent strategies by an institution would certainly be of significance to the teachers and students at that high school.

Finally, this analysis can assist future policy in the UAE, particularly with regard to integration of ICT into the curriculum; and initiate projects to determine the generic ICT skills needed by teachers through an ICT competency framework.

6.4 Limitations of the Research

✓ The researcher has chosen to investigate the impact and status of technology (ICT) in high schools in the UAE from the respective of the major stakeholders; such a choice has been made based on the limited time frame available to the researcher as well as on the complexity due to the increased number of stakeholders involved.

✓ The investigation covered the public high schools only. An investigation of the private high schools would have added more insight to the research.

- ✓ ICT is constantly changing with the development of new ideology; there is always a need to update the knowledge related to the proposed framework and to the technology development and adoption worldwide in educational innovation.

6.5 Suggestion for Further Research

Information technology is changing at a very fast pace, and all evidence suggests that it will continue to do so. The research reported in this study confirms that schools around the world are adapting to the evolving technology. In fact, what we have documented here is the particular role that ICT is playing in the evolving or emerging instructional practices that is being increasingly used in schools.

The breadth and depth of these ICT-supported emerging practices suggest that these trends will persist, if not accelerate and expand, in the coming decade. For ICT to play a supportive, beneficial role in improving education in the future, the most critical factor is whether or not educational leadership, at all levels, continues to address the policy issues as they emerge, including the need to develop the capacity for schools to be ICT-supportive learning organizations.

The future depends upon whether key future-oriented policy issues are given ongoing attention. For instance, are ICT replacement policies being frequently modified to adjust for technological changes? Are policies being established and refined whenever new Internet opportunities are created for students to find and use harmful materials? Is the content of staff development current with the technical and instructional opportunities available for teachers? Are periodic assessments in place to illuminate instances (digital divides) where students are not getting equal opportunities for participation in ICT-supported functions?

The results of this study point to such issue areas as those that need to be monitored, analyzed, and addressed by school policies. Overall, the results of this study raise many difficult but important questions about the effects of various modes of utilizing ICT in the learning process. Future research on:

- ✓ Why ICT typically plays such a narrow role in the curriculum.
- ✓ What is the extent to which ICT may contribute to the process of reforming schools so that they are better placed to adopt and implement the emerging practices.

- ✓ The challenge will be that determining how teachers' ability to use ICT for instructional purposes can be improved.

can help build upon this foundation to improve the ways in which information and communication technologies improve education.

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Appendix (A)

Survey Instruments

A.1 Technology Survey Questionnaires

A.2 Pilot-Technology Survey Questionnaires

A.3 Interview Schedule

A.4 Observation Protocol

A.1.a Technology Survey Questionnaires/ Principals

PART ONE-PRINCIPALS TECHNOLOGY SURVEY

School Name:
School Code No.:
School Gender: __1__ Males __2__ Females

A SCHOOLS PRINCIPAL'S TECHNOLOGY SURVEY ON THE IMPACT OF INFORMATION TECHNOLOGY ON TEACHING AND LEARNING IN HIGH SCHOOLS IN THE UAE.

The following is in partial completion of my Doctorate degree requirement for the University of Leicester, England. Your participation in this survey will remain confidential. The survey is only for the purposes of my research project and while the results will be revealed to anyone of the participants who is interested, the individual responses will **NOT.**

Thank you for your time,

Researcher: Nadia Farhat,

Management Information Systems Department,

College of Business Administration,

Sharjah University.

Please complete all of the Questions.

A. GENERAL INFORMATION ABOUT YOUR SCHOOL

Code	Factor	Answers
A1	Total number of classes	
A2	Total number of students	
A3	Total number of teachers	
A5	Total number of Emirate teachers	
A6	Total number of Non-Emirate teachers	

B. THE ICT RESOURCES IN YOUR SCHOOL

For questions B1, B4, and B6 please (unless otherwise specified):

- ***Count terminals (if it has a keyboard and a screen) as computers***
- ***Exclude computers which are not in use***
- ***Exclude computers which are only used as servers***
- ***Exclude computers which are only used for teachers and/or administrative purposes***
- ***Exclude graphical calculators***
- ***Exclude personally owned computers brought to school by teachers and/or students***

Code	Question and Items	Answer
B1	How many computers are available for use by students of grade 11 and 12 in the school?	
B2	How many students in the 11 and 12 grades are using the computers listed in question B1?	
B3	What percentage of students from the 11 and 12 grades brings their own laptops to the school?	
B4	List the number of fixed computers used by 11 and 12 grades students for educational use in different computer rooms (Labs).	
B5	List the number of fixed computers used by 11 and 12 grades students for educational use in classrooms.	
B6	List the number of fixed computers used by 11 and 12 grades students for educational use in other locations (for students or teachers).	
B7	How many of the total number of computers from questions B4-B5 are in a local network?	
B8	How many students from grades 11 and 12 are using the computers listed in questions B4-B8?	
B9	How many computers listed in questions B4-B5 are available to use by grades 11 and 12 students use Latest version of windows XP	
B10	How many computers listed in questions B4-B5 are available to use by grades 11 and 12 students use Windows2000, Win NT, or MacOS 7.5 and higher	

B11	**How many computers listed in questions B4-B5 are available to use by grades 11 and 12 students use Windows95/98, Win NT, or MacOS 7.5 and higher**	
B12	**How many computers listed in questions B4-B5 are available to use by grades 11 and 12 students use Other systems**	

B13 **Does your school have any computers (in addition to the computers listed in questions B1) which are not currently in use by teachers and/or students for teaching and/or learning purposes?**
__1__ Yes __2__ No

B14 **From question B15, Why are they not in use? Put ✓ or ✗ in the answer box**

Code	Reasons of not in use	Answer
1	Computers are out dated	
2	They are not compatible with other computers	
3	They are broken	
4	Teachers/students do not know how to use them	
5	Other reasons	

B15	**With respect to the total number of computers from questions B4-B5, how many are multimedia computers (equipped with a CD-ROM and a sound card)?**		
B16	**Does your school have access to the Internet for instructional purposes?**	**Yes**	**No**
B17	**If "No" in B18, When do you expect that the school will get Internet access: In (year)**		
B18	**How many of the computers listed in questions B4-B5 can have access to e-mail at the same time?**		
B19	**How many of the computers listed in questions B4-B5 can have access to the World Wide Web at the same time?**		

B20 **Which of the following peripherals are available at your school for educational use in grades 11 and 12? Put ✓ or ✗ in the answer box**

Code	Peripherals	Answer
1	Laser printer	
2	CD-ROM driver	
3	Devices for mentally and/or physically disabled students	
4	Devices for digital image or video processing	
5	Color printer	
6	CD- Writer (CD-R, DVD)	
7	Graphic Tablet	
8	Video Projector	
9	Scanner	
10	LCD-panel	

B21 **In your school, which of the following types of software are available for teaching and learning (in grades 11 and 12) on at least one computer? Put ✓ or ✗ in the answer box**

Code	Software item	Answer
1	Word processing, desktop publishing	
2	Spreadsheet	
3	Database	
4	Graphics: presentation, no professional drawing	
5	CAD (computers aided design), CAM (computer aided manufacturing)	

6	**Statistical, mathematical programs**	
7	**Programming Languages**	
8	**Accounting, book-keeping, financial software**	
9	**Drill and practice programs**	
10	**Tutorial programs (for self learning)**	
11	**Simulations (e.g. Real world simulations)**	
12	**Educational games**	
13	**Recreational games/other games**	
14	**For exam/tests/constructing tests/administrating tests**	
15	**Internet browser**	
16	**E-mail software**	
17	**Encyclopedia on CD-ROM**	
18	**Video/audio/author-ware**	
19	**Music composition**	
20	**Presentation software (e.g. PowerPoint)**	
21	**Software supporting Microcomputer Based Laboratories**	

C- HISTORY OF ICT IN YOUR SCHOOL, CURRENT OBJECTIVES, AND USE

No.	Questions and items
C1	**How many years have computers been used by your school for teaching and/or learning activities/purposes for students in grades 11 and 12? (_____) years**
C2	**How important were each of the following goals in determining how computers are now used at your school?**

1 = *Not Important* (NI) 2 = *Important* (I) 3 = *Very Important* (VI)

Code	Goals	NI	I	VI
1	To prepare students for future jobs.	1	2	3
2	To improve student achievement	1	2	3
3	To promote active learning strategies training courses	1	2	3
4	To individualize student learning experiences curriculum purposes	1	2	3
5	To encourage more cooperative and project-based learning.	1	2	3
6	To develop students independence and responsibility for own learning.	1	2	3
7	To give students drill and practice exercises.	1	2	3
8	To make the learning process more interesting.	1	2	3

No.	Questions and items
C3	**To what extent is each of the following aspects of teaching and learning present in your school and to what extent has ICT been used in realizing these aspects?**

Tick two answers per practice: one for presence and the other for the realization via ICT.		Present				Realized via ICT		
Code	Teaching and Learning practices	Never	Usually	Many		Never	Usually	many
1	Combining parts of school subjects with	1	2	3		1	2	3

2	Students developing abilities to undertake independent learning.	1	2	3		1	2	3
3	Providing weaker students additional instruction.	1	2	3		1	2	3
4	Organizing teaching and learning so that differences in entrance level, learning pace, and learning route are taken into account.	1	2	3		1	2	3
5	Students learning to search for information, process data, and present information.	1	2	3		1	2	3
6	The emphasis I am learning is on the development of skills.	1	2	3		1	2	3
7	Students working on the same learning materials at the same pace and/or sequence.	1	2	3		1	2	3
8	Teachers keeping track of all students' activities and progress.	1	2	3		1	2	3
9	Students being largely responsible for controlling their own learning progress.	1	2	3		1	2	3
10	Students learning and/or working during lessons at their own pace.	1	2	3		1	2	3
11	Students involved in cooperative and/or project-based learning.	1	2	3		1	2	3
12	Students learning by doing.	1	2	3		1	2	3

C4 According to your school's objectives, which of the following skills should your students acquire by the end of their grade? Put ✓ or ✗ in the answer box

Code	Skills	Answer
1	Operating a computer (saving files, printing, keyboarding)	
2	Writing documents with a word processor (typing, editing, layout)	
3	Making illustrations with graphical programs	
4	Calculating with spreadsheets programs (sheet creation, using formulas).	
5	Writing simple programs	
6	Communicating via e-mail with teachers and other students	
7	Sending, searching for, and using electronic forms of information	

C5 Does your school have written policy or statements with regard to the use of computers for educational purposes by students in the specified grades?

( ) No, proceed to question C6.

( ) Yes, which of the following does it include? Put ✓ or ✗ in the answer box

Code	Written policy or statements	Answer
1	Use of computers in the current school year	
2	Use of computers in the forthcoming school years	
3	Plans for hardware replacement of upgrading	
4	Plans for staff development with regard to ICT training	
5	Specifications for computer- related tasks and persons in charge	

7	Equity of access	
8	Internet policy	

C6 Indicate whether special measures have been set up in your school to ensure the following statements?

Code	Statements	Yes	No
1	Rewards given to teachers who use ICT	1	2
2	Incentives for teachers to take ICT courses or training	1	2
3	Security measures to prevent unauthorized system access or entry	1	2
4	The honoring of intellectual property rights	1	2
5	Restricted game playing on school computers	1	2
6	Specifications of compulsory student computer-related knowledge and skills	1	2

C7 The following statements concern the use of computers in different aspects.

Please answer two questions for each aspect:

1) Is it a policy goal in your school
2) To what extent has this been realized in your school

Code	Statements concern the use of computers in different aspects	Policy Goals			Realized		
A	Learning process	Yes	No		Low	Moderate	High
1	One or more computers available in every classroom	1	2		1	2	3
2	Teachers use computers in their instructional practice.	1	2		1	2	3
3	Encouraging independent learning with the aid of computers	1	2		1	2	3
4	Students using computers as supportive learning aids	1	2		1	2	3
B	Communication/collaboration	Yes	No		Low	Moderate	High
1	Every teacher has an individual e-mail address at/via school	1	2		1	2	3
2	Students use e-mail	1	2		1	2	3
3	Students access external databases via the Internet/WWW	1	2		1	2	3
4	Cooperation with other schools in the area of computers	1	2		1	2	3
C	Others	Yes	No		Low	Moderate	High
1	Provision of training for all teachers in using ICT for educational purposes	1	2		1	2	3
2	Provision of training for one or a couple of teachers to become an ICT –specialist of computers	1	2		1	2	3
3	Development of a common vision on the use of computers within the school	1	2		1	2	3
4	Assignment of non-teaching hours to teachers to support the use of computers in the school	1	2		1	2	3
5	Attention to norms and values in using Internet/WWW	1	2		1	2	3

D- ICT SUPPORT AND NEEDS

Code	Questions and Items
D1	How many hours a week are formally allocated to computer coordination for the individuals marked in the previous question? (_______) hours a week.
D2	Who coordinates and/or provides leadership at your school relating to teachers' instructional use of computers and training of teachers? Put ✓ or ✗ in the answer box

Code	Computer-related activities Coordinator	Answer
	Nobody coordinates	
	A full – time computer coordinator with possibly a small teaching load	
	A classroom teacher	
	A person from the (national, regional, provincial, district) level.	
	The school principal or non teaching administrator	
	Another person	
	A committee for the coordination of technology	

E. YOUR PERSONAL OPINIONS ABOUT THE VALUE OF ICT

Please indicate how strongly you agree or disagree with the following statements related to the role of computers and other Information and Communication Technologies using the following scale?

1 = Strongly Disagree (SD) 2 = Disagree (D) 3 = Uncertain (U) 4 = Agree 5 = Strongly Agree (SA)

Code	Statements	SD	D	U	A	SA
1	Students are more attentive when computers are used in class	1	2	3	4	5
2	Every school should have access to the Internet/WWW	1	2	3	4	5
3	Every student should learn about e-mail	1	2	3	4	5
4	Internet /WWW offer excellent opportunities for educational applications.	1	2	3	4	5
5	ICT can effectively enhance problem solving and critical thinking skills of students.	1	2	3	4	5
6	All teachers should have their own e-mail address	1	2	3	4	5
7	ICT can accommodate student's varied needs preferences and learning strategies by providing new tools for knowledge manipulation, expression and creativity	1	2	3	4	5
8	ICT can help teachers to attune to the learning and pace of the individual student.	1	2	3	4	5
9	ICT should be used more by teachers to create environments for students' independent learning.	1	2	3	4	5
10	ICT improves the monitoring of the student's learning progress	1	2	3	4	5
11	Computers help to teach more effectively.	1	2	3	4	5
12	In-service training courses on computers should be made compulsory	1	2	3	4	5
13	The achievement of students can be increased when using computers for teaching.	1	2	3	4	5
14	The use of e-mail increases the motivation of students.	1	2	3	4	5

15	Teachers should initiate more cooperative and/or project-based learning.	1	2	3	4	5
16	All teachers should acquire ICT certification.	1	2	3	4	5
17	Using computers in class leads to more productivity of students	1	2	3	4	5
18	The use of ICT is a ministry of Education Requirement	1	2	3	4	5
19	The use of ICT is an educational Trend in the UAE	1	2	3	4	5

F. STAFF DEVELOPMENT

The following contains some questions about ICT related training for teachers of grades 11 and 12?

Code	ICT related training
1	Is it obligatory for all grades teachers to take at least two basic computer courses? __1__ Yes __2__ No
2	Is it obligatory for all grades teachers to regularly take courses to update their ICT knowledge and skills? __1__ Yes __2__ No
3	What is the number of teachers that attended at least two computer coerces the past two academic years? (__________) teachers.
4	What is the number of teachers regularly take courses to update their ICT knowledge and skills the past two academic years? (__________) teachers.

G. OBSTACLES WITH REGARD TO ICT IN YOUR SCHOOL

No.	Questions and Items
G1	Indicate whether or not you consider each of the following to be major obstacles affecting the realization of your school's computer-related goals for students in grades 11 and 12.

Code	Obstacles	Yes	No
	Hardware		
1	Insufficient numbers of computers	1	2
	Software		
2	Not enough copies of software for instructional purposes	1	2
3	Not enough types (variety) of software	1	2
	Instruction		
4	Insufficient time for teachers to prepare lessons in which computers are used	1	2
5	Difficult to integrate computers in classroom instruction practices	1	2
6	Not enough staff for supervising computer using students	1	2
7	Problems in scheduling enough computer time for different classes	1	2
	Internet/WWW		
8	Difficult to use with low achieving students	1	2

	9	**No time in the school schedule for using the Internet/www**	**1**	**2**
		Other		
	10	**No time in teacher's schedules to explore opportunities for using the Internet/www**	**1**	**2**
	11	**Not enough space to locate computers appropriately**	**1**	**2**
	12	**Lack of interest /willingness of teachers to use computers**	**1**	**2**
	13	**Teachers lack knowledge of / skills in using computers for instructional purposes**	**1**	**2**
	14	**Not enough training opportunities for teachers**	**1**	**2**
	15	**Insufficient plans/resources to prevent theft and vandalism of computers**	**1**	**2**
	16	**Lack of support from school's governing body or community**	**1**	**2**
	17	**Weak infrastructure (telecommunications, electricity, available room space, etc.)**	**1**	**2**

G2 **Which of the obstacles from the list above do you consider as most serious?**

Please list a maximum of 4 numbers From the list above:

First choice: _____

Second choice: _____

Third choice: _____

Fourth choice: _____

H. Teacher PERSONAL BACKGROUND INFORMATION

Code	Personal Factors
1	**How many years being Principal of this school? (_____) years**
2	**How many years being working in any professional capacity at this school (including years as teachers, vice-principal)? (_______) years**
3	**How many years being Principal of any other school (including this school)? (_____) years**
4	**Please indicate your gender? __1__ male __2__ female**
5	**Your age? (_____) years**
6	**How often do you personally use a computer? *Tick one.*** **__1__ Never __2__ A few times a year __3__ Almost monthly __4__ Weekly __5__ Daily**
7	**What do you use your computer for?**

Code	Computer uses	Yes	No
1	Writing documents and letters	1	2
2	Using spreadsheets	1	2
3	For planning purposes	1	2
4	For communication- the Internet, e-mail	1	2
5	For searching and using information on www	1	2
6	For teaching/instruction	1	2

This is the end of the questionnaire.

Thank you very much for your cooperation.

A.1.b Technology Survey Questionnaires/ Teachers

Part One-TEACHERS TECHNOLOGY SURVEY

Questionnaire No. (______)
School Code No.:
School Gender: __1__ Males __2__ Females

A TEACHER'S TECHNOLOGY SURVEY ON THE IMPACT OF INFORMATION TECHNOLOGY ON TEACHING AND LEARNING IN HIGH SCHOOLS IN THE UAE.

The following is in partial completion of my Doctorate degree requirement for the University of Leicester, England. Your participation in this survey will remain confidential. The survey is only for the purposes of my research project and while the results will be revealed to anyone of the participants who is interested, the individual responses will NOT. Permission has been given for this incursion into your valuable time.

I am grateful to you for setting time aside to complete this survey as I know how precious a commodity time is. I respectfully request, as a professional courtesy, that you complete and return this questionnaire as soon as possible to me, Nadia Farhat, MIS Department, College of Business Administration, Sharjah University.

Thank you for your time,

Researcher: Nadia Farhat,

Management Information Systems Department,

College of Business Administration,

Sharjah University.

Please complete all of the Questions.

A- USE OF ICT

No.	Questions and Items
1	**Do you use E-mail for instructional purposes?** **__1__ Yes __2__ No**
2	**Do students of grades 11 and 12 use E-mail for instructional purposes?** **__1__ Yes __2__ No**
3	**Do you use the WWW for instructional purposes?** **__1__ Yes __2__ No**
4	**Do your students of grades 11 and 12 uses the WWW for instructional purposes?** **__1__ Yes __2__ No**
5	**In what year were E-mail first used by your school for teaching and/or learning purposes in grades 11 and 12? (______)**
6	**In what year were WWW first used by your school for teaching and/or learning purposes in grades 11 and 12? (______)**
7	**What % of grades 11 and 12 students used E-mail by the end of grade? (_______)%**
8	**What % of grades 11 and 12 students used WWW by the end of grade? (_______)%**
	What % of teachers is using E-mail by the end of grade? (_______)%
	What % of teachers is using WWW by the end of grade? (_______)%
	Please indicate if a typical student will have done any of the following at the school by the end of grade 11 and 12?

Code	Internet related activities done by 11 and 12 grades students	Yes	No
1	Communicating via e-mail with teachers within and /or outside the school for learning purposes	1	2
2	Communicating via e-mail with peers from other schools within and/or outside the country	1	2
3	Using e-mails or bulletin boards for group projects/collaboration Within the school and/or with other schools	1	2
4	Using external databases to retrieve and extract information from different sites across the Internet and or www.	1	2
5	Designing and maintaining Web sites	1	2

Please indicate if a typical student will have done any of the following at the school by the end of grade 11 and 12?

Code	Technology applications used by 11 and 12 grades students	Yes	No
1	Dynamic modeling and graphical modeling of mathematical	1	2
2	Software for simple data manipulation and statistical analysis	1	2
3	Word processing/desk top publishing	1	2
4	Spreadsheet packages	1	2
5	Software for learning programming skill	1	2

B. THE ICT RESOURCES IN YOUR SCHOOL

Code	Question and Items
B1	With respect to the total number of computers, how many are multimedia computers (equipped with a CD-ROM and a sound card)?
B2	Does you school have access to the Internet for instructional purposes? __1__ Yes __2__ No
B3	If “No” in B2, When do you expect that the school will get Internet access? In year (_______)
B4	How many of the computers listed in questions B2 can have access to e-mail at the same time? (______)
B5	How many of the computers listed in questions B2 can have access to the World Wide Web at the same time? (______)
B6	Which of the following peripherals are available at your school for educational use in grades 11 and 12? Put ✓ or × in the answer box

Code	Peripherals	Answer
1	Laser printer	
2	CD-ROM driver	
3	Devices for mentally and/or physically disabled students	
4	Devices for digital image or video processing	
5	Color printer	
6	CD- Writer (CD-R, DVD)	
7	Graphic Tablet	
8	Video Projector	
9	Scanner	
10	LCD-panel	

Code	Question and Items
B7	In your school, which of the following types of software are available for teaching and learning (in grades 11 and 12) on at least one computer? Put ✓ or × in the answer box

Code	Software item	Answer
1	Word processing, desktop publishing	
2	Spreadsheet	
3	Database	
4	Graphics: presentation, no professional drawing	
5	CAD (computers aided design), CAM (computer aided manufacturing)	
6	Statistical, mathematical programs	
7	Programming Languages	
8	Accounting, book-keeping, financial software	
9	Drill and practice programs	
10	Tutorial programs (for self learning)	
11	Simulations (e.g. Real world simulations)	
12	Educational games	
13	Recreational games/other games	
14	For exam/tests/constructing tests/administrating tests	
15	Internet browser	
16	E-mail software	
17	Encyclopedia on CD-ROM	
18	Video/audio/author-ware	
19	Music composition	
20	Presentation software (e.g. PowerPoint)	

21	Software supporting Microcomputer Based Laboratories	

C- History of ICT in your school, current Objectives, and Use

No.	Questions and items
C1	How many years have computers been used by your school for teaching and/or learning activities/purposes for students in grades 11 and 12? (____) years
C2	How important were each of the following goals in determining how computers are now used at your school?

1 = *Not Important* (NI) 2 = *Important* (I) 3 = *Very Important* (VI)

Code	Goals	NI	I	VI
1	To prepare students for future jobs.	1	2	3
2	To improve student achievement	1	2	3
3	To promote active learning strategies training courses	1	2	3
4	To individualize student learning experiences curriculum purposes	1	2	3
5	To encourage more cooperative and project-based learning.	1	2	3
6	To develop students independence and responsibility for own learning.	1	2	3
7	To give students drill and practice exercises.	1	2	3
8	To make the learning process more interesting.	1	2	3

C3 To what extent is each of the following aspects of teaching and learning present in your school and to what extent has ICT been used in realizing these aspects?

Tick two answers per practice: one for presence and the other for the realization via ICT.		Present			Realized via ICT		
Code	Teaching and Learning practices	Never	Usually	Many	Never	Usually	many
1	Combining parts of school subjects with one another (multidisciplinary approach).	1	2	3	1	2	3
2	Students developing abilities to undertake independent learning.	1	2	3	1	2	3
3	Providing weaker students additional instruction.	1	2	3	1	2	3
4	Organizing teaching and learning so that differences in entrance level, learning pace, and learning route are taken into account.	1	2	3	1	2	3
5	Students learning to search for information, process data, and present information.	1	2	3	1	2	3
6	The emphasis I am learning is on the development of skills.	1	2	3	1	2	3
7	Students working on the same learning materials at the same pace and/or sequence.	1	2	3	1	2	3
8	Teachers keeping track of all students' activities and progress.	1	2	3	1	2	3
9	Students being largely responsible for controlling their own learning progress.	1	2	3	1	2	3

	10	Students learning and/or working during lessons at their own pace.	1	2	3		1	2	3
	11	Students involved in cooperative and/or project-based learning.	1	2	3		1	2	3
	12	Students learning by doing.	1	2	3		1	2	3

C4 **According to your school's objectives, which of the following skills should your students acquire by the end of their grade? Put ✓ or ✗ in the answer box**

Code	Skills	Answer
1	Operating a computer (saving files, printing, keyboarding)	
2	Writing documents with a word processor (typing, editing, layout)	
3	Making illustrations with graphical programs	
4	Calculating with spreadsheets programs (sheet creation, using formulas).	
5	Writing simple programs	
6	Communicating via e-mail with teachers and other students	
7	Sending, searching for, and using electronic forms of information	
8	Others (Please specify): 1. ………………………………………………………………….. 2. …………………………………………………………………..	

C6 **Indicate whether special measures have been set up in your school to ensure the following statements?**

Code	Statements	Yes	No
1	Rewards given to teachers who use ICT	1	2
2	Incentives for teachers to take ICT courses or training	1	2
3	Security measures to prevent unauthorized system access or entry	1	2
4	The honoring of intellectual property rights	1	2
5	Restricted game playing on school computers	1	2
6	Specifications of compulsory student computer-related knowledge and skills	1	2

C7 **The following statements concern the use of computers in different aspects.**

Please answer two questions for each aspect:

First: Is it a *policy goal* in your school?

Second: To what extent has this been *realized* in your school?

Code	Statements concern the use of computers in different aspects	Policy Goals			Realized		
A	Learning process	Yes	No		Low	Moderate	High
1	One or more computers available in every classroom	1	2		1	2	3
2	Teachers use computers in their instructional practice.	1	2		1	2	3
3	Encouraging independent learning with the aid of computers	1	2		1	2	3

4	Students using computers as supportive learning aids	1	2		1	2	3
B	**Communication/collaboration**	**Yes**	**No**		**Low**	**Moderate**	**High**
1	Every teacher has an individual e-mail address at/via school	1	2		1	2	3
2	Students use e-mail	1	2		1	2	3
3	Students access external databases via the Internet/WWW	1	2		1	2	3
4	Cooperation with other schools in the area of computers	1	2		1	2	3
C	**Others**	**Yes**	**No**		**Low**	**Moderate**	**High**
1	Provision of training for all teachers in using ICT for educational purposes	1	2		1	2	3
2	Provision of training for one or a couple of teachers to become an ICT –specialist of computers	1	2		1	2	3
3	Development of a common vision on the use of computers within the school	1	2		1	2	3
4	Assignment of non-teaching hours to teachers to support the use of computers in the school	1	2		1	2	3
5	Attention to norms and values in using Internet/WWW	1	2		1	2	3

D- ICT SUPPORT AND NEEDS

Code	Questions and Items
D1	**How many hours a week are formally allocated to computer coordination for the individuals marked in the previous question? (_______) hours a week.**
D2	**Who coordinates and/or provides leadership at your school relating to teachers' instructional use of computers and training of teachers? Put ✓ or × in the answer box**

Code	Computer-related activities Coordinator	Answer
1	Nobody coordinates	
2	A full – time computer coordinator with possibly a small teaching load	
3	A classroom teacher	
4	A person from the (national, regional, provincial, district) level.	
5	The school principal or non teaching administrator	
6	Another person	
7	A committee for the coordination of technology	
8	Others (Please specify): 1. ……………………………………………………………….. 2. ………………………………………………………………..	

Code	Questions and Items
D3	**Please Indicate the extent to which your school considers each of the following a priority for further external support? Put ✓ or × in the answer box**

Code	Priority for further external support	None	Low	Moderate	High
1	Availability of software	0	1	2	3
2	Quality of software or materials	0	1	2	3
3	Availability of in-service training courses	0	1	2	3
4	On line services for curriculum purposes	0	1	2	3
5	Others (Please specify): 1. ………………………………………………….. 2. …………………………………………………..				

E. YOUR PERSONAL OPINIONS ABOUT THE VALUE OF ICT

Please indicate how strongly you agree or disagree with the following statements related to the role of computers and other Information and Communication Technologies using the following scale?

1 = Strongly Disagree (SD) 2 = Disagree (D) 3 = Uncertain (U) 4 = Agree 5 = Strongly Agree (SA)

Code	Learning process	SD	D	U	A	SA
1	Students are more attentive when computers are used in class	1	2	3	4	5
2	Every school should have access to the Internet/WWW	1	2	3	4	5
3	Every student should learn about e-mail	1	2	3	4	5
4	Internet /WWW offer excellent opportunities for educational applications.	1	2	3	4	5
5	ICT can effectively enhance problem solving and critical thinking skills of students.	1	2	3	4	5
6	All teachers should have their own e-mail address	1	2	3	4	5
7	ICT can accommodate student's varied needs preferences and learning strategies by providing new tools for knowledge manipulation, expression and creativity	1	2	3	4	5
8	ICT can help teachers to attune to the learning and pace of the individual student.	1	2	3	4	5
9	ICT should be used more by teachers to create environments for students' independent learning.	1	2	3	4	5
10	ICT improves the monitoring of the student's learning progress	1	2	3	4	5
11	Computers help to teach more effectively.	1	2	3	4	5
12	In-service training courses on computers should be made compulsory	1	2	3	4	5
13	The achievement of students can be increased when using computers for teaching.	1	2	3	4	5
14	The use of e-mail increases the motivation of students.	1	2	3	4	5
15	Teachers should initiate more cooperative and/or project-based learning.	1	2	3	4	5
16	All teachers should acquire ICT certification.	1	2	3	4	5
17	Using computers in class leads to more productivity of students	1	2	3	4	5
18	The use of ICT is a ministry of Education requirement	1	2	3	4	5

19	The use of ICT is an educational trend in the UAE	1	2	3	4	5

F. STAFF DEVELOPMENT

The following contains some questions about ICT related training for teachers of grades 11 and 12.

Code	ICT related training
F1	How does the transfer of knowledge on ICT in education take place between teachers in your school? Put ✓ or × in the answer box

Code	Transfer of knowledge on ICT in education	Answer
1	Via informal contacts/communication	
2	Via the school's working group or committee for ICT in education	
3	The use of ICT/computers in education is a regular item on the agenda of staff meetings	
4	Via a regular newsletter (printed or electronically)	
5	A teacher who has attended a course usually repeats this course at school for other teachers.	
6	Via courses by an external agency or expert	
7	Via in-school courses	
8	Via the computer coordinator or technical assistant	
9	There is no organized structure for the exchange of information	

Code	ICT related training
F2	Which of the following (in-house and/or external) training courses are available/conducted for your teachers in grades 11 and 12?

Code	Training courses are available/conducted	Internal	External
1	General introductory course (how to use a computer, principles of soft- and hardware, functions of mouse, printer)	1	2
2	General introductory course (history of ICT, relevance, consequences of computer use, etc.)	1	2
3	Introductory course for applications/standard tools (basic word-processing, spreadsheet, databases, etc.)	1	2
4	Introductory course for Internet use (retrieve information send/receive emails etc.)	1	2
5	Introductory technical course for operating and maintaining computer systems	1	2
6	Advanced course for applications/standard tools (e.g. Advanced word-processing, complex relational databases).	1	2
7	Advanced course for Internet use (e.g. Creating websites develop a home page, advanced use of Internet, video conferencing).	1	2
8	Advanced technical course for operating and maintaining computers systems (e.g. Networks, special equipment)	1	2
9	General course about didactical/pedagogical principles of computer use	1	2
10	Subject specific training (with subject-specific learning software, e.g. Tutorials or drill and practice software)	1	2
11	Programming course, where teachers can learn how to create their own software (also with author ware)	1	2
12	Special course with digital video- and audio-equipment	1	2

F3	Do you consider yourself adequately prepared in each of the following areas for your work in supporting ICT activities in your school?

Code	Areas for your work in supporting ICT activities	Answer	
A	General	Yes	No
1	MS-Windows	1	2
2	MacOs	1	2
3	MS-DOS	1	2
4	Word Processing	1	2
5	Databases	1	2
6	Spreadsheets	1	2
B	Instructional Processes	Yes	No
1	Subject specific applications	1	2
2	Application of student progress tracking software	1	2
3	Didactical and organizational integration of computers in subjects	1	2
4	The use of specific programs for subjects	1	2
5	Evaluation and selection of instructional software	1	2
6	User of computers for individualized learning programs	1	2
7	The use of multimedia application	1	2
8	Adaptation of software to fit school purposes	1	2
C	E-mail, Internet, WWW	Yes	No
1	The use of e-mail for educational purposes	1	2
2	The use of the Internet/WWW for educational purposes	1	2
D	Presentation	Yes	No
1	The user of software for making presentations	1	2

G. OBSTACLES WITH REGARD TO ICT IN YOUR SCHOOL

No.	Questions and Items
G1	Indicate whether or not you consider each of the following to be major obstacles affecting the realization of your school's computer-related goals for students in grades 11 and 12.

Code	Obstacles	Yes	No
	Hardware		
1	Insufficient numbers of computers	1	2
	Software		
2	Not enough copies of software for instructional purposes	1	2
3	Not enough types (variety) of software	1	2
	Instruction		
4	Insufficient time for teachers to prepare lessons in which computers are used	1	2
5	Difficult to integrate computers in classroom instruction practices	1	2
6	Not enough staff for supervising computer using students	1	2
7	Problems in scheduling enough computer time for different classes	1	2
	Internet/WWW		
8	Difficult to use with low achieving students	1	2
9	No time in the school schedule for using the Internet/www	1	2

10	No time in teacher's schedules to explore opportunities for using the Internet/www	1	2
	Other		
11	Not enough space to locate computers appropriately	1	2
12	Lack of interest /willingness of teachers to use computers	1	2
13	Teachers lack knowledge of / skills in using computers for instructional purposes	1	2
14	Not enough training opportunities for teachers	1	2
15	Insufficient plans/resources to prevent theft and vandalism of computers	1	2
16	Lack of support from school's governing body or community	1	2
17	Weak infrastructure (telecommunications, electricity, available room space, etc.)	1	2

G2 **Which of the obstacles from the list above do you consider as most serious?**

Please list a maximum of 4 numbers From the list above:

First choice: _____

Second choice: _____

Third choice: _____

Fourth choice: _____

H. PRINCIPAL PERSONAL BACKGROUND INFORMATION

Code	Personal Factors
H1	How many years being Teacher? (_____) years
H2	How many years being Teacher using ICT? (_____) years
H3	Please indicate your gender? __1__ male __2__ female
H4	Your age? (_____) years
H5	Nationality __1__ Emirate __2__ Non-Emirate
H6	Major? *Please specify*: ______________________________________
H7	How often do you personally use a computer? *Circle one.* __1__ Never __2__ A few times a year __3__ Almost monthly __4__ Weekly __5__ Daily
H8	What do you use your computer for?

Code	Computer uses	Yes	No
1	Writing documents and letters	1	2
2	Using spreadsheets	1	2
3	For planning purposes	1	2
4	For communication- the Internet, e-mail	1	2
5	For searching and using information on www	1	2
6	For teaching/instruction	1	2

This is the end of the questionnaire.

Thank you very much for your cooperation.

A.1.c Technology Survey Questionnaires/ Student

Student Technology Survey

Technology and Learning in the Classroom

Questionnaire No. (______)	
School Code No.:	
School Gender: __1__ Males	**__2__ Females**

A STUDENT TECHNOLOGY SURVEY ON THE IMPACT OF INFORMATION TECHNOLOGY ON TEACHING AND LEARNING IN HIGH SCHOOLS IN THE NORTHERN EMIRATES.

The following is in partial completion of my Doctorate degree requirement for the University of Leicester, England. Your participation in this survey will remain confidential. The survey is only for the purposes of my research project and is to examine the opinions of students regarding the integration of technology in the classroom. Your participation will include answering a brief questionnaire about your experiences with technology usage in the classroom. All questionnaires are completely confidential and names will not be disclosed at any point during or after the study. While the results will be revealed to anyone of the participants who is interested, the individual responses will **NOT.**

Thank you for your time,

Researcher: Nadia Farhat,

Management Information Systems Department,

College of Business Administration,

Sharjah University.

Please do all of the Questions.

3	**Grade:**	
4	**Gender: __1__ Male**	**__2__ Female**
5	**Nationality: __1__ Emirate**	**__2__ Non-Emirate**

No.	Questions and Items
A	**Describe your knowledge level of computer use.** **__1__ Beginner __2__ Intermediate __3__ Advanced**
B	**Approximately how many hours a week do you spend on the computer? ( ) hrs.**
C	**Of the time you spend on the computer, approximately how much is for school-related work. ( ) hrs.**
I	**How many academic classes are you currently taking? ( ) class**
J	**At the beginning of the semester, when you heard you would be using more technology in the classroom, how did you feel? __1__ Sad __2__ Concerned __3__ Happy**
M	**Does your teacher use technology in the classroom? __1__ Never __2__ Often __3__ Always**
O	**Do you feel that the technology used in your classes makes lessons more interesting? __1__No __2__ Yes**
K	**Have you ever e-mailed your teacher about a class assignment? __1__ No __2__ Yes**
D	**Please list the school-related activities for which you use the computer at school.**
E	**Please list the non school-related activities for which you use the computer.**
F	**Access To Technology:** ***Please answer the following using the following scale*****?** **__1__ Never (N) __2__ Sometimes (S) __3__ Usually (U) __4__ Always (A)**

I:

1	Of these academic classes how many have a class website. ( ) class
2	Of these academic classes how many use "IT" as part of the curriculum. ( ) class
3	Of these academic classes how many use "IT" as a support to the curriculum. ( ) class

D:

Code	School Related activities	Yes	No
1	writing reports	1	2
2	Research purposes	1	2
3	checking assignments	1	2
4	emailing teachers	1	2
5	Preparing homework	1	2
6	Preparing presentations for class	1	2
7	Browsing the web	1	2

E:

Code	Non-School Related activities	Yes	No
1	emailing friends	1	2
2	using chat rooms	1	2
3	checking movie times	1	2
4	checking news	1	2

F:

Code	(I have access to...)	N	S	U	A
1	A computer at school	1	2	3	4
2	The Internet at school for assignments and projects	1	2	3	4
3	Word processing programs like MS-Word	1	2	3	4
4	Graphic programs like MS-PowerPoint	1	2	3	4

	5	E-mail at school	1	2	3	4
	6	Spreadsheet or database programs like Excel	1	2	3	4

G **Technology Support:** ***Please answer the following using the following scale*?**

__1__ Never (N) **__2__ Sometimes (S)** **__3__ Usually (U)** **__4__ Always (A)**

Code	(I get computer help at school from......	N	S	U	A
1	My classroom teacher(s)	1	2	3	4
2	My friends or classmates	1	2	3	4
3	A computer teacher	1	2	3	4

H **Benefits of Technology:** ***Please answer the following using the following scale*?**

__1__ Never (N) **__2__ Sometimes (S)** **__3__ Usually (U)** **__4__ Always (A)**

Code	(Using the computer and Internet at school.....)	N	S	U	A
1	Helps me get more work completed	1	2	3	4
2	Helps me work faster	1	2	3	4
3	Improves my writing skills	1	2	3	4
4	Allows me to learn things not possible without technology				
5	Helps me get better grades				
6	Helps me do better on tests				
7	Allows me to share my work with others				
8	Makes school more interesting				
9	Helps me feel more confident				
10	Motivated me to learn differently				
11	Enables me to work at any place				

I **How would you rate this type of communication?**

__1__ Not helpful **__2__ Somewhat helpful** **__3__ Helpful** **__4__ Very helpful**

J **What forms of technology is currently used in the classroom?**

Code	forms of technology	Yes	No
1	Digital cameras,	1	2
2	PowerPoint,	1	2
3	E-mail,	1	2
4	Smart Board,	1	2
5	Data Show	1	2
6	The Internet	1	2

K	**What do you like <u>best</u> about using technology?**
1	
2	
L	**What do you like <u>least</u> about using technology?**
1	
2	
M	**Please share any comments or suggestions you have for making better use of technology to help you learn:**

1	
2	

Student Satisfaction Survey Course-Instructor

INSTRUCTIONS: Please complete this questionnaire. You will remain anonymous; your instructor will not know who you are unless you want to include your name. Instructors will not see the results of the class surveys until after grades have been submitted at the end of the semester. The researcher interested in students' honest opinions regarding all courses in the Technology Program every semester.

Additional comments about course-instructor level of delivery.
1.
2.
3.
4.
5.

Thank you again for taking the time and effort to complete these questions, and for providing data for this study.

A.2.a Pilot Technology Survey Questionnaires/ Principals

PART ONE- PRINCIPALS TECHNOLOGY SURVEY

School Name:	
School Code No.:	
School Gender: __1__ Males	**__2__ Females**

A SCHOOLS PRINCIPAL'S TECHNOLOGY SURVEY ON THE IMPACT OF INFORMATION TECHNOLOGY ON TEACHING AND LEARNING IN HIGH SCHOOLS IN THE UAE.

The following is in partial completion of my Doctorate degree requirement for the University of Leicester, England. Your participation in this survey will remain confidential. The survey is only for the purposes of my research project and while the results will be revealed to anyone of the participants who is interested, the individual responses will **NOT.**

Thank you for your time,

Researcher: Nadia Farhat,

Management Information Systems Department,

College of Business Administration,

Sharjah University.

Please complete all of the Questions.

A. GENERAL INFORMATION ABOUT YOUR SCHOOL

Code	Factor	Answers
A1	Total number of classes	
A2	Total number of students	
A3	Total number of teachers	
A5	Total number of Emirate teachers	
A6	Total number of Non-Emirate teachers	

B. THE ICT RESOURCES IN YOUR SCHOOL

For questions B1, B4, and B6 please (unless otherwise specified):

- *Count terminals (if it has a keyboard and a screen) as computers*
- *Exclude computers which are not in use*
- *Exclude computers which are only used as servers*
- *Exclude computers which are only used for teachers and/or administrative purposes*
- *Exclude graphical calculators*
- *Exclude personally owned computers brought to school by teachers and/or students*

Code	Question and Items	Answer
B1	How many computers are available for use by students of grade 11 and 12 in the school?	
B2	How many students in the 11 and 12 grades are using the computers listed in question B1?	
B3	What percentage of students from the 11 and 12 grades brings their own laptops to the school?	
B4	List the number of fixed computers used by 11 and 12 grades students for educational use in different computer rooms (Labs).	
B5	List the number of fixed computers used by 11 and 12 grades students for educational use in classrooms.	
B6	List the number of fixed computers used by 11 and 12 grades students for educational use in other locations (for students or teachers).	
B7	How many of the total number of computers from questions B4-B5 are in a local network?	
B8	How many students from grades 11 and 12 are using the computers listed in questions B4-B8?	
B9	How many computers listed in questions B4-B5 are available to use by grades 11 and 12 students use Latest version of windows XP	
B10	How many computers listed in questions B4-B5 are available to use by grades 11 and 12 students use Windows2000, Win NT, or MacOS 7.5 and higher	
B11	How many computers listed in questions B4-B5 are available to use by grades 11 and 12 students use Windows95/98, Win NT, or MacOS 7.5 and higher	

B12	**How many computers listed in questions B4-B5 are available to use by grades 11 and 12 students use Other systems**	
B13	**Does your school have any computers (in addition to the computers listed in questions B1) which are not currently in use by teachers and/or students for teaching and/or learning purposes?** **__1__ Yes __2__ No**	
B14	**From question B15, Why are they not in use? <u>Put ✓ or × in the answer box</u>**	

Code	Reasons of not in use	Answer
1	Computers are out dated	
2	They are not compatible with other computers	
3	They are broken	
4	Teachers/students do not know how to use them	
5	Other reasons	

B15	**With respect to the total number of computers from questions B4-B5, how many are multimedia computers (equipped with a CD-ROM and a sound card)?**		
B16	**Does your school have access to the Internet for instructional purposes?**	**Yes**	**No**
B17	**If "No" in B18, When do you expect that the school will get Internet access: In (year)**		
B18	**How many of the computers listed in questions B4-B5 can have access to e-mail at the same time?**		
B19	**How many of the computers listed in questions B4-B5 can have access to the World Wide Web at the same time?**		
B20	**Which of the following peripherals are available at your school for educational use in grades 11 and 12? <u>Put ✓ or × in the answer box</u>**		

Code	Peripherals	Answer
1	Laser printer	
2	CD-ROM driver	
3	Devices for mentally and/or physically disabled students	
4	Devices for digital image or video processing	
5	Color printer	
6	CD- Writer (CD-R, DVD)	
7	Graphic Tablet	
8	Video Projector	
9	Scanner	
10	LCD-panel	

B21	**In your school, which of the following types of software are available for teaching and learning (in grades 11 and 12) on at least one computer? <u>Put ✓ or × in the answer box</u>**

Code	Software item	Answer
1	Word processing, desktop publishing	
2	Spreadsheet	
3	Database	
4	Graphics: presentation, no professional drawing	
5	CAD (computers aided design), CAM (computer aided manufacturing)	
6	Statistical, mathematical programs	
7	Programming Languages	

8	Accounting, book-keeping, financial software	
9	Drill and practice programs	
10	Tutorial programs (for self learning)	
11	Simulations (e.g. Real world simulations)	
12	Educational games	
13	Recreational games/other games	
14	For exam/tests/constructing tests/administrating tests	
15	Internet browser	
16	E-mail software	
17	Encyclopedia on CD-ROM	
18	Video/audio/author-ware	
19	Music composition	
20	Presentation software (e.g. PowerPoint)	
21	Software supporting Microcomputer Based Laboratories	

C- HISTORY OF ICT IN YOUR SCHOOL, CURRENT OBJECTIVES, AND USE

No.	Questions and items
C1	How many years have computers been used by your school for teaching and/or learning activities/purposes for students in grades 11 and 12? (_____) years
C2	How important were each of the following goals in determining how computers are now used at your school?

1 = *Not Important* (NI) 2 = *Important* (I) 3 = *Very Important* (VI)

Code	Goals	NI	I	VI
1	To prepare students for future jobs.	1	2	3
2	To improve student achievement	1	2	3
3	To promote active learning strategies training courses	1	2	3
4	To individualize student learning experiences curriculum purposes	1	2	3
5	To encourage more cooperative and project-based learning.	1	2	3
6	To develop students independence and responsibility for own learning.	1	2	3
7	To give students drill and practice exercises.	1	2	3
8	To make the learning process more interesting.	1	2	3

No.	Questions and items
C3	To what extent is each of the following aspects of teaching and learning present in your school and to what extent has ICT been used in realizing these aspects?

Tick two answers per practice: one for presence and the other for the realization via ICT.		Present				Realized via ICT		
Code	Teaching and Learning practices	Never	Usually	Many		Never	Usually	many
1	Combining parts of school subjects with one another (multidisciplinary approach).	1	2	3		1	2	3
2	Students developing abilities to undertake independent learning.	1	2	3		1	2	3
3	Providing weaker students additional instruction.	1	2	3		1	2	3

	4	Organizing teaching and learning so that differences in entrance level, learning pace, and learning route are taken into account.	1	2	3		1	2	3
	5	Students learning to search for information, process data, and present information.	1	2	3		1	2	3
	6	The emphasis I am learning is on the development of skills.	1	2	3		1	2	3
	7	Students working on the same learning materials at the same pace and/or sequence.	1	2	3		1	2	3
	8	Teachers keeping track of all students' activities and progress.	1	2	3		1	2	3
	9	Students being largely responsible for controlling their own learning progress.	1	2	3		1	2	3
	10	Students learning and/or working during lessons at their own pace.	1	2	3		1	2	3
	11	Students involved in cooperative and/or project-based learning.	1	2	3		1	2	3
	12	Students learning by doing.	1	2	3		1	2	3

C4 According to your school's objectives, which of the following skills should your students acquire by the end of their grade? Put ✓ or ✗ in the answer box

Code	Skills	Answer
1	Operating a computer (saving files, printing, keyboarding)	
2	Writing documents with a word processor (typing, editing, layout)	
3	Making illustrations with graphical programs	
4	Calculating with spreadsheets programs (sheet creation, using formulas).	
5	Writing simple programs	
6	Communicating via e-mail with teachers and other students	
7	Sending, searching for, and using electronic forms of information	

C5 Does your school have written policy or statements with regard to the use of computers for educational purposes by students in the specified grades?

( ) No, proceed to question C6.

( ) Yes, which of the following does it include? Put ✓ or ✗ in the answer box

Code	Written policy or statements	Answer
1	Use of computers in the current school year	
2	Use of computers in the forthcoming school years	
3	Plans for hardware replacement of upgrading	
4	Plans for staff development with regard to ICT training	
5	Specifications for computer- related tasks and persons in charge	
6	Plans for software acquisition	
7	Equity of access	
8	Internet policy	

C6 Indicate whether special measures have been set up in your school to ensure the following

Code	Questions and Items
	statements?

Code	Statements	Yes	No
1	Rewards given to teachers who use ICT	1	2
2	Incentives for teachers to take ICT courses or training	1	2
3	Security measures to prevent unauthorized system access or entry	1	2
4	The honoring of intellectual property rights	1	2
5	Restricted game playing on school computers	1	2
6	Specifications of compulsory student computer-related knowledge and skills	1	2

C7 **The following statements concern the use of computers in different aspects.**

Please answer two questions for each aspect:

3) **Is it a policy goal in your school**
4) **To what extent has this been realized in your school**

Code	Statements concern the use of computers in different aspects	Policy Goals			Realized	
A	Learning process	Yes	No	Low	Moderate	High
1	One or more computers available in every classroom	1	2	1	2	3
2	Teachers use computers in their instructional practice.	1	2	1	2	3
3	Encouraging independent learning with the aid of computers	1	2	1	2	3
4	Students using computers as supportive learning aids	1	2	1	2	3
B	Communication/collaboration	Yes	No	Low	Moderate	High
1	Every teacher has an individual e-mail address at/via school	1	2	1	2	3
2	Students use e-mail	1	2	1	2	3
3	Students access external databases via the Internet/WWW	1	2	1	2	3
4	Cooperation with other schools in the area of computers	1	2	1	2	3
C	Others	Yes	No	Low	Moderate	High
1	Provision of training for all teachers in using ICT for educational purposes	1	2	1	2	3
2	Provision of training for one or a couple of teachers to become an ICT –specialist of computers	1	2	1	2	3
3	Development of a common vision on the use of computers within the school	1	2	1	2	3
4	Assignment of non-teaching hours to teachers to support the use of computers in the school	1	2	1	2	3
5	Attention to norms and values in using Internet/WWW	1	2	1	2	3

D- ICT SUPPORT AND NEEDS

Code	Questions and Items

D1	**How many hours a week are formally allocated to computer coordination for the individuals marked in the previous question? (_______) hours a week.**
D2	**Who coordinates and/or provides leadership at your school relating to teachers' instructional use of computers and training of teachers? Put ✓ or × in the answer box**

Code	Computer-related activities Coordinator	Answer
	Nobody coordinates	
	A full – time computer coordinator with possibly a small teaching load	
	A classroom teacher	
	A person from the (national, regional, provincial, district) level.	
	The school principal or non teaching administrator	
	Another person	
	A committee for the coordination of technology	

E. YOUR PERSONAL OPINIONS ABOUT THE VALUE OF ICT

Please indicate how strongly you agree or disagree with the following statements related to the role of computers and other Information and Communication Technologies using the following scale?

1 = Strongly Disagree (SD) 2 = Disagree (D) 3 = Uncertain (U) 4 = Agree 5 = Strongly Agree (SA)

Code	Statements	SD	D	U	A	SA
1	Students are more attentive when computers are used in class	1	2	3	4	5
2	Every school should have access to the Internet/WWW	1	2	3	4	5
3	Every student should learn about e-mail	1	2	3	4	5
4	Internet /WWW offer excellent opportunities for educational applications.	1	2	3	4	5
5	ICT can effectively enhance problem solving and critical thinking skills of students.	1	2	3	4	5
6	All teachers should have their own e-mail address	1	2	3	4	5
7	ICT can accommodate student's varied needs preferences and learning strategies by providing new tools for knowledge manipulation, expression and creativity	1	2	3	4	5
8	ICT can help teachers to attune to the learning and pace of the individual student.	1	2	3	4	5
9	ICT should be used more by teachers to create environments for students' independent learning.	1	2	3	4	5
10	ICT improves the monitoring of the student's learning progress	1	2	3	4	5
11	Computers help to teach more effectively.	1	2	3	4	5
12	In-service training courses on computers should be made compulsory	1	2	3	4	5
13	The achievement of students can be increased when using computers for teaching.	1	2	3	4	5
14	The use of e-mail increases the motivation of students.	1	2	3	4	5
15	Teachers should initiate more cooperative and/or project-based learning.	1	2	3	4	5
16	All teachers should acquire ICT certification.	1	2	3	4	5
17	Using computers in class leads to more productivity of students	1	2	3	4	5

18	The use of ICT is a ministry of Education Requirement	1	2	3	4	5
19	The use of ICT is an educational Trend in the UAE	1	2	3	4	5

F. STAFF DEVELOPMENT

The following contains some questions about ICT related training for teachers of grades 11 and 12?

Code	ICT related training
1	Is it obligatory for all grades teachers to take at least two basic computer courses? __1__ Yes __2__ No
2	Is it obligatory for all grades teachers to regularly take courses to update their ICT knowledge and skills? __1__ Yes __2__ No
3	What is the number of teachers that attended at least two computer coerces the past two academic years? (__________) teachers.
4	What is the number of teachers regularly take courses to update their ICT knowledge and skills the past two academic years? (__________) teachers.

G. OBSTACLES WITH REGARD TO ICT IN YOUR SCHOOL

No.	Questions and Items
G1	Indicate whether or not you consider each of the following to be major obstacles affecting the realization of your school's computer-related goals for students in grades 11 and 12.

Code	Obstacles	Yes	No
	Hardware		
1	Insufficient numbers of computers	1	2
	Software		
2	Not enough copies of software for instructional purposes	1	2
3	Not enough types (variety) of software	1	2
	Instruction		
4	Insufficient time for teachers to prepare lessons in which computers are used	1	2
5	Difficult to integrate computers in classroom instruction practices	1	2
6	Not enough staff for supervising computer using students	1	2
7	Problems in scheduling enough computer time for different classes	1	2
	Internet/WWW		
8	Difficult to use with low achieving students	1	2
9	No time in the school schedule for using the Internet/www	1	2
	Other		
10	No time in teacher's schedules to explore opportunities for using the Internet/www	1	2
11	Not enough space to locate computers appropriately	1	2
12	Lack of interest /willingness of teachers to use computers	1	2
13	Teachers lack knowledge of / skills in using computers for instructional purposes	1	2
14	Not enough training opportunities for teachers	1	2

	15	**Insufficient plans/resources to prevent theft and vandalism of computers**	**1**	**2**
	16	**Lack of support from school's governing body or community**	**1**	**2**
	17	**Weak infrastructure (telecommunications, electricity, available room space, etc.)**	**1**	**2**
G2	**Which of the obstacles from the list above do you consider as most serious?** ***Please list a maximum of 4 numbers From the list above:*** **First choice: _____** **Second choice: _____** **Third choice: _____** **Fourth choice: _____**			

H. Teacher PERSONAL BACKGROUND INFORMATION

Code	Personal Factors
1	**How many years being Principal of this school? (_____) years**
2	**How many years being working in any professional capacity at this school (including years as teachers, vice-principal)? (_______) years**
3	**How many years being Principal of any other school (including this school)? (_____) years**
4	**Please indicate your gender? __1__ male __2__ female**
5	**Your age? (_____) years**
6	**How often do you personally use a computer?** ***Tick one.*** **__1__ Never __2__ A few times a year __3__ Almost monthly __4__ Weekly __5__ Daily**
7	**What do you use your computer for?**

Code	Computer uses	Yes	No
1	Writing documents and letters	1	2
2	Using spreadsheets	1	2
3	For planning purposes	1	2
4	For communication- the Internet, e-mail	1	2
5	For searching and using information on www	1	2
6	For teaching/instruction	1	2

This is the end of the questionnaire.

Thank you very much for your cooperation.

A2.b Pilot Technology Survey Questionnaires/ Teachers

Part one: TEACHER TECHNOLOGY SURVEY

School Code No. (______) **Questionnaire No. (______)**

Questionnaire:

A TEACHER'S TECHNOLOGY SURVEY ON THE IMPACT OF INFORMATION TECHNOLOGY ON TEACHING AND LEARNING IN HIGH SCHOOLS IN THE NORTHERN EMIRATES.

The following is in partial completion of my Doctorate degree requirement for the University of Leicester, England. Your participation in this survey will remain confidential. The survey is only for the purposes of my research project and while the results will be revealed to anyone of the participants who is interested, the individual responses **will NOT**. Permission has been given for this incursion into your valuable time.

I am grateful to you for setting time aside to complete this survey as I know how precious a commodity time is. I respectfully request, as a professional courtesy, that you complete and return this questionnaire as soon as possible to me, Nadia Farhat, MIS Department, College of Business Administration, Sharjah University.

Please provide the following information?

A. Instructor Pedagogic Background: (Check the appropriate)			
A.1	**Your Gender:**	**(1) Male**	**(2) Female**
A.2	**Your Age:**	**( ) years**	
A.3	**As of the end of the last school year, how many years have you been teaching (experience)?**	**( ) years**	
A.4	**What subject areas do you teach at your school?**		
	a		
	b		
	c		
A.5	**How do you classify your main assignment at the school?**		
	a	Regular full-time teacher.	
	b	Regular part-time teacher.	
	c	Long-term substitute.	
	d	Part- time.	
A.6	**Training in computers**		
	a	Self taught	
	b	Training at an Institute.	
	c	Degree in computer science	
	d	During undergraduate Studies	
	e	During graduate studies	

B. Instructor Pedagogic Environment:

B.1	**Your students are**	**(1) Males**	**(2) Females** **(3) Mixed**
B.2	**How many total students do you teach each week?**		
B.3	**What is your average class size?**		
B.4	**How many computers you have in your classroom? (If you use more than one classroom, think about the one you spend the most time in for this questions and all other).**		
B.5	**How many computers you have in your classroom that are connected to the Internet?**		
B.6	**How many computers you have in your lab**		
B.7	**How many computers you have in your lab that are connected to the Internet?**		

B.8	**How has technology impacted your student's achievement?**				**Strongly agree**	**Agree**	**Disagree**	**Strongly Disagree**
1	Technology increased my student's motivation							
2	My students use technology to acquire basic skills							
3	My students use technology to become more critical thinkers							
4	My students use technology to help them construct knowledge							
5	My students use technology to solve relevant real – life problems							
6	My students use technology to discover concepts and prove relationships							
7	My students use technology to communicate knowledge and information							

B.9	**Please check all of the technologies which you employ with your students Approximately, how often do you use each of these applications with your students?**	**Not Available**	**Never**	**Once a year**	**Twice a year**	**Monthly**	**Weekly**	**Daily**
A	Computers in general							
B	Word processing packages							
C	Spreadsheets							
D	Databases							
E	Graphical applications							
F	Presentation software (e.g., Power Point)							
G	Desktop publishing							
H	Any Internet activity							
I	Search engines for the Internet							
G	Multimedia							
K	Integrated Learning Systems							
L	Simulation Programs							
M	Drill/Practice Programs, Tutorials							

B.10	**For what purpose(s) do students use computers in your classes? (Check all that apply)**	
	A	to organize and store information
	B	to collect data and perform measurements
	C	to manipulate/analyze/interpret data
	D	to communicate information as the result of investigations
	E	to create visual displays of data/information (e.g., graphs, charts, maps)
	F	to plan, draft, proofread, revise, and publish written text
	G	to create visual presentations
	H	to perform calculations
	I	to create models or simulations
	J	to support individualized learning
	K	to compensate for a disability or limitation
	The following questions deal with your use of technology	
B.11	**I use Internet in my classes to…. (Check all that apply)**	
	A	gather information from a variety of sources
	B	communicate with others outside of the school
	C	Find materials relevant to my curriculum
B.12	**I use technology applications such as word processors and spreadsheets to produce materials for use with my students.**	
	A	yes
	B	No
B.13	**I use e-mail**	
	A	To contact peers and experts both inside and outside of my educational district.
	B	To communicate with parents and students
B.14	**I use technology**	
	A	To monitor student performance (e.g. electronic portfolios)
	B	To maintain student records (e.g. attendance, electronic grade-book)
B.15	**I believe that I can recognize the ethical use of technology.**	
	A	yes
	B	No
B.16	**I model the ethical use of technology with my students.**	
	A	yes
	B	No
B.17	**I use a variety of teaching strategies which incorporate technology use this often.**	
	A	Seldom
	B	weekly
	C	Several times a day
	D	Daily
	E	Never
B.18	**The learning activities I develop require students to use technology this often**	
	A	Seldom
	B	Sometimes
	C	Frequently
	D	Always

B.19	**Please estimate the percentage of your written communication (to all individuals in the course of your professional work) that takes place electronically**	
	A	100%
	B	95%
	C	75%
	D	50%
	E	25%
	F	None
B.20	**The technology plan for my school is "frequently monitored".**	
	A	yes
	B	No
B.21	**The Principal in my school is supportive of technology**	
	A	yes
	B	No
B.22	**In an average week, you may take on a variety of roles. What percentage of the time do you think you act in the following roles: (**Total should add up to 100 %)	
	A	Lecturer …………%
	B	Supervisor …………%
	C	Mediator …………%
	D	Facilitator …………%
B.23	**Have you received any professional development in the use of technology during the past two school years (2003/2004 and 2004/2005)?**	
	YES	Go to section C Professional Development Activities
	NO	Go to section D The Effect Of Technology

C. Professional Development Activities				
(Report all professional development related to the use of technology that you participated in over the past school year 2004/2005. Do not report professional development not related to technology (e.g., reading).				
C.1	**In the past year, did you participate in the following types of professional development activities related to technology? We are treating these categories as mutually exclusive so please report hours for each activity under on category only**	**N**	**Y**	**# of hrs. (don't put zero)**
C.1a	Within district workshops or institutes, focused on a specific topic, provided by or within the district.			
C.1b	Out-of-district workshops and institutes, focused on a specific topic, provided outside the district.			
C.1c	Teacher collaborative or networks, connecting teachers regionally, state wide, nationally, or internationally (do not include activities described in questions a through c).			
C.1d	Out-of-district conferences, provided by professional organizations, regional centres, the state department of education, etc.			
C.1e	Receiving mentoring, coaching, lead teaching, or observation, in a one-on-one situation, usually in the classroom.			
C.1f	Teacher resource centre, which provides professional development materials and is staffed by a lead or resource teacher.			
C.1g	Committees or task forces focusing on curriculum, instruction, or student assessment.			
C.1h	Teacher study groups that meet regularly, in face-to-face meetings, to further your knowledge in your discipline or of pedagogical approaches.			
C.2	**In the past school academic year 2004-2005, did you participate in any of the following types of individual professional development related to technology?**			
C.2a	Individual research project, in which you examine your own teaching and your students learning.	**(0) No**	**Yes, ------ hrs**	
C.2b	Individual learning, in which you read journals or other professional publications, browses the Internet, etc.	**(0) No**	**Yes, ------ hrs**	
C.2c	Other forms of individual professional development related to the use of technology in teaching (Specify: ______________________________________)	**(0) No**	**Yes, ------ hrs**	

C.3	Circle up to three of the technology-related professional development activities you participated in during the 2005-2006 school year. Using the activities codes below, indicate the extent to which you agree with statements in the chart.

Activities	
a	Within-district workshops or institutes…
b	Out-of-district workshops and institutes…
c	Courses for college credit.
d	Teacher collaborative or networks…
e	Out-of-district conferences…
f	Immersion or internship activities…
g	Receiving mentoring coaching, lead teaching, or observation…
h	Teacher resource center…
i	Committees or task forces…
g	Teacher study groups…
k	Other forms of organized professional development…
l	Individual research project
m	Individual learning
n	Other forms of individual professional development…

Key: SA = Strongly Agree; A = Agree; D = Disagree; SD = Strongly Disagree

		Activity 1	Activity 2	Activity 3
A	Well matched to your own goals for your professional development.	SA A D SD	SA A D SD	SA A D SD
B	Well matched to your school's or department's plan to change practice.	SA A D SD	SA A D SD	SA A D SD
C	Based explicitly on what you had learned in earlier professional development exercises.	SA A D SD	SA A D SD	SA A D SD
D	Followed up with activities that built upon what you learned in this professional development activity.	SA A D SD	SA A D SD	SA A D SD
E	Designed to support reform efforts underway in your school.	SA A D SD	SA A D SD	SA A D SD
F	Designed to support state or district curriculum frameworks.	SA A D SD	SA A D SD	SA A D SD
G	Designed to support state or district assessment.	SA A D SD	SA A D SD	SA A D SD

C.4	Approximately how many hours did you spend during the 2005-2006 school year in all types of technology-related professional development activities?

A	5 – 20 hrs
B	21 – 40 hrs
C	41 – 60 hrs
D	61 – 80 hrs
E	81 hrs and more

C.5	**Do you believe that technology has changed or determined the way you teach your classes?**	**(1) Not at all**	**(2) Somewhat**	**(3) Greatly**

C.6

Code	Experience	Code	Comfort
1	A lot of experience	**1**	Very comfortable
2	Some experience	**2**	Moderately comfortable
3	Little experience	**3**	Would need some help to feel comfortable.
4	No experience	**4**	Would need a lot of help to feel comfortable

	Rate your <u>experience</u> and <u>comfort level</u> in each of the following applications using a scale from 1 to 4	**Experience**	**Comfort**
A	Computers in general	**1 2 3 4**	**1 2 3 4**
B	Word processing package	**1 2 3 4**	**1 2 3 4**
C	Spreadsheets	**1 2 3 4**	**1 2 3 4**
D	Database	**1 2 3 4**	**1 2 3 4**
E	Graphical applications	**1 2 3 4**	**1 2 3 4**
F	Presentation software (e.g. PowerPoint)	**1 2 3 4**	**1 2 3 4**
G	Desktop publisher	**1 2 3 4**	**1 2 3 4**
H	Internet software (e.g. Netscape)	**1 2 3 4**	**1 2 3 4**
I	Search engines for the Internet	**1 2 3 4**	**1 2 3 4**
J	Multimedia	**1 2 3 4**	**1 2 3 4**
K	Integrated learning systems (e.g. Jostens, CCC)	**1 2 3 4**	**1 2 3 4**
L	Simulation programs	**1 2 3 4**	**1 2 3 4**
M	Drill/ practice programs/ tutorials	**1 2 3 4**	**1 2 3 4**

D. The Effect Of Technology

D.1 **Who provided you with support in integrating technology into your work? (check all hat applies)**

A	Teachers in my school
B	Computer coordinator
C	Students
D	Parent/community volunteer
E	Instructional technology specialist
F	Principle in my school

D.2 **Which of the following statements best describes your use of technology in your instructional program?**

A	Technology is fully integrated into my instructional program.
B	I have integrated technology into specific instructional projects.
C	I use technology infrequently with students.
D	I have not used technology at all in my instructional program

D.3	In What ways has the use of technology changed your instructional practices?		(1) No	(2) Doesn't apply	(3) Yes
	A	I spend less time lecturing to the whole class.	1	2	3
	B	I spend more time with individual students.	1	2	3
	C	I am more comfortable with small group activities.	1	2	3
	D	I am more comfortable with students working independently	1	2	3
	E	I am better able to present complex material to my students	1	2	3
	F	I am better able to assess students work in particular subject areas.	1	2	3
D.4	**Indicate whether any of the following are barriers to integrating technology into your instructional program.**		**Not a barrier**	**Minor barrier**	**Major barrier**
	A	Not enough or limited access to computer hardware.	1	2	3
	B	Not enough computer software.	1	2	3
	C	Purchase software has not been installed.	1	2	3
	D	Lack of time in school schedule for projects involving technology.	1	2	3
	E	Use of technology not integrated into curriculum documents.	1	2	3
	F	Lack for adequate technical support for technology projects.	1	2	3
	G	Not enough teacher training opportunities for technology projects.	1	2	3
	H	Lack of knowledge about ways to integrate technology to enhance curriculum.	1	2	3
	I	Technology integration is not a school priority.	1	2	3
	J	Difficulty finding substitute in order for teacher to attend training is discouraged	1	2	3
	K	Hiring substitute in order for teachers to attend training is discouraged.	1	2	3
	L	Students do not have access to the necessary technology at home.	1	2	3

A.2.c Pilot Technology Survey Questionnaires/ Students

Student Technology Survey

Technology and Learning in the Classroom

Questionnaire:

A STUDENT TECHNOLOGY SURVEY ON THE IMPACT OF INFORMATION TECHNOLOGY ON TEACHING AND LEARNING IN HIGH SCHOOLS IN THE NORTHERN EMIRATES.

The following is in partial completion of my Doctorate degree requirement for the University of Leicester, England. Your participation in this survey will remain confidential. The survey is only for the purposes of my research project and is to examine the opinions of students regarding the integration of technology in the classroom. Your participation will include answering a brief questionnaire about your experiences with technology usage in the classroom. All questionnaires are completely confidential and names will not be disclosed at any point during or after the study. While the results will be revealed to anyone of the participants who is interested, the individual responses **will NOT**.

Thank you for your time,

Nadia Farhat, MIS Department, College of Business Administration, Sharjah University.

Please do all of the Questions.

School Code No. (_____) **Questionnaire No. (______)**

1	**School Code:**		
2	**Grade:**		
3	**Gender:**	**(1) Male**	**(2) Female**
4	**Nationality:**		

A		**Describe your knowledge level of computer use.** **1. Beginner** **2. Intermediate** **3. Advanced**	
B		**Approximately how many hours a week do you spend on the computer?**	**( ) hrs.**
C		**Of the time you spend on the computer, approximately how much is for school-related work.**	**( ) hrs.**
I		**How many academic classes are you currently taking?**	**( ) class**
	1	**Of these academic classes how many have a class website.**	**( ) class**
	2	**Of these academic classes how many use “IT” as part of the curriculum.**	**( ) class**
	3	**Of these academic classes how many use “IT” as a support to the curriculum.**	**( ) class**

J	**At the beginning of the semester, when you heard you would be using more technology in the classroom, how did you feel?**	**(3) Sad**	**(1) Concerned**	**(2) Happy**
M	**Does your teacher use technology in the classroom?**	**(1) Never**	**(2) Often**	**(3) Always**

O	**Do you feel that the technology used in your classes makes lessons more interesting?**	**(1) No**	**(2) Yes**
K	**Have you ever e-mailed your teacher about a class assignment?**	**(1) No**	**(2) Yes**

D	**Please list the school-related activities for which you use the computer at school.**	
	1	writing reports
	2	Research purposes
	3	checking assignments
	4	emailing teachers
	5	Preparing homework
	6	Preparing presentations for class
	7	Browsing the web

E	**Please list the non school-related activities for which you use the computer.**	
	1	emailing friends
	2	using chat rooms
	3	checking movie times
	4	checking news

F	**Access To Technology (I have access to...)**		**Never**	**Some-times**	**Usually**	**Always**
	1	A computer at school	**1**	**2**	**3**	**4**
	2	The Internet at school for assignments and projects	**1**	**2**	**3**	**4**
	3	Word processing programs like MS-Word	**1**	**2**	**3**	**4**
	4	Graphic programs like MS-PowerPoint	**1**	**2**	**3**	**4**
	5	E-mail at school	**1**	**2**	**3**	**4**
	6	Spreadsheet or database programs like Excel	**1**	**2**	**3**	**4**
	7	Other (Specify: ______________________)	**1**	**2**	**3**	**4**
G	**Technology Support (I get computer help at school from......**		**Never**	**Some-times**	**Usually**	**Always**
	1	My classroom teacher(s)	**1**	**2**	**3**	**4**
	2	My friends or classmates	**1**	**2**	**3**	**4**
	3	A computer teacher	**1**	**2**	**3**	**4**
	4	Other (Specify: ______________________)	**1**	**2**	**3**	**4**
H	**Benefits of Technology (Using the computer and Internet at school.....)**		**Never**	**Some-times**	**Usually**	**Always**
	1	Helps me get more work completed	**1**	**2**	**3**	**4**
	2	Helps me work faster	**1**	**2**	**3**	**4**
	3	Improves my writing skills	**1**	**2**	**3**	**4**

	4	Allows me to learn things not possible without technology	**1**	**2**	**3**	**4**
	5	Helps me get better grades	**1**	**2**	**3**	**4**
	6	Helps me do better on tests	**1**	**2**	**3**	**4**
	7	Allows me to share my work with others	**1**	**2**	**3**	**4**
	8	Makes school more interesting	**1**	**2**	**3**	**4**
	9	Helps me feel more confident	**1**	**2**	**3**	**4**
	10	Motivated me to learn differently	**1**	**2**	**3**	**4**
	11	Enables me to work at any place	**1**	**2**	**3**	**4**
L	**How would you rate this type of communication?**					
	1	Not helpful				
	2	Somewhat helpful				
	3	Helpful				
	4	Very helpful				
N	**What forms of technology is currently used in the classroom?**					
	1	Digital cameras,				
	2	PowerPoint,				
	3	E-mail,				
	4	Smart Board,				
	5	Data Show				
	6	The Internet				
P	**What do you like best about using technology?**					
1						
2						
Q	**What do you like least about using technology?**					
1						
2						
R	**Please share any comments or suggestions you have for making better use of technology to help you learn:**					
1						
2						
3						

Student Satisfaction Survey Course-Instructor

INSTRUCTIONS: Please complete this questionnaire. You will remain anonymous; your instructor will not know who you are unless you want to include your name. Instructors will not see the results of the class surveys until after grades have been submitted at the end of the semester. The researcher interested in students' honest opinions regarding all courses in the Technology Program every semester.

Additional comments about course-instructor level of delivery.

Thank you again for taking the time and effort to complete these questions, and for providing data for this study.

Interview Schedules

C.1 Technology Survey Interview/Principals

Part Two-Principal's Technology Interview

School Name:
School Code No.:
School Gender: __1__ Males __2__ Females

A SCHOOLS PRINCIPAL'S TECHNOLOGY SURVEY ON THE IMPACT OF INFORMATION TECHNOLOGY ON TEACHING AND LEARNING IN HIGH SCHOOLS IN THE UAE.

The following is in partial completion of my Doctorate degree requirement for the University of Leicester, England. Your participation in this survey will remain confidential. The survey is only for the purposes of my research project and while the results will be revealed to anyone of the participants who is interested, the individual responses will NOT.

Thank you for your time,

Researcher: Nadia Farhat,

Management Information Systems Department,

College of Business Administration,

Sharjah University.

Please provide a short answer to the following questions (or if you get excited about an answer, write on the back of the page)

A1: Is applying technology in your school a formal part of its educational mission? **__1__ Yes __2__ No**
Why? Because: **1. ……………………………………………………………………………………………**

2. …………………………………………………………………………………………   3. …………………………………………………………………………………………
A2: Is technology incorporated in the curriculum. At what level?   **__1__ Yes __2__ No**
What level   1. …………………………………………………………………………………………   2. …………………………………………………………………………………………
A3: State three areas where technology is important to your school ?
1. …………………………………………………………………………………………   2. …………………………………………………………………………………………   3. …………………………………………………………………………………………

B: Student Access and Use Questions

Q1	**How do your students typically use school based computer?**
a	
b	
Q2	**Describe the types of things your students typically do with technology?**
a	
b	
Q3	**We're interested in your impressions of how information technology has impacted your students' learning. Overall, how have students been impacted by the use of technology in your school?**
a	
b	
Q4	**What does technology allow your students to do now – either physically or intellectually – that would have been impossible (or at least more difficult) before technology was widely available in your school?**
What	**1.**
	2.
Q5	**What changes could be made to technology in your school which would allow *your students* to benefit more from technology?**
1.	
2.	

Teacher Fluency Questions

Q6	**Can you give me your impressions of how *fluent* your teachers are in their technology use? By "fluent" we mean how skilled are they in both operating the technology AND in applying it to student learning situations.** **__1__ None __2__ Fluent __3__ Least Fluent**
Q7	**What do you believe is the greatest impact information technology has had on your teachers?**
Q8	**In what ways has YOUR professional practice (as a principal) improved through the use of technology?**
Q9	**What barriers have you encountered in trying to use technology in your school?**
1	
2	

C: Leadership Strategy Questions

Q10	**Please describe your primary role as "technology leader" in your school.**
Q11	**What sorts of strategies have you employed to encourage your teachers to use technology?**
Q12	**What is your definition of "technology integration"?**
Q13	**What is the most interesting or intriguing use of technology in education that you have ever heard about? It doesn't matter to us whether you or your teachers can actually DO this yet…we just want to know what you find interesting.**

D: Access and Professional development Questions

Q14	**What changes would you like to see made in your school with regard to how technology is allocated or structured?**
Q15	**How often is technology staff development offered to you and your teachers and who is responsible for conducting this training?** **__1__ None __2__ Often __3__ A lot** **Responsibility of :__________________________________**

Q16	**How often have you *personally* participated in the training that was offered?** **__1__ None __2__ Often __3__ A lot**
Q17	**What barriers have you encountered in terms of getting the technology training you want and/or need?**
1	
2	
Q18	**What has been the most useful use technology workshop you have attended, and why?**
What	
Q19	**Is there anything else you would like to share with us?**
What	**1.**
	2.

Thank you again for taking the time and effort to complete these questions, and for providing data for the research

A.3 Technology Survey Interview/Teachers

Part Two-Teachers Technology Interview

Questionnaire No. (______)	
School Code No.:	
School Gender: __1__ Males	**__2__ Females**

A TEACHER'S TECHNOLOGY SURVEY ON THE IMPACT OF INFORMATION TECHNOLOGY ON TEACHING AND LEARNING IN HIGH SCHOOLS IN THE UAE.

The following is in partial completion of my Doctorate degree requirement for the University of Leicester, England. Your participation in this survey will remain confidential. The survey is only for the purposes of my research project and while the results will be revealed to anyone of the participants who is interested, the individual responses will **NOT.** Permission has been given for this incursion into your valuable time.

Researcher: Nadia Farhat,

Management Information Systems Department,

College of Business Administration,

Sharjah University.

Please provide a short answer to the following questions (or if you get excited about an answer, write on the back of the page)

B: Student Access and Use Questions

Q1	**Describe the types of things your students typically do with technology?**
Q2	**What does technology allow your students to do now – either physically or intellectually – that would have been impossible (or at least more difficult) before technology was widely available in your school?**
What	
Q3	**What changes could be made to technology in your school which would allow *your students* to benefit more from technology?**

C: Teacher Fluency Questions

Q4	**Please describe how you *most frequently* make use of school computers. We don't want to know all of what you do…just what you most often do?**
Q5	**What is the % of accessibility are the classroom or lab computers to teachers throughout the day?**
Q7	**What, if any, impact has the use of information technology had on your teaching?**
Q6	**In what ways has your professional practice (i.e., teaching) improved through the use of technology?**
Q7	**What barriers have you encountered in trying to use technology in the classroom?**

D: Teacher Vision/Strategy Questions

Q8	**How do you get your ideas for integrating technology in the classroom?**

Q9	**What is the most interesting or intriguing use of technology in education that you have ever heard about? It doesn't matter to us whether you can actually DO this yet…we just want to know what you find interesting.**

E: Teacher access and Professional development Questions

Q10	**What changes would you like to see made in your school with regard to how technology is allocated or structured?**
Q11	**How often have you participated in the training that was offered?** **__1__ None __2__ Often __3__ A lot**
Q12	**What barriers have you encountered in terms of getting the technology training you want and/or need?**
Q13	**What has been the most useful use technology workshop you have attended, and why?**
What	
Q14	**Is there anything else you would like to share with us?**

Thank you again for taking the time and effort to complete these questions, and for providing data for this research.

A.4 Observation Protocol

RESEARCH OBSERVATION PROTOCOL

Observation No. (______)	**Date:**
School Code No.:	**Teacher cod No.:**
School Gender: __1__ Males	**__2__ Females**
Grade No. (______)	**Subject:**
Class Length:	**Time:**

A CLASS OBSERVATION PROTOCOL ON THE IMPACT OF INFORMATION TECHNOLOGY ON TEACHING AND LEARNING IN HIGH SCHOOLS IN THE UAE.

The following is in partial completion of my Doctorate degree requirement for the University of Leicester, England. Your participation in this observation session will remain confidential. The survey is only for the purposes of my research project and while the results will be revealed to anyone of the participants who is interested, the individual responses will NOT. Permission has been given for this incursion into your valuable time.

I am grateful to you for setting time aside to complete this survey as I know how precious a commodity time is. I respectfully request, as a professional courtesy, that you complete and return this questionnaire as soon as possible to me, Nadia Farhat, MIS Department, College of Business Administration, Sharjah University.

Thank you for your time,

Researcher: Nadia Farhat,

Management Information Systems Department,

College of Business Administration,

Sharjah University

.

I . CURRICULUM AND DIDACTIC CHARACTERISTICS

1 = Strongly Disagree (SD) 2 = Disagree (D) 3 = Uncertain (U) 4 = Agree 5 = Strongly Agree (SA)

A-Code	Degree of Curriculum differentiation	SD	D	U	A	SA
1	The same content for all pupils	1	2	3	4	5
2	The same learning activity for all pupils	1	2	3	4	5
3	The same learning material for all pupils	1	2	3	4	5
4	Degree of individualization in class	1	2	3	4	5
5	Remedial activity	1	2	3	4	5
6	Higher level activity	1	2	3	4	5

B-	Access to ICT
B1	How many computers are available for use by students in the classroom?
B2	How many computers listed in questions B4-B5 are available to use by grades 11 and 12 students use Latest version of windows XP
B3	How many computers listed in questions B4-B5 are available to use by grades 11 and 12 students use Windows2000, Win NT, or MacOS 7.5 and higher

C-	Characteristics of ICT Use
C1	In your school, which of the following types of software are available for teaching and learning? Put ✓ or ✗ in the answer box

Code	Software item	Answer
1	Word processing, desktop publishing	
2	Spreadsheet	
3	Database	
4	Graphics: presentation, no professional drawing	
5	CAD (computers aided design), CAM (computer aided manufacturing)	
6	Statistical, mathematical programs	
7	Programming Languages	
8	Accounting, book-keeping, financial software	
9	Drill and practice programs	
10	Tutorial programs (for self learning)	
11	Simulations (e.g. Real world simulations)	
12	Educational games	
13	Recreational games/other games	
14	For exam/tests/constructing tests/administrating tests	
15	Internet browser	
16	E-mail software	
17	Encyclopedia on CD-ROM	
18	Video/audio/author-ware	
19	Music composition	

	20	Presentation software (e.g. PowerPoint)	
	21	Software supporting Microcomputer Based Laboratories	

D-	Social Groupings of Pupils Using ICT
D1	Individual
D2	Pairs
D3	Small Groups
E-	% of ICT use
E1	What is the percentage of pupils using ICT during the lesson? --------------

II . TEACHER BEHAVIOR CHARACTERISTICS

1 = Strongly Disagree (SD) 2 = Disagree (D) 3 = Uncertain (U) 4 = Agree 5 = Strongly Agree (SA)

A-Code	Coaching of and feedback to pupils working with ICT	SD	D	U	A	SA
1	The teacher walks around the classroom and coaches pupils	1	2	3	4	5
2	The teacher divides time about equally over small groups	1	2	3	4	5
3	The teachers helps pupils by referring to ways to solve problems	1	2	3	4	5
4	Teacher asks questions to help solve problems	1	2	3	4	5
B-Code	Classroom Management	SD	D	U	A	SA
1	Clarity on communication rules for pupils	1	2	3	4	5
2	Clarity on desired pupil behavior	1	2	3	4	5
3	Shows in own behavior that (s)he knows what pupils do.	1	2	3	4	5

III . CHARACTERIZATION OF LEARNING ENVIRONMENT

1 = Strongly Disagree (SD) 2 = Disagree (D) 3 = Uncertain (U) 4 = Agree 5 = Strongly Agree (SA)

A-Code	Degree of pupil Centeredness	SD	D	U	A	SA
1	Teacher centered	1	2	3	4	5
2	Teacher Transmits Knowledge	1	2	3	4	5
3	Teacher as a lecturer	1	2	3	4	5
4	Teacher in control	1	2	3	4	5
5	Focus on whole class teaching	1	2	3	4	5
		1	2	3	4	5
6	Pupil centered	1	2	3	4	5
7	Pupil construct knowledge	1	2	3	4	5
8	Teacher as a coach	1	2	3	4	5
9	Pupils in control	1	2	3	4	5
10	Focus on collaborative learning	1	2	3	4	5

Appendix (B)

Correspondence

B1- Letter asking for support –MIS Chair- University of Sharjah.

B2- Support letter from MIS Chair.

B3- Letter to the Heads of schools.

B4- Covering letter accompanying the survey.

B5- Letter informing the interview sub-sample of the forthcoming interview.

B6- Consent form for interview respondents

B1

January 3, 2007

Asst. Professor M. Nour

Chair MIS Dept. /College of Business Administration

University of Sharjah

Dear Dr. Nour,

Please find enclosed my research proposal that has been recently accepted for candidacy AT THE University of Leicester-U.K., titled, The Impact of Technology (ICT) on teaching and learning in high schools in the UAE. I am now writing to you to inform you of my progress, as stated in my proposal concerning ethical issue, and to confirm your support for the study.

I am about to embark on the initial data collection, which will involve distributing a survey instrument (refined after a pilot study in other schools) issued to principals, teaching staff and students at the selected high schools. The purpose of this survey will be to establish baseline data about the teaching staff and students at the selected high schools with regards to their use of information technology in their teaching and learning. The survey data will also identify management, teachers and student's attitude, awareness and uptake of information technology.

At this point I am about to approach each Head of School to obtain permission to approach their staff. In turn I will then approach individual staff. Clearly the support of each Head of School is vital for this data collection phase and I feel that with your support this permission may be more forthcoming.

Regards,

Nadia Farhat

PhD Student

Faculty of MIS

University of Sharjah

nfarhat@sharjah.ac.ae

B2

University of Sharjah

College of Business Administration

جـــامـــعــــة الشــــارقــــة

كلــيــــة إدارة الأعــمــــــال

08/يناير/2007

<u>لمن يهمه الأمر</u>

السلام عليكم ورحمة الله وبركاته ،،،

السيدة/ ناديه فرحات ،محاضرة في قسم المعلومات الإدارية في كلية إدارة الأعمال ،جامعة الشارقة تقوم بإجراء استبيان حول "تأثير التكنولوجيا على التعليم و التعلم في المدارس الثانوية في الإمارات" كجزء من متطلبات رسالة الدكتوراه المقدمة لجامعة Leicester في انجلترا.

تشتمل الأطروحة على الاستبيانات التالية:

1. استبيان عن التقنية موجه لمدراء المدارس.
2. استبيان عن التقنية موجه للمعلمين.
3. استبيان عن التقنية موجه للطلاب.

و يسرني أن أقدم الدعم للأستاذة/ نادية فرحات لتسهيل مهمتها في ما يتعلق بجمع البيانات المطلوبة لأطروحتها،وأنا واثق من أن النتائج التي ستتوصل إليها ستكون مفيدة لصانعي القرار في مختلف المستويات في مجال التعليم الثانوي.

وتفضلوا بقبول فائق الاحترام...

College of Business & Management
Approved by: Dr. Mohd. Abdulla Nour
Date: / /

د.محمد نور
رئيس قسم نظم المعلومات الإدارية

ص.ب: ٢٧٢٧٢ ، الشارقة – الإمارات العربية المتحدة ، هاتف: ٥٠٥٠–٥٤٧ ، ٥٠٥٠–٥١٥ (٩٧١٦) ، فاكس: ٥٠٥٠–١٠٠ (٩٧١٦)
P.O. Box: 27272, Sharjah -United Arab Emirates , Tel: (9716) 5050-547, 5050-515, Fax: (9716) 5050-100
E-mail: rahman@sharjah.ac.ae
البريد الإلكتروني: susa@sharjah.ac.ae

University of Sharjah

College of Business Administration

Department of MIS

جـــامـــعـــــة الشــــارقــــــة

كلـــيـــــة إدارة الأعـــمـــــــال

قســـم نـــظم المعلومات الإداريـــة

08 January 2007

To Whom It May Concern;

Ms. Nadia Farhat, a lecture in the Department of MIS at the College of Business Administration, the University of Sharjah, is conducting a survey on the "Impact of Technology on Teaching and Learning in High Schools in the UAE" as a partial fulfillment of her Doctoral degree requirement for the University of Leicester, England.

Her thesis involves the following three questionnaires:

1. Principals Technology Survey.
2. Teachers Technology Survey.
3. Students Technology survey.

I am pleased to lend support to Nadia Farhat's request to facilitate her task in connection with the data gathering for her thesis. I anticipate that the eventual findings will be useful to the decision makers in various levels in the field of secondary education.

Regards,

College of Business & Management
Approved by: Dr. Mohd. Abdulla Nour
Date: / /

Mohamed A. Nour, PhD
Chair, Department of MIS
College of Business Administration
The University of Sharjah
(971)6-505-3522
mnour@sharjah.ac.ae

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E-mail: rahman@sharjah.ac.ae البريد الإلكتروني: susa@sharjah.ac.ae

B2

B3

January 9th, 2007

Nadia Farhat

University of Sharjah

College of Business Administration

P.O.Box 27272

Sharjah

Dear Principal ,

I am currently a PhD student at the University of Leicester, U.K., and staff member in the Faculty of MIS at The University of Sharjah. The title of my PhD study is “The Impact of technology (ICT) on Teaching and Learning in High Schools in the UAE” (abstract attached).

I am about to embark on a survey regarding principal, students and teaching staff at the sampled high schools. The purpose of this survey will be to establish baseline data about the Principals, students and teaching staff at the sampled high schools with regard to their use of information technology in their teaching and learning. The instrument (see attached) took only 10 minutes to complete in recent trials.

Please find attached a letter from the ministry and Dr. Nour acknowledging the importance of such a study. I am writing to notify you that within the next few weeks I will be sending out the survey instrument to your teaching staff and I hope that you are able to support such a study in your school. Please don't hesitate to contact me if you have any queries.

Many thanks in anticipation of your support.

Yours Sincerely,

Nadia Farhat

PhD Student

Faculty of MIS

University of Sharjah

E-mail: nfarhat@sharjah.ac.ae

B4

January 9th. 2007

Dear Sir/ Madame,

I am currently a PhD student at the university of Leicester, U.K. and staff member in the Faculty of MIS at the University of Sharjah. The title of my study is "The Impact of technology on Teaching and Learning in High Schools in the UAE".

I am about to embark on a survey of a select number of students and teaching staff at your school. The survey is designed to find out how students and teaching staff at this School are using Information Technology in their teaching and learning. In this context the term Information Technology means "the application of computer and communications technologies for the electronic storage and transmission of information in order to solve problems in a wide range of human endeavors". This is where you come into the picture. I really need your help to complete and return the survey. The instrument took only 35 minutes to complete in recent trials.

You can be assured that all the information supplied will be treated in a professional and confidential manner.

My study will depend on people like you completing and returning the survey.

Please note that there is no right or wrong answers only a description of your situation and your views. I thank you very much in anticipation of your support.

Yours sincerely,

Nadia Farhat
PhD Student
Faculty of MIS
University of Sharjah
nfarhat@sharjah.ac.ae

B5

«Title» «Name» «School»

12th January, 2007

Dear «First Name»

Thank you very much for completing my Technology Survey. T here was an excellent response, indicating that the teaching staff at high schools is genuinely concerned about the Information Technology issues pertaining to their teaching and learning.

I am now at the second phase of data collection and as you may remember you kindly agreed to a brief interview. This note is to advise you that I will be calling you within a few days to organize an appropriate time for us to meet. I thought this may be an ideal time prior to the commencement of second semester before we all need to get back to teaching. The interview will only take about 30 minutes and I am happy to send you a copy of the questions prior to the interview if you so wish.

Yours truly,

Nadia Farhat

University of Sharjah

College of Business Administration

Email: nfarhat@sharjah.ac.ae

B6

Confidentiality & Permission Statement

The interviewee acknowledges that the researcher has guaranteed the confidentiality and anonymity of all information provided. This information has been given voluntarily.

Name: «Title» «First_Name» «Name» «School»

Signature: ___________________________

Date: ___________________________

Appendix (C)

Tables

Tables related to the calculation of the Innovation Diffusion on the Teachers level and the school level (tables C1-C10)

Table C1 Teacher's survey Skills assessment

Level of ICT integration	%
Very Low-(1-20) Laggards	21%
Low-(21-40) Late majority	36%
Medium-(41-60) Early majority	22%
High-(61-800) early adopters	14%
Very High-(81-100) innovators	7%

Table C2 school level Skills assessment

Level of ICT integration	Teachers %	Students %	Average skills School level
Very Low-(1-20) Laggards	21%	22%	21.5%
Low-(21-40) Late majority	36%	43%	39.5%
Medium-(41-60) Early majority	22%	21%	21.5%
High-(61-800) early adopters	14%	14%	14%
Very High-(81-100) innovators	7%	0%	3.5%

Items that are skills oriented were chosen from F3 -Teacher

Items that are skills oriented were chosen from B11- Students

Table C3 Support level

Level of ICT integration	Teachers %	Principal %	Average skills School level
Very Low-(1-20) Laggards	0%	0%	0%
Low-(21-40) Late majority	0%	0%	0%
Medium-(41-60) Early majority	0%	0%	0%
High-(61-800) early adopters	9%	17%	13%
Very High-(81-100) innovators	0%	0%	0%

Q/D2 -Teacher

Q/D2- Principal

Table C4-Training and support level

Level of ICT integration	Teachers %	Principal %	Students %	Average skills School level
Very Low-(1-20) Laggards	0%	38%	14.7%	18% (15)
Low-(21-40) Late majority	53%	0%	47.7%	27.6% (28)
Medium-(41-60) Early majority	62%	45%	27.1%	50.4% (37)
High-(61-800) early adopters	9%	39.50%	10.5%	20% (20)
Very High-(81-100) innovators	0%	0%	0%	0% (0)

M2-Teacher/F3- Principal/B12-Student corrected to be out of 100 ( ).

Table C5 Attitude Teacher

Level of ICT integration	%
Very Low-(1-20) Laggards	0%
Low-(21-40) Late majority	69%
Medium-(41-60) Early majority	23%
High-(61-800) early adopters	8%
Very High-(81-100) innovators	0%

From C7A-B-C (mean converted to %) . Mean/3.

i.e.= M= 1.01/3= 34%. The realized attitude was converted and grouped into the categories in the table.

Table C6 Attitude Principal

Level of ICT integration	%
Very Low-(1-20) Laggards	15.4%
Low-(21-40) Late majority	15.4%
Medium-(41-60) Early majority	30.8%
High-(61-800) early adopters	15.4%
Very High-(81-100) innovators	23.0%

From C7 (goals %) grouped

Table C7 Attitude student

Level of ICT integration	%
Very Low-(1-20) Laggards	5%
Low-(21-40) Late majority	10%
Medium-(41-60) Early majority	34%
High-(61-800) early adopters	51%
Very High-(81-100) innovators	0%

From B5 and B13

Table C8-Attitude level

Level of ICT integration	Teachers %	Principal %	Students %	Average skills School level
Very Low-(1-20) Laggards	0%	15.4%	5%	6.8%
Low-(21-40) Late majority	69%	15.4%	10%	31.5%
Medium-(41-60) Early majority	23%	30.8%	34%	29.3%
High-(61-800) early adopters	8%	15.4%	51%	24.8%
Very High-(81-100) innovators	0%	23.0%	0%	7.7%

Table C9

Level of ICT integration	**Teachers**	Skills	Training & Support	Attitude	**Average School level**
Very Low-(1-20) Laggards	**21%**	21.5.%	15%	6.8%	**14%**
Low-(21-40) Late majority	**36%**	39.5%	29%	31.5%	**33%**
Medium-(41-60) Early majority	**29%**	21.5%	38%	29.3%	**30%**
High-(61-80) early adopters	**7%**	14%	18%	24.8%	**19%**
Very High-(81-100) innovators	**7%**	7%	0%	7.7%	**4%**

Table C10

Level of ICT integration	**Rogers**	**Teachers**	**Average School level**
Very Low-(1-20) Laggards	**16%**	**21%**	**14%**
Low-(21-40) Late majority	**34%**	**36%**	**33%**
Medium-(41-60) Early majority	**34%**	**22%**	**30%**
High-(61-800) early adopters	**13.5%**	**14%**	**19%**
Very High-(81-100) innovators	**2.5%**	**7%**	**4%**

C11- sampling Table

N	S	N	S	N	S
10	10	220	140	1,200	291
15	14	230	144	1,300	297
20	19	240	148	1,400	302
25	24	250	152	1,500	306
30	28	260	155	1,600	310
35	32	270	159	1,700	313
40	36	280	162	1,800	317
45	40	290	165	1,900	320
50	44	300	169	2,000	322
55	48	320	175	2,200	327
60	52	340	181	2,400	331
65	56	360	186	2,600	335
70	59	380	191	2,800	338
75	63	400	196	3,000	341
80	66	420	201	3,500	346
85	70	440	205	4,000	351
90	73	460	210	4,500	354
95	76	480	214	5,000	357
100	80	500	217	6,000	361
110	86	550	226	7,000	364
120	92	600	234	8,000	367
130	97	650	242	9,000	368
140	103	700	248	10,000	370
150	108	750	254	15,000	375
160	113	800	260	20,000	377
170	118	850	265	30,000	379
180	123	900	269	40,000	380
190	127	950	274	50,000	381
200	132	1,000	278	75,000	382
210	136	1,100	285	1,000,000	384

Notes
N = population size
S = sample size
Source Krejcie and Morgan, 1970

C12–Sample coding of the surveys and the Interviews in SPSS

Revised Principals Raw Data.sav - SPSS Data Editor

File Edit View Data Transform Analyze Graphs Utilities Add-ons Window Help

1 : SN 1

	SN	SGender	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B8
1	1	School Gender		300	72	25	47	30	150	10	30	10	10	8	10
2	2	Male	10	250	60	20	40	50	200	10	30	10	10	8	10
3	3	Female	12	280	66	30	36	35	200	10	35	10	19	8	19
4	4	Female	12	260	50	25	25	25	200	10	25	4	10	10	5
5	5	Female	24	500	130	50	80	40	350	10	40	10	25	15	.
6	6	Female	24	500	100	40	60	50	200	15	50	20	30	20	.
7	7	Male	20	450	100	40	60	60	200	15	60	20	30	20	.
8	8	Male	20	420	90	40	60	45	200	15	45	15	25	20	.
9	9	Male	28	700	140	50	50	50	350	10	50	.	25	25	.
10	10	Male	26	650	140	40	100	50	300	15	50	20	30	20	.
11	11	Female	30	700	120	40	80	60	400	20	60	30	30	30	.
12	12	Female	30	700	100	40	40	60	400	20	60	30	30	30	.

	B9	B10_1	B10_2	B10_3	B10_4	B10_5	B11	B12	B13	B14	A2_B1	A2_B4	B5_B4	B6_B4	B7_E
1	Yes	.	.	Yes	.	.	15	Yes	10	8	10	10	0	0	
2	No	Yes	No	No	No	No	15	Yes	13	10	5	8	0	0	
3	No	.	.	.	.	.	15	Yes	13	15	8	8	0	1	
4	No	.	.	.	.	.	10	Yes	.	10	10	10	0	0	
5	Yes	No	No	Yes	No	No	20	Yes	10	20	13	13	0	1	
6	Yes	No	No	Yes	No	Yes	20	Yes	10	20	10	10	0	1	
7	Yes	No	No	Yes	No	No	30	Yes	10	20	8	8	0	1	
8	Yes	Yes	No	Yes	No	No	20	No	.	.	9	9	0	1	
9	No	No	No	No	No	No	20	No	.	.	14	14	.	1	
10	Yes	No	No	Yes	No	Yes	30	Yes	10	30	13	13	0	1	
11	No	No	No	No	No	No	30	Yes	30	20	12	12	1	1	
12	No	.	.	.	.	.	30	Yes	30	20	12	12	1	1	

Data View / Variable View

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	SN	SNC	SGender	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11_1	A11_2	A11_3	A11_4	A11_5	A11	A12_1	A12_2	A12_3	A12_4	A12_5	A12	C3_1_1	C3_1_2	C3_2_1
1	1	1	Male	No	No	Yes	Yes	2002	2005	40	60	40	60	Yes	Yes	No	Yes	No	1	No	Yes	Yes	Yes	Yes	1	Usually	Many	Never
2	2	1	Male	Yes	Yes	Yes	Yes	2002	2005	40	40	40	40	Yes	Yes	No	Yes	No	1	No	Yes	Yes	Yes	Yes	1	Usually	Many	Never
3	3	1	Male	No	No	Yes	Yes	2002	2005	40	30	30	40	Yes	Yes	No	Yes	No	1	No	Yes	Yes	Yes	No	1	Usually	Many	Never
4	4	1	Male	Yes	No	Yes	Yes	2002	2005	30	40	40	50	Yes	Yes	No	Yes	No	1	No	Yes	Yes	Yes	No	1	Usually	Many	Never
5	5	1	Male	Yes	No	Yes	Yes	2002	2005	40	50	40	30	Yes	Yes	No	Yes	No	1	No	Yes	Yes	Yes	No	1	Usually	Many	Never
6	6	1	Male	No	No	Yes	Yes	2002	2005	40	50	40	40	Yes	Yes	No	Yes	No	1	No	Yes	Yes	Yes	No	1	Usually	Many	Never
7	7	1	Male	No	No	Yes	Yes	2002	2005	30	40	40	50	Yes	Yes	No	Yes	No	1	No	Yes	Yes	Yes	Yes	1	Usually	Usually	Never
8	8	1	Male	Yes	Yes	Yes	Yes	2002	2005	60	60	40	40	Yes	Yes	No	Yes	No	1	No	Yes	Yes	Yes	No	1	Usually	Many	Never
9	1	2	Male	No	No	Yes	Yes	2006	2003	3	20	10	30	No	No	No	Yes	No	0	No	Yes	Yes	No	No	0	Usually	Usually	Never
10	2	2	Male	No	No	Yes	Yes	2006	2003	3	20	10	30	No	No	No	Yes	No	0	No	Yes	Yes	No	No	0	Usually	Usually	Never
11	3	2	Male	No	No	Yes	Yes	2006	2003	3	18	10	20	No	No	No	Yes	No	0	No	Yes	Yes	No	No	0	Usually	Usually	Never
12	4	2	Male	No	No	Yes	Yes	2006	2003	2	25	10	20	No	No	No	Yes	No	0	No	Yes	Yes	No	No	0	Usually	Usually	Never
13	5	2	Male	No	No	Yes	Yes	2006	2003	2	18	10	15	No	No	No	Yes	No	0	No	Yes	Yes	No	No	0	Usually	Usually	Never
14	6	2	Male	No	No	Yes	Yes	2006	2003	3	20	10	30	No	No	No	Yes	No	0	No	Yes	Yes	No	No	0	Usually	Usually	Never
15	7	2	Male	No	No	Yes	Yes	2006	2003	3	15	8	15	No	No	No	Yes	No	0	No	Yes	Yes	No	No	0	Usually	Usually	Never
16	8	2	Male	No	No	Yes	Yes	2006	2003	3	20	10	30	No	No	No	Yes	No	0	No	Yes	Yes	No	No	0	Usually	Usually	Never
17	9	2	Male	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	Usually	Usually	Never
18	10	2	Male	No	No	Yes	Yes	2006	2003	2	4	10	30	No	No	No	Yes	No	0	No	Yes	Yes	No	No	0	Usually	Usually	Never
19	1	3	Female	No	No	Yes	Yes	2005	2003	2	5	1	11	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Usually
20	2	3	Female	No	No	Yes	Yes	2006	2003	2	4	1	11	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Usually
21	3	3	Female	No	No	Yes	Yes	2005	2003	3	5	.	10	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Usually
22	4	3	Female	No	No	Yes	Yes	2005	2003	2	5	.	10	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Usually
23	5	3	Female	No	No	Yes	Yes	2005	2003	3	5	.	10	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Usually
24	6	3	Female	No	No	Yes	Yes	2005	2003	2	5	.	10	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Usually
25	7	3	Female	No	No	Yes	Yes	2005	2003	2	5	1	10	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Usually
26	8	3	Female	No	No	Yes	Yes	2005	2003	3	5	1	10	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Usually
27	9	2	Female	No	No	Yes	Yes	2005	2003	2	3	.	10	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	.	Usually
28	10	3	Female	No	No	Yes	Yes	2005	2003	3	5	.	10	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Usually
29	1	4	Female	No	No	Yes	Yes	2006	2004	2	4	2	11	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Never
30	2	4	Female	No	No	Yes	Yes	2006	2004	2	5	2	10	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Never
31	3	4	Female	No	No	Yes	Yes	2006	2004	2	2	2	10	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Never
32	4	4	Female	No	No	Yes	Yes	2006	2004	2	4	2	10	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Never
33	5	4	Female	No	No	Yes	Yes	2006	2004	2	6	2	10	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Never
34	6	4	Female	No	No	Yes	Yes	2006	2004	2	5	2	10	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Never
35	7	4	Female	No	No	Yes	Yes	2006	2004	3	5	2	16	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Never
36	8	4	Female	No	No	Yes	Yes	2006	2004	3	6	3	12	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Never
37	9	4	Female	No	No	Yes	Yes	2006	2004	2	5	5	12	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Never
38	10	4	Female	No	No	Yes	Yes	2006	2004	2	5	5	15	No	No	No	Yes	No	0	No	No	Yes	Yes	No	0	Usually	Usually	Never
39	1	5	Female	Yes	Yes	Yes	Yes	2006	2005	10	15	10	10	Yes	Yes	No	Yes	No	1	No	Yes	Yes	Yes	Yes	1	Usually	Usually	Never
40	2	5	Female	Yes	Yes	Yes	Yes	2006	2005	8	15	15	20	Yes	Yes	No	Yes	No	1	No	Yes	Yes	Yes	Yes	1	Usually	Usually	Never
41	3	5	Female	Yes	Yes	Yes	Yes	2006	2005	10	12	10	15	Yes	Yes	No	Yes	No	1	No	Yes	Yes	Yes	Yes	1	Usually	Usually	Never
42	4	5	Female	Yes	Yes	Yes	Yes	2006	2005	10	15	8	10	Yes	Yes	No	Yes	No	1	No	Yes	Yes	Yes	Yes	1	Usually	Usually	Never
43	5	5	Female	Yes	Yes	Yes	Yes	2006	2005	10	15	15	15	Yes	Yes	No	Yes	No	1	No	Yes	Yes	Yes	Yes	1	Usually	Usually	Never
44	6	5	Female	Yes	Yes	Yes	Yes	2006	2005	10	15	10	10	Yes	Yes	No	Yes	No	1	No	Yes	Yes	Yes	Yes	1	Usually	Usually	Never

Data View / Variable View

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	SN	SNC	Grade	Gender	Nationality	B1	B2	B3	B4	B4_1	B4_2	B4_3	B5	B6	B7	B8	B9_1	B9_2	B9_3	B9_4	B9_5	B9_6	B9_7	B10_1	B10_2	B10_3
1	1	1	G10	Male	.	Intermediat	4	4	6	.	1	2	Happy	Ofte	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
2	2	1	G10	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
3	3	1	G10	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
4	4	1	G10	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
5	5	1	G10	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
6	6	1	G10	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
7	7	1	G10	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
8	8	1	G10	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
9	9	1	G10	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
10	10	1	G10	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
11	11	1	G11	Male	.	Intermediat	4	3	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
12	12	1	G11	Male	.	Intermediat	4	3	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
13	13	1	G11	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
14	14	1	G11	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
15	15	1	G11	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
16	16	1	G11	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
17	17	1	G11	Male	.	Beginner	4	3	6	.	.	3	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
18	18	1	G11	Male	.	Beginner	3	3	6	.	.	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
19	19	1	G11	Male	.	Beginner	3	3	6	.	.	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
20	20	1	G11	Male	.	Beginner	3	2	6	.	.	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
21	21	1	G11	Male	Emirate	Beginner	3	3	6	.	.	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
22	22	1	G12	Male	.	Intermediat	6	6	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
23	23	1	G12	Male	.	Intermediat	6	6	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes
24	24	1	G12	Male	.	Advanced	6	6	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes
25	25	1	G12	Male	.	Intermediat	6	6	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes
26	26	1	G12	Male	.	Advanced	6	6	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes
27	27	1	G12	Male	.	Advanced	6	6	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
28	28	1	G12	Male	.	Intermediat	6	6	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
29	29	1	G12	Male	.	Intermediat	6	6	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
30	30	1	G12	Male	.	Intermediat	6	6	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
31	31	1	G12	Male	.	Intermediat	6	6	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
32	32	1	G12	Male	.	Advanced	6	6	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes
33	33	1	G12	Male	.	Advanced	6	6	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes
34	34	1	G12	Male	.	Advanced	6	6	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
35	35	1	G12	Male	.	Advanced	6	5	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes
36	36	1	G11	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
37	37	1	G11	Male	.	Intermediat	4	3	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes
38	38	1	G11	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
39	39	1	G11	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
40	40	1	G11	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
41	41	1	G11	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
42	42	1	G11	Male	.	Intermediat	4	3	6	.	1	3	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
43	43	1	G11	Male	.	Intermediat	4	3	6	.	1	3	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
44	44	1	G11	Male	.	Intermediat	4	4	6	.	1	2	Happy	Often	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No

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Appendix (D)

TRINAGULATED RESULTS AND DESCRIPTIVE STATISTICS

D1- Principal's & Teachers Survey Results

D2- Student Survey Results

D3- Observation Survey Results

D4-Principals Interview Results

D5- Teacher Interview Results

D1/Principals and Teachers Survey Results

Part A. GENERAL INFORMATION ABOUT YOUR SCHOOL

Principals Responses

D1/PA

	N	Min	Max	Mean	S. D
A1: Total number of classes	12	10	30	20.67	7.499
A2: Total number of students	12	250	700	475.83	179.112
A3: Total number of teachers	12	50	140	97.33	30.976
A4: Total number of Emirate teachers	12	20	50	36.67	9.614
A5: Total number of Non-Emirate teachers	12	25	100	56.50	21.581

Part A: USE OF ICT

Teachers Responses

D1/TA1-TA4 (use of e-mail & www for instructional purposes)

	N	P	S. D
A1: Do you use E-mail for instructional purposes?	117	.12	.326
A2: Do students of grades 10, 11 and 12 use E-mail for instructional purposes?	117	.10	.305
A3: Do you use the WWW for instructional purposes?	117	.49	.502
A4: Do your students of grades 10, 11 and 12 uses the WWW for instructional purposes?	117	.61	.491

Part C: HISTORY OF ICT IN YOUR SHOOL, CURRENT OBJECTIVES, AND USE.
PRINCIPALS AND TEACHERS RESPONSES

D1/PTC3: To what extent is each of the following aspects of teaching and learning <u>present</u> in your school and to what extent has ICT been used in <u>realizing</u> these aspects?

		Present							Realization								
		Principals				Teachers			Principals				Teachers			T	P
Code		**N**	**Mean**	**S. D**		**N**	**Mean**	**N**	**Mean**	**S. D**	**S. D**		**N**	**Mean**	**S. D**	**Pearson** ***r***	**Pearson** ***r***
E	C3_1: Combining parts of school subjects with one another (multidisciplinary approach).	12	1.67	.492		118	1.66	117	1.90	.480	.515		117	1.90	.480	.184	.478
E	C3_2: Students developing abilities to undertake independent learning.	12	1.08	.289		118	1.08	118	1.15	.361	.389		118	1.15	.361	.717	.674
E	C3_3: Providing weaker students additional instruction.	12	1.00	.000		118	1.01	118	1.02	.130	.000		118	1.02	.130	.704	.(a)
E	C3_4: Organizing teaching and learning so that differences in entrance level, learning pace, and learning route are taken into account.	12	1.08	.289		118	1.07	118	1.58	.496	.515		118	1.58	.496	.231	.255
E	C3_5: Students learning to search for information, process data, and present information.	12	1.92	.289		118	1.92	118	2.24	.834	.669		118	2.24	.834	.453	.257
E	C3_9: Students being largely responsible for controlling their own learning progress.	12	1.00	.000		117	1.01	117	1.07	.253	.289		117	1.07	.253	..343	.(a)
E	C3_10: Students learning and/or working during lessons at their own pace.	12	1.00	.000		118	1.00	117	1.35	.497	.515		117	1.35	.497	.(a)	.(a)
E	C3_11: Students involved in cooperative and/or project-based learning.	12	1.83	.389		118	1.83	118	1.97	.562	.603		118	1.97	.562	.787	.775
E	C3_12: Students learning by doing.	12	1.75	.452		118	1.76	116	1.94	.498	.515		116	1.94	.498	.684	.684
Average Emerging		**12**	**1.37**	**.109**		**117**	**1.37**	**113**	**1.58**	**.304**	**.288**		**113**	**1.58**	**.304**		
T	C3_6: The emphasis I am learning is on the development of skills.	12	2.25	.452		118	2.15	118	2.40	.492	.492		118	2.40	.492	.521	.816
T	C3_7: Students working on the same learning materials at the same pace and/or sequence.	12	1.92	.996		117	1.92	117	1.71	.788	.754		117	1.71	.788	.898	.817
T	C3_8: Teachers keeping track of all students' activities and progress.	12	1.58	.515		118	1.65	118	1.97	.158	.000		118	1.97	.158	-.005	.(a)
Average Traditional		**12**	**1.92**	**.571**		**117**	**1.91**	**117**	**2.03**	**.353**	**.361**		**117**	**2.03**	**.353**		
	Average	**12**	**1.51**	**.186**		**116**	**1.51**	**112**	**1.69**	**.269**	**.250**		**112**	**1.69**	**.269**	**.308**	**.422**

C3-1/2/3/4/5/9/10/11=Emerging practices; C3-6/7/8=Traditional practices; t=Teacher & P=principal

D1/PTC7: The following statements concern the use of computers in different aspects.

	Policy Goals									Realization							
	Principals				Teachers					Principals				Teachers		T	P
	N	P	S. D		N	P	S. D	Pearson *r*	Pearson *r*	Mean	S. D		N	Mean	S. D	Pearson *r*	Pearson *r*
C7_A: Learning Process	**12**	**.44**	**.241**		**118**	**.42**	**.187**	.184		**1.35**	**.225**		**115**	**1.00**	**.146**	.511	.654
C7_A1: One or more computers available in every classroom	12	.08	.289		118	.00	.000	.717		1.00	.000		115	1.01	.093	.(a)	.(a)
C7_A2: Teachers use computers in their instructional practice.	12	.50	.522		118	.51	.502	.704		1.42	.515		114	1.31	.463	.350	.507
C7_A3: Encouraging independent learning with the aid of computers	12	.17	.389		118	.17	.377	.231		1.00	.000		116	1.01	.093	-.043	.(a)
C7_ A4: Students using computers as supportive learning aids	12	1.00	.000		118	1.00	.000	.453		2.00	.603		118	1.98	.599	.(a)	.(a)
C7_B: Communication/ Collaboration	**12**	**.42**	**.308**		**118**	**.44**	**.276**	..343		**1.25**	**.282**		**112**	**1.26**	**.270**	.459	.528
C7_B1: Every teacher has an individual e-mail address at/via school	12	.00	.000		118	.00	.000	.(a)		1.08	.289		113	1.08	.272	.(a)	.(a)
C7_B2: Students use e-mail	12	.42	.515		118	.41	.493	.787		1.08	.289		115	1.09	.283	.239	.357
C7_B3: Students access external databases via the Internet/WWW	12	.75	.452		118	.83	.377	.684		1.67	.651		118	1.66	.630	.476	.617
C7_B4: Cooperation with other schools in the area of computers	12	.50	.522		118	.51	.502			1.17	.389		118	1.19	.398	**.398**	**.447**
C7_C: Others	**12**	**.67**	**.287**		**118**	**.66**	**.285**	.521		**1.17**	**.144**		**114**	**1.18**	**.142**	.445	.588
C7_C1: Provision of training for all teachers in using ICT for educational purposes	12	.83	.389		118	.83	.377	.898		1.58	.515		118	1.63	.486	.492	.529
C7_C2: Provision of training for one or a couple of teachers to become an ICT -specialist of computers	12	1.00	.000		118	.98	.130	-.005		1.08	.289		117	1.12	.326	-..358	.(a)
C7_C3: Development of a common vision on the use of computers within the school	12	.75	.452		118	.75	.437			1.08	.289		116	1.08	.269	**.164**	**..174**
C7_C4: Assignment of non-teaching hours to teachers to support the use of computers in the school	12	.33	.492		118	.34	.475	**.308**		1.00	.000		115	1.00	.000	.(a)	**.(a)**
C7_C5: Attention to norms and values in using Internet/WWW	12	.42	.515		118	.42	.496		12	1.08	.289		116	1.07	.254	**-.237**	**-.255**

Part D- ICT SUPPORT AND NEEDS

Principals and Teachers Responses

D1/PTD1: How many hours a week are formally allocated to computer coordination for the individuals marked in the previous question?

	N	Min	Max	Mean	S. D
Principals	9	2	25	16.33	8.500
Teachers	6	10	25	20.00	7.746

D1/PTD2: Level of Technical coordination at schools

	Principals				Teachers		
	N	P	S. D		N	P	S. D
D2_1: Nobody coordinates	12	.00	.000		118	.00	.000
D2_2: A full - time computer coordinator with possibly a small teaching load	12	.17	.389		118	.09	.292
D2_3: A classroom teacher	12	.83	.389		118	.90	.304
D2_4: A person from the (national, regional, provincial, district) level.	12	.00	.000		118	.02	.130
D2_5: The school principal or non teaching administrator	12	.00	.000		118	.01	.092
D2_6: Another person	12	.00	.000		118	.01	.092
D2_7: A committee for the coordination of technology	12	.00	.000		118	.01	.092

D1/TD3: Please Indicate the extent to which your school considers each of the following a priority for further external support?

Teachers only						
		None	Low	Moderate		
	N	N (%)	N (%)	N (%)	Mean	S. D
D3_1: Availability of software	118	0 (0.0)	42 (35.6)	76 (64.4)	1.64	.481
D3_2: Quality of software or materials	118	0 (0.0)	71 (60.2)	47 (39.8)	1.40	.492
D3_3: Availability of in-service training courses	118	12 (10.2)	68 (57.6)	38 (32.2)	1.22	.615
D3_4: On line services for curriculum purposes	118	65 (55.1)	53 (44.9)	0 (0.0)	.45	.500

D3/ Class observation Survey Results

Observation Descriptive Statistics

D3/I. CURRICULUM AND DIDACTIC CHARACTERISTICS

P: Characteristics of ICT Use (D3/IP)	**N**	**Min**	**Max**	**Mean**	**S. D**
P_1: Word processing, desktop publishing	24	1	1	1.00	.000
P_2: Spreadsheet	24	1	1	1.00	.000
P_3: Database	24	1	1	1.00	.000
P_4: Graphics: presentation, no professional drawing	24	0	0	.00	.000
P_5: CAD (Computers Aided Design), CAM (Computer Aided Manufacturing)	24	0	0	.00	.000
P_6: Statistical, mathematical programs	24	0	1	.50	.511
P_7: Programming Languages	24	1	1	1.00	.000
P_8: Accounting, book-keeping, financial software	24	0	0	.00	.000
P_9: Drill and practice programs	24	0	0	.00	.000
P_10: Tutorial programs (for self learning)	24	0	0	.00	.000
P_11: Simulations (e.g. Real world simulations)	24	0	0	.00	.000
P_12: Educational games	24	0	1	.67	.482
P_13: Recreational games/other games	24	1	1	1.00	.000
P_14: For Exam/ Tests/ Constructing tests/ Administrating tests	24	0	0	.00	.000
P_15: Internet browser	24	1	1	1.00	.000
P_16: E-mail software	24	1	1	1.00	.000
P_17: Encyclopedia on CD-ROM	24	1	1	1.00	.000
P_18: Video/audio/author-ware	24	0	0	.00	.000
P_19: Music composition	24	0	0	.00	.000
P_20: Presentation software (e.g. PowerPoint)	24	1	1	1.00	.000
P_21: Software supporting Microcomputer Based Laboratories	24	0	0	.00	.000

Q: Social grouping of pupils using ICT (D3IQ)	**Frequency**	**Percent**
Individual	0	0.0
Pairs	4	16.7
Small Groups	20	83.3
Total	**24**	**100.0**

D4/ Principals Interview Results

Principals Interviews Results

Part J: APPLYING TECHNOLOGY

Principals Responses

D4/PJ1_1: Is applying technology in your school a formal part of its educational mission?

	N	%
Yes	12	100.0

D4/PJ1_2: Why?

	N	%
1: It is educationally policy requirement	8	66.7
2: It is within the formal part of the education plan	1	8.3

D4/PJ2: Is technology incorporated in the curriculum?

	N	%
Yes	12	100.0

D4/J2: At what level?

	N	%
1: It is an IT course	7	58.3
2: It is a computer literacy course	2	16.7
3: It is given as a separate computer course	3	25.0
4: Students use technology in getting information	1	8.3
5: General level	1	8.3
6: Subject level	1	8.3

D4/J3: State three areas where technology is important to your school?

	N	%
1: Students are more responsible	1	8.3
2: prepares students for environment beyond school	6	50.0
3: connects schools to each other and to the community	4	33.3
4: it widens the scope of students, helps with homework, and	9	75.0
5: the schools are modern, have good reputation and presence	8	66.7
6: Students can be more contented to teacher	1	8.3
7: exposes teachers to new concepts of teaching and widens t	4	33.3
8: Students are motivated	4	33.3

Part K: STUDENT ACCESS AND USE QUESTIONS

Principals Responses

D4/PK1: How do your students typically use school based computer?

	N	%
1: They use it to search the web.	7	58.3
2: students use it as an aid in homework	9	75.0
3: They use it to understand computer software usage	2	16.7
4: Learn new skills	1	8.3

D4/PK2: Describe the types of things your students typically do with technology?

	N	%
1: They use it to search the web.	3	25.0
2: It helps them in their homework	1	8.3
3: They use it to understand computer software usage	1	8.3
4: They use it to try things	9	75.0
5: They use it for presentation of projects	1	8.3

D4/PK3: We're interested in your impressions of how information technology has impacted your students' learning. Overall, how have students been impacted by the use of technology in your school?

	N	%
1: Students memorize less and think more	3	25.0
2: They are motivated	6	50.0
3: They acquire new skills	2	16.7
4: They are more interested in their class	2	16.7
5: Learn new software	2	16.7
6: They spend more time searching for new things	1	8.3
7: They look for options before doing their homework	2	16.7

D4/PK4: What does technology allow your students to do now - either physically or intellectually - that would have been impossible (or at least more difficult) before technology was widely available in your school?

	N	%
1: Internet search and get varied information thus getting e	10	83.3
2: Make work interesting, widens thinking process and helps	6	50.0
3: Better knowledge of the language	1	8.3

D4/PK5: What changes could be made to technology in your school which would allow your students to benefit more from technology?

	N	%
1: A better Network	7	58.3
2: More access to the Internet.	4	33.4
3: Teachers should have e-mail address	1	8.3
5: More hardware and software.	3	25.0
6: We should have a clear IT implementation Plan	1	8.3
7: Give students more training	2	16.7
8: Give teachers more training	2	16.7
9: More dedicated technical support.	2	16.7

Part L: Teacher Fluency Questions

Principals Responses

D4/PL1: Can you give me your impressions of how fluent your teachers are in their technology use? By "fluent" we mean how skilled are they in both operating the technology AND in applying it to student learning situations.

	N	%
Fluent	6	50.0
Least Fluent	6	50.0

D4/PL2: What do you believe is the greatest impact information technology has had on your teachers?

	N	%
1: They are motivated to change their usual teaching methods	1	8.3
2: Using it to simplify the teaching process	1	8.3
3: They are motivated to acquire new skills	9	75.0
4: Allows them to expand their horizon beyond the books	1	8.3

D4/PL3: In what ways has YOUR professional practice (as a principal) improved through the use of technology?

	N	%
1: I am more open to suggestions	1	8.3
2: I can see a better supervisor	2	16.7
3: I can accomplish more administrative work in less time	2	16.7
4: It helps me plan better	5	41.7
5: I am more in control	1	8.3
6: It makes my job clearer and more structured	1	8.3

D4/PL4: What barriers have you encountered in trying to use technology in your school?

	N	%
1: Lack of budget	5	41.7
2: Lack of clear IT	1	8.3
3: Lack of support	1	8.3
4: Lack of fluent teachers using technology	2	16.7
5: Little teachers training	3	25.0
6: Insufficient equipment	5	41.7
7: Very hard to train teachers with their teaching load	2	16.7
8: Poor network	1	8.3

Part M: Leadership Strategy Questions

Principals Responses

D4/PM1: Please describe your primary role as "technology leader" in your school.

	N	%
1: Helping all concerned in the school to use computers	3	25.0
2: Acquire the best in educational IT for school	1	8.3
3: Put in place the MOE IT directions	1	8.3
4: Do my best to apply technology	6	50.0
5: To try to accomplish the maximum with my budget	1	8.3

D4/PM2: What sorts of strategies have you employed to encourage your teachers to use technology?

	N	%
1: Incentives	4	33.3
2: Give less hours of teaching	4	33.3

D4/PM3: What is your definition of "technology integration"?

	N	%
1: Apply technology in classrooms	5	41.7
2: Incorporate technology in teaching	1	8.3
3: Putting technology in the content of the course	4	33.3
4: Give more computer classes	2	16.7

D4/PM4: What is the most interesting or intriguing use of technology in education that you have ever heard about? It doesn't matter to us whether you or your teachers can actually DO this yet…we just want to know what you find interesting.

	N	%
1: Teaching the Blind by using computers	1	8.3
2: Graphical software	1	8.3
3: Availability of special software enables students think	1	8.3
4: Games that enhance the thinking skills	1	8.3
5: Networking with other schools	3	25.0
6: Use of Internet	1	8.3

Part N: ACCESS AND PROFESSIONAL DEVELOPMENT QUESTIONS

Principals Responses

D4/PN1: What changes would you like to see made in your school with regard to how technology is allocated or structured?

	N	%
1: Better support	1	8.3
2: See a good network my school linked with other schools	3	25.0
3: We need a better network and computers in classes	7	58.3
4: Have internet in school	1	8.3

D4/PN2: How often is technology staff development offered to you and your teachers and who is responsible for conducting this training?

	N	%
Often	12	100.0

D4/PN3: Who is responsible for conducting this training?

	N	%
1: External Company	7	58.3
2: The Ministry of Education	3	25.0

D4/PN4: How often have you personally participated in the training that was offered?

	N	%
Often	12	100.0

D4/PN5_1: What barriers have you encountered in terms of getting the technology training you want and/or need?

	N	%
1: Time	9	75.0
2: Budget	3	25.0

D4/PN5_2: What barriers have you encountered in terms of getting the technology training you want and/or need?

	N	%
1: Time	1	8.3
2: Budget	3	25.0

D4/PN6: What has been the most useful use technology workshop you have attended?

	N	%
1: Workshop on implementation of IT in schools	1	8.3
2: Workshop of IT in general regarding education	2	16.7
3: Workshop on MS Office	6	50.0

D4/PN7: Is there anything else you would like to share with us?

	N	%
1: I'd like to have a clear plan of IT implementation	4	33.3
2: See a plan of IT implemented on the school level	1	8.3
3: More opportunities for having Internet use	2	16.7
4: Training should be conducted in summer	2	16.7
5: Have more budget to send teachers for training	3	25.0
6: Have more up-to-date computers and software	1	8.3
7: See more communication opportunities given to principals	1	8.3
8: How to apply technology in the teaching environment	1	8.3

D5/ Teachers Interview Responses

Teachers Technology Interview

Part J: Student Access and Use Questions

Teachers Responses (D5/TJ)

D5/TJ1: Describe the types of things your students typically do with technology?

	N	%
1: Microsoft Office	32	27.1
2: Web use	22	18.6
3: Programming	3	2.5
4: Logical thinking and IT skills	20	16.9
5: Experiment	12	10.2
6: Games	2	1.7
7: Access software	2	1.7

D5/TJ2: What does technology allow your students to do now - either physically or intellectually - that would have been impossible (or at least more difficult) before technology was widely available in your school?

	N	%
1: Better performance	6	5.1
2: Increases information attainment scope by using Internet	44	37.3
3: Enhances self confidence and thinking process	29	24.6

D5/TJ3: What changes could be made to technology in your school which would allow your students to benefit more from technology?

	N	%
1: Additional equipment and peripherals	20	16.9
2: Redistribution of equipment in labs and classes	18	15.3
3: Leaders support and commitment	11	9.3
4: Staff training and practice opportunities	40	33.9

Part K: Teacher Fluency Questions

Teachers Responses (D5/TK)

D5/TK1: Please describe how you most frequently make use of school computers. We don't want to know all of what you do…just what you most often do?

	N	%
1: Office suite and windows	25	21.2
2: Internet and E-mail	45	38.1
3: Programming and generic skills	5	4.2
4: Homework preparation	17	14.4
5: Practice	3	2.5

D5/TK2: What is the % of accessibility are the classroom or lab computers to teachers throughout the day?

N	Min	Max	Mean	S. D
74	1	20	10.62	3.447

D5/TK3: In what ways has your professional practice (i.e., teaching) improved through the use of technology?

	N	%
1: More time for students	19	16.1
2: More professional and effective	25	21.2
3: Easy access to information and communication	7	5.9
4: I am motivated	34	28.8

D5/TK4: What barriers have you encountered in trying to use technology in the classroom?

	N	%
1: Skills	6	5.1
2: Support/Policy/Leadership	31	26.3
3: Resources	26	22.0
5: Time	16	13.6

Part L: Teacher Vision/Strategy Questions

Teachers Responses (D5/TL)

D5/TL1: How do you get your ideas for integrating technology in the classroom?

	N	%
1: Other schools	9	7.6
2: Other teachers	13	11.0
3: Software vendors	7	5.9
4: Book vendors	24	20.3
5: Internet	26	22.0

D5/TL2: What is the most interesting or intriguing use of technology in education that you have ever heard about? It doesn't matter to us whether you can actually DO this yet…we just want to know what you find interesting.

	N	%
1: Self based learning	8	6.8
2: Software for art and graphics	11	9.3
3: Software using logic techniques	6	5.1
4: Computers for the blind	5	4.2
5: Software using drill down techniques	3	2.5
6: PhotoShop	4	3.4

Part M: Teacher access and Professional development Questions

Teachers Responses (D5/TM)

D5/TM1: What changes would you like to see made in your school with regard to how technology is allocated or structured?

	N	%
1: Full time support in school	18	15.3
2: Dedicated technical support for students working online	21	17.8
3: Support team with varied specialist skills	10	8.5
5: Reliable equipment	7	5.9
6: Training	6	5.1
7: Work in collaboration with other schools	5	4.2
8: More networked computers	5	4.2
9: Upgrades hardware and software	3	2.5
10: More computers	2	1.7

D5/TM2: How often have you participated in the training that was offered?

		N	%
Valid	Often	74	62.7
Missing	System	44	37.3
Total		118	100.0

D5/TM3: What barriers have you encountered in terms of getting the technology training you want and/or need?

Barriers	N	%
1: Limited places	15	12.7
2: Principals support	1	.8
3: Time constraint	39	33.1
4: Policy leadership	1	.8
5: Lack of in-house training	14	11.9
6: Should be given in school vacations	1	.8

D5/TM4: What has been the most useful use technology workshop you have attended?

Technology workshop	N	%
1: Microsoft office	74	62.7
2: Web application	33	28.0
3: Introduction	20	16.9
4: Self training	1	.8
5: Short courses	10	8.5

Appendix (E)

RELIABILTY ANALYSIS/CORRELATIONS

E1. Principals Reliability Analysis

Reliability

Reliability	Cronbach's Alpha	N of Items
Reliability Statistics for C2	.719	8
Reliability Statistics For C3 E Present	.141	9
Reliability Statistics for C3 E Realization	.771	9
Reliability Statistics for C3 T Present	.752	3
Reliability Statistics C3 T Realization	.465	3
Reliability Statistics for C7_A Policy Goals	.607	4
Reliability Statistics for C7_A Realization	.299	4
Reliability Statistics for C7_B Policy Goals	.680	4
Reliability Statistics for C7_B Realization	.556	4
Reliability Statistics for C7_C Policy Goals	.726	5
Reliability Statistics for C7_C Realization	8.08E-015	5
Reliability Statistics for E A	-1.048	4
Reliability Statistics for E B	.609	5
Reliability Statistics for E C	.612	5
Reliability Statistics for E D	.849	5

Teachers Reliability Analysis

Teachers Results

Reliability

Reliability	Cronbach's Alpha	N of Items
Reliability Statistics for C3 E Present	.239	9
Reliability Statistics for C3 T Realization	.797	9
Reliability Statistics for C3 T Present	.631	3
Reliability Statistics for C3 T Realization	.320	3
Reliability Statistics for C7_A Policy Goals	.399	4
Reliability Statistics for C7_A Realization	.241	4
Reliability Statistics for C7_B Policy Goals	.635	4
Reliability Statistics for C7_B Realization	.526	4
Reliability Statistics for C7_C Policy Goals	.744	5
Reliability Statistics for C7_C Realization	.092	5
Reliability Statistics for E_A	-.276	4
Reliability Statistics for E_B	.497	5
Reliability Statistics for E_C	.411	5
Reliability Statistics for E_D	.717	5

E3- Observation Pilot Reliability Analysis

Reliability

Reliability		Cronbach's Alpha	N of Items
Part I: Section A	Degree of curriculum differentiation	.928	6
Part II: Section A	Coaching and Feedback to pupils working with ICT	N.A Variance .000	4
Part II: Section B	Classroom Management	.750	3
Part III: Section A	Teacher Centered	.582	4
Part III: Section B	Student Centered	.684	4

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
B1: How many computers are available for use by students in the classroom?	8	35	60	47.50	13.363
B2: How many computers listed in questions B4 and B5 are available to use by grades 11, 12, and 13 students use latest version of windows XP?	8	12	30	21.00	9.621
B3: How Many computers listed in questions B4 and B5 are available to use by grades 11, 12, and 13 students use Windows 2000, Win NT, or MacOS 7.5 and higher?	8	8	20	14.00	6.414
Valid N (listwise)	8				

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
C1: Word processing, desktop publishing.	8	1	1	1.00	.000
C2: Spreadsheet.	8	1	1	1.00	.000
C3: Database.	8	1	1	1.00	.000
C4: Graphics: presentation, no professional drawing.	8	0	0	.00	.000
C5: CAD (Computers aided design), CAM (Computer aided manufacturing).	8	0	0	.00	.000
C6: Statistical, mathematical programs.	8	0	1	.50	.535
C7: Programming Languages	8	1	1	1.00	.000
C8: Accounting, book-keeping, financial software.	8	0	0	.00	.000
C9: Drill and practice programs.	8	0	0	.00	.000
C10: Tutorial programs (for self learning).	8	0	0	.00	.000
C11: Simulations (e.g. Real world simulations).	8	0	0	.00	.000
C12: Educational games.	8	0	1	.50	.535
C13: Recreational games/other games.	8	1	1	1.00	.000
C14: For exams/tests/constructing tests/administrating tests.	8	0	0	.00	.000
C15: Internet Browser.	8	1	1	1.00	.000
C16: E-mail software.	8	1	1	1.00	.000
C17: Encyclopedia on CD-ROM.	8	1	1	1.00	.000
C18: Video/Audio/Author-ware.	8	0	0	.00	.000
C19: Music composition	8	0	0	.00	.000
C20: Presentation software (e.g. PowerPoint).	8	1	1	1.00	.000
C21: Software supporting Microcomputer Based Laboratories.	8	0	0	.00	.000
Valid N (listwise)	8				

Frequencies

D: Social grouping of pupils using ICT.

D: Social grouping of pupils using ICT.		Frequency
Valid	Pairs	4
	Small groups	4
	Total	8

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
E: What is the percentage of pupils using ICT during the lesson?	8	60	90	75.63	15.454

E4. Principals Results Correlation

Correlations

	Mean	Std. Deviation	N
F1: Is it obligatory for all grades teachers to take at least two basic computer courses?	.83	.389	12
F3: What is the number of teachers that attended at least two computers coerces the past two academic years?	22.08	8.649	12

Correlations F1/F3		F1: Is it obligatory for all grades teachers to take at least two basic computer courses?		
F3: What is the number of teachers that attended at least two computers coerces the past two academic years?	Pearson Correlation	.113		
	Sig. (2-tailed)	.728		
		Mean	Std. Deviation	N
F2: Is it obligatory for all grades teachers to regularly take courses to update their ICT knowledge and skills?		.17	.389	12
F4: What is the number of teachers regularly taking courses to update their ICT knowledge and skills the past two academic years?		16.00	9.155	12

Correlations F2/F4		F2: Is it obligatory for all grades teachers to regularly take courses to update their ICT knowledge and skills?
F4: What is the number of teachers regularly taking courses to update their ICT knowledge and skills the past two academic years?	Pearson Correlation	-.255
	Sig. (2-tailed)	.424

Correlations

		C1: How many years have computers been used by your school for teaching and/or learning activities/purposes for students in grades 10, 11 and 12?
EC3 Present	Pearson Correlation	.406
	Sig. (2-tailed)	.215
	N	11
EC3 Realization	Pearson Correlation	.787(**)
	Sig. (2-tailed)	.004
	N	11
TC3 Present	Pearson Correlation	-.474
	Sig. (2-tailed)	.141
	N	11
TC3 Realization	Pearson Correlation	-.123
	Sig. (2-tailed)	.718
	N	11

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Correlations

		EC3 Present	EC3 Realization
C7_A Policy Learning Process	Pearson Correlation	.287	.055
	Sig. (2-tailed)	.366	.866
	N	12	12
C7_A Realized Learning Process	Pearson Correlation	.444	.735(**)
	Sig. (2-tailed)	.148	.006
	N	12	12
C7_B1R (2-4)	Pearson Correlation	.175	.666(*)
	Sig. (2-tailed)	.586	.018
	N	12	12
C7_B2R (2-4)	Pearson Correlation	.587(*)	.629(*)
	Sig. (2-tailed)	.045	.028
	N	12	12
C7_ABPolicy	Pearson Correlation	.357	.633(*)
	Sig. (2-tailed)	.255	.027
	N	12	12
C7_ABRelization	Pearson Correlation	.686(*)	.897(**)
	Sig. (2-tailed)	.014	.000
	N	12	12

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Correlations

		TC3 Present	TC3 Realization
C2: Goals followed in determining how computers are used at school	Pearson Correlation	-.231	-.068
	Sig. (2-tailed)	.470	.833
	N	12	12

** Correlation is significant at the 0.01 level (2-tailed).

Descriptives

	Policy Goals						Realization				
C7_B Policy	**N**	**Min**	**Max**	**Mean**	**S D**		**N**	**Min**	**Max**	**Mean**	**S D**
C7_B2: Students use e-mail	12	0	1	.42	.515		12	1	2	1.08	.289
C7_B3: Students access external databases via the Internet/WWW	12	0	1	.75	.452		12	1	3	1.67	.651
C7_B4: Cooperation with other schools in the area of computers	12	0	1	.50	.522		12	1	2	1.17	.389
C7_B1R (2-4)	**12**	**0**	**1**	**.56**	**.410**		**12**	**1**	**2**	**1.31**	**.332**

Descriptive Statistics

	Policy Goals						Realization				
Indicators of emerging objectives	**N**	**Min**	**Max**	**Mean**	**S D**		**N**	**Min**	**Max**	**Mean**	**S D**
C7_A1_1: One or more computers available in every classroom	12	0	1	.08	.289		12	1	1	1.00	.000
C7_A2_1: Teachers use computers in their instructional practice.	12	0	1	.50	.522		12	1	2	1.42	.515
C7_A3_1: Encouraging independent learning with the aid of computers	12	0	1	.17	.389		12	1	1	1.00	.000
C7_ A4_1: Students using computers as supportive learning aids	12	1	1	1.00	.000		12	1	3	2.00	.603
C7_B2_1: Students use e-mail	12	0	1	.42	.515		12	1	2	1.08	.289
C7_B3_1: Students access external databases via the Internet/WWW	12	0	1	.75	.452		12	1	3	1.67	.651
C7_B4_1: Cooperation with other schools in the area of computers	12	0	1	.50	.522		12	1	2	1.17	.389
C7_AB Policy	**12**	**.14**	**.71**	**.49**	**.197**		**12**	**1.00**	**1.57**	**1.33**	**.205**

E5. Teachers Results Correlation

Correlations

		EC3 Present	**EC3 Realization**
C7_A_Policy Goals	Pearson Correlation	.291(**)	-.086
	Sig. (2-tailed)	.001	.363
	N	117	113
C7_A_Realized	Pearson Correlation	.533(**)	.411(**)
	Sig. (2-tailed)	.000	.000
	N	114	110
C7_BR Policy (2-4)	Pearson Correlation	.227(*)	.845(**)
	Sig. (2-tailed)	.014	.000
	N	117	113
C7_BR Realize (2-4)	Pearson Correlation	.492(**)	.651(**)
	Sig. (2-tailed)	.000	.000
	N	114	110
C7_ABR Indicators of Emerging Objectives Policy	Pearson Correlation	.352(**)	.654(**)
	Sig. (2-tailed)	.000	.000
	N	117	113
C7_ABR Indicators of Emerging Objectives Realization	Pearson Correlation	.631(**)	.762(**)
	Sig. (2-tailed)	.000	.000
	N	109	105

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Descriptive Statistics

	Policy Goals						Realization				
	N	**Min**	**Max**	**Mean**	**S D**		**N**	**Min**	**Max**	**Mean**	**S D**
C7_B: Students use e-mail	118	0	1	.41	.493		115	1	2	1.09	.283
C7_B: Students access external databases via the Internet/WWW	118	0	1	.83	.377		118	1	3	1.66	.630
C7_B: Cooperation with other schools in the area of computers	118	0	1	.51	.502		118	1	2	1.19	.398
C7_BR Policy (2-4)	**118**	**0**	**1**	**.58**	**.368**		**115**	**1**	**2**	**1.32**	**.321**

	Policy Goals						Realization				
Indicators of emerging objectives	N	Min	Max	Mean	S D		**N**	**Min**	**Max**	**Mean**	**S D**
C7_A: One or more computers available in every classroom	118	0	0	.00	.000		115	1	2	1.01	.093
C7_A: Teachers use computers in their instructional practice.	118	0	1	.51	.502		114	1	2	1.31	.463
C7_A: Encouraging independent learning with the aid of computers	118	0	1	.17	.377		116	1	2	1.01	.093
C7_A: Students using computers as supportive learning aids	118	1	1	1.00	.000		118	1	3	1.98	.599
C7_B: Students use e-mail	118	0	1	.41	.493		115	1	2	1.09	.283
C7_B: Students access external databases via the Internet/WWW	118	0	1	.83	.377		118	1	3	1.66	.630
C7_B: Cooperation with other schools in the area of computers	118	0	1	.51	.502		118	1	2	1.19	.398
C7_ABR	**118**	**0**	**1**	**.49**	**.191**		**110**	**1**	**2**	**1.33**	**.186**