Information and Communication Technology in Cyprus Primary Schools: A Study of the Integration Process, Teachers' Use, and the Influential Factors

by

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Abstract

Information and Communication Technology (ICT), and specifically computer technology, was abruptly introduced in Cyprus primary schools in the early 1990s without ensuring that the facilitating conditions for its unhindered infusion into education's core processes of teaching and learning were in place. Nevertheless, the recently launched overall reform of the Cypriot educational system intensified and systematised the process of ICT integration in schools. In this context, the thesis researches the process of ICT integration in Cyprus primary education, taking into consideration teachers' perceptions on a diversity of issues related to ICT implementation, the factors that seem to be influencing ICT use, as well as their professional development in ICT.

The analysis of the collected data resulted in several findings, indicating that the process of ICT integration is unsatisfactory, since teachers' ICT use is low and restricted only to a small number of resources. Simultaneously, the applications of ICT are mostly for tasks that are not directly connected to actual teaching and learning. Overall, the study shows that ICT did not manage to be smoothly interwoven into teachers' everyday instructional practices, nor did it manage to be naturally incorporated into students' learning environment as an integral part of their everyday learning experiences.

Teachers indicate that the lack of time, their uncertainty of how to integrate ICT in their work, the unsuitable curriculum, the problematic access to equipment, the frequent technical problems, as well as the lack of immediate technical support, are some of the most significant factors affecting ICT use. Nevertheless, the study shows that there is a positive ground on which ICT can be successfully and meaningfully integrated in schools, like teachers' positive ICT attitudes, their willingness and demand for quality ICT training, and the positive impact that ICT seems to have on some of teachers' professional responsibilities. Additionally, the study indicates that teachers' use of audiovisual resources, their ICT self-efficacy beliefs, their attitudes toward ICT, their pedagogical beliefs, as well as their views on the barriers and enablers to ICT use are significant predictors of teachers' ICT use.

Based on the study's results, the thesis suggests that the ongoing reform of the educational system provides a great opportunity to set up the right conditions that will facilitate the sound integration of ICT in schools. This includes the reconsideration of ICT integration's theoretical background and objectives, the release of time to teachers as a result of the new curriculum, the reconsideration of teachers' professional development in ICT, as well as the establishment of an updated technical infrastructure and a solid technical support mechanism.

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Abbreviations used

ACOT: Apple Classrooms Of Tomorrow

AI: Artificial Intelligence

BECTA: British Educational Communications and Technology Agency

CAI: Computer-Assisted Instruction

CAQDAS: Computer-Assisted Qualitative Data Analysis Software

CPD: Continuing Professional Development

DfES: Department for Education and Skills

ECDL: European Computer Driving Licence

ECDL-CTP: European Computer Driving Licence – Certified Training Professional

ESCB: European System of Central Banks

EU: European Union

ICT: Information Communication Technology

ILS: Integrated Learning System

INSET: In-service Education and Training

ITS: Intelligent Tutoring Systems

MOEC: Ministry of Education and Culture

MS Word: Microsoft Word

NAM: Non-Aligned Movement

OSCE: Organisation for Security and Co-operation in Europe

PD: Professional Development

PIU: Project Implementation Unit

PRONETT: Professionals Networking Education and Teacher Training

SEM: Structural Equation Modelling

SOEID: Scottish Office Education and Industry Department

TLC (survey): Teaching, Learning, and Computing (survey)

UK: United Kingdom

UN: United Nations

US: United States

ZPD: Zone of Proximal Development

Chapter 1: Introduction

1.1 The study's background

The diverse educational stakeholders and the educational community in general, assume that the process of introducing, and more importantly, of meaningfully integrating Information and Communication Technology (ICT) into an educational system could provoke and initiate a challenging change process that could result in the transformation of education. The integration of these technological tools into education's core processes of teaching and learning holds the promise to facilitate the emergence of innovative teaching approaches that would improve the offered education service and enhance the overall students' performance and learning. Within this framework, students' entitlement to an education that is compatible with the demands of the 21st century, as well as with the needs of a way of personal and professional life that is defined by the norms of the Information Age, is an argument frequently brought forth to justify the heavy investment on technological resources and technical infrastructure in school settings. The same and similar arguments are also used to intensify the pressure placed on schools and teachers to accelerate the process of ICT integration and to increase the use of ICT in the classroom.

Nevertheless, it is empirically evident that, although the technology's presence in schools is constantly increasing due to the extensive investments in technological equipment, the desired and much expected transformation of schooling is not happening. In other cases, the pace of this change is very slow, and definitely much slower compared to what the various educational stakeholders, as well the educational policy-makers, would wish for. Much research evidence indicates that teachers' use of ICT is infrequent and in many cases for tasks that are not directly connected to the classroom's main activities. Simultaneously, much of teachers' use of ICT is only to support and underpin traditional and established instructional approaches that are not compatible with the current trends in pedagogy, maintaining in this way an outdated and inefficient for the 21st century educational status quo. In this context, it is supported that even though teachers have little choice over whether to use the various ICT resources for their professional responsibilities, they retain a great deal of control over how and when they meaningfully use them. Consequently, the pressure on teachers to find creative and productive ways to exploit ICT in the context of their work, to enhance their teaching approaches in accordance to the prevailing learning theories, and to help their students improve their learning outcomes, is being intensified.

In an effort to identify what hinders ICT's successful integration in schools, as well as teachers' meaningful use of technology in their teaching practices, researchers and educational stakeholders have identified a number of determinant and decisive factors. These factors could be related to matters that concern the technology itself, like the sufficient availability of quality technological resources in schools, the ease of access to these resources by teachers, as well as the existence of support mechanisms to facilitate teachers' effort to incorporate these resources. At the same time, these factors could be directly related to teachers, like their personal pedagogical beliefs, their beliefs about ICT, their ICT use self-efficacy beliefs, their ICT training, as well as their personal characteristics. Addressing and dealing with these factors is considered to be a prerequisite for ICT's successful integration. Some of these issues, like the adequacy of updated technological equipment, the practical organisation of ICT resources which facilitates teachers' direct access, as well as the establishment of a supportive infrastructure readily available to teachers, could presumably be tackled with sufficient funding and careful planning. Contrarily, issues that are connected to teachers' general pedagogical and ICT beliefs are more complex to be dealt with.

In this context, and whereas ICT's presence and access in schools with respect to ICT equipment and resources is unhindered, the light of interest is directed on teachers. This is due to the fact that teachers are considered to be the key actors responsible, not only for the meaningful and sound infusion of ICT into their everyday teaching approaches, but also for the success of any planned reform by the educational community. Based on that, it is obvious that ICT cannot redefine and transform education just because it is placed in schools. Teachers are evidently responsible for making and sustaining any change in schools by consciously adopting and incorporating in their everyday teaching repertoire new instructional methods and tools that can differentiate their established practices. In any case, their overall professional knowledge as well as their stances, beliefs, and attitudes toward ICT and pedagogy are definitely affecting the decisions they make and the actions they take.

It must be noted that in the process of integrating ICT in schools, the role of teachers' professional development is boldly highlighted, not only in the respective literature, but also in reform plans designed and launched by policy-makers and other educational stakeholders. This is based on the belief that well-organised, focused, and innovative ways of teachers' training could effectively promote technology in schools, by helping teachers develop new ways of thinking and working with technological tools, as well as by addressing and dealing with teachers' overall beliefs and perspectives. It must be also underscored that much research evidence shows that untrained teachers with lack of technical skills that would allow them to fully exploit the various technological tools to support their professional responsibilities, is considered to be a significant factor that influences the successful integration of technology in schools.

1.2 The emergence of the 'Information Age' and ICT integration in schools

The 'Information Age' is based on rapidly increasing and changing information (Chen 2003), which denotes that learners will have to face an ever-increasing body of information (McFarlane, 1997; Grabe and Grabe 2001; Yelland 2007). As citizens of the twenty-first century's 'Information Age', they will have to be able to deal with vast amounts of data, as well as with the fact that the self-life of knowledge is too short (Wexler and Culp 2006; Plomp et al. 2007; Yelland 2007). It is therefore suggested that defining education in terms of specific information or skills is counterproductive (Roblyer and Edwards 2000). Learning more information is not only unnecessary, but is impossible, and surely not wise, since the rapid developments in the area of technology are making increasingly possible the ability to retrieve specific information as it is needed (McFarlane, 1997; Grabe and Grabe 2001)

Moreover, the technological developments within the 'Information Age' allow the permeation of numerous technological tools in all aspects of society, creating radical changes in the ways that people work, create products and intellectual property, communicate, transport themselves, distribute tangible or intangible resources, and spend their leisure time. Technology is everywhere discreetly or not, and its products and applications are increasingly supporting, regulating, facilitating, and limiting the things that people do, and the lives that they lead (Snyder, 2001; Anderson and Weert 2002; Siraj-Blatchford and Whitebread 2003; Tearle 2003; Semenov 2005; Yelland 2007). In this context, it is argued that technology cannot be avoided, since "it represents the logical, evolutionary next step for the human race to refine what it does with its intelligences" (Gura and Percy 2005:x). Due to the emergence of the 'Information Age', novel needs have arisen in the human experiences which are to a large extent, being solved by the constant developments of technologies. Nevertheless, as technology becomes more capable and pervades more aspects of society, everyday life also has become more complex and demanding (Roblyer and Edwards 2000).

In this framework, a democratic society with responsible members who take initiatives and know how to successfully deal with the challenges and opportunities derived by the emergence of the 'Information Age', must know how to use and exploit the modern technological tools so as to find, understand, and use information to make informed and productive decisions. The educational system of such a society ought to prepare citizens who will be living and working in the 'Information Age' and who will be successful in their responsibilities (Marlowe and Page 2005). In the context of this age, in which the significance of information is dominant, there is an imperative need to alter the traditional educational practices, and to emphasise the higher-level knowledge construction needed to cope with the rapid expansion of information (Airasian and Walsh 1997; Bonk and King 1998; Marlowe and Page 2005). Technology and its high-intensity power tools can energise and empower everything that learners and 'knowers' naturally do, and as a result, new and more effective ways to learn, know, and communicate, are developed (Gura and Percy 2005). Based on the new state of affairs formed by the emergence of the 'Information Age', it is underscored that the goal of education is no longer to train students to store and retrieve mastered information (Chen 2003).

Although the effects and consequences of the ‘Information Age’ are evident in everyday life, and although the technological innovations and applications have conquered every aspect of people’s activities, a considerable number of authors in the respective literature indicate that things in the area of education are not quite encouraging. It is characteristically stressed that “school, society’s vehicle for preparing the emerging generation for life in a technology-dominated future, represents the last technology-resistant major institution” (Gura and Percy 2005:xi). Schools, and often teachers, are harshly criticised that they deprive students their right to receive the appropriate intellectual tools and skills which will enable them to function effectively in the rapidly changing world of the ‘Information Age’ (Cook and Finlayson 1999; Grabe and Grabe 2001; Stallard and Cocker 2001; Wardlaw 2007). They underscore that it is ironic that schools are the last remaining ‘nook’ in which technology is not used as a principal support of its core processes, and that this should be changed, because education will otherwise be out of pace with the rest of the world (Gura and Percy 2005). They also argue that children ought to be prepared to live meaningful lives in the twenty-first century, which denotes that they need to be provided with relevant learning (Yelland 2007). This means that schools and teachers should prepare them for the ‘Information Age’, by teaching them how to think with their knowledge and to apply it flexibly and responsibly (Staples et al. 2005; Wiske et al. 2005; Wexler and Culp 2006).

The argument that technology’s presence in schools is inadequate and inconsistent with the demands of the ‘Information Age’ is not the only one put forth so as to increase and intensify the pressure on schools and teachers to ‘technologise’ learning. The traditional ways in which the various technological tools are applied and integrated in teaching and learning processes are also criticised. In this context, it is argued that schools “seem to be caught in a ‘time warp’ and continue to adopt the practice of mapping the new technologies on to old curricula with tired pedagogy” (Yelland, 2002:85). It is indicated that the traditional curricula are crowded and are based on, and constrained by different models of access to ICT resources, timetables, focus on skills and teacher direction (Downes, 2002; Yelland 2007). In this way, modern technology and ICT tools cannot be integrated into curricula which were not developed to cover the needs of the 'Information Age'. It is simplistic to consider that teaching and learning with ICT is a solution to yesterday's problems and definitely students deserve a different and more contemporary approach (Loveless, 2002; Semenov 2005). Education should focus on more general capabilities such as 'learning to learn' skills that will help them as future citizens cope with the inevitable changes that technology brings about (Roblyer and Edwards 2000). Students will then have the opportunity to become critical and creative participants in the 'Information Age', who will know how to generate knowledge of personal significance (Grabe and Grabe 2001; Wexler and Culp 2006), and not passive consumers of information (Loveless and Dore 2002). Students also have to become life-long learners who will regard themselves as responsible for keeping their knowledge and skills up-to-date and who will be able to use ICT to access the latest knowledge in a particular domain (Semenov 2005; Plomp et al. 2007).

In this context, it is advocated that a radical rethinking of the existing school curricula is needed, which will incorporate contemporary notions and themes that will provide to children opportunities to explore and investigate various topics in ways that were not possible without the new technologies (Yelland 2007). Novel, broad, and balanced curricula for the twenty-first century should also incorporate 'technology literacy' (Anderson and Weert 2002; Siraj-Blatchford and Whitebread 2003). 'Technology literacy' represents an essential body of twenty-first century skills (Koenraad et al. 2002; Gura and Percy 2005; Wexler and Culp 2006), that are needed for the students' future success in educational, professional, and civic realms of society (LeCourt, 2001). It is suggested that schools should begin to educate with the acquisition of these skills as a high-priority need (Gura and Percy 2005), since "where at one time a scholarly person was expected to have a good general knowledge, today's professionals must have enough working knowledge to perform their roles" (Loveless et al, 2001). New economies and workplaces are places of diversity with established, but also evolving, cultures, which demand citizens who are capable of being creative, innovative, and transformative in their use of knowledge and skills in order to create products, ideas, and services, and who are able to work abstractly and efficiently, and adapt to changing times with fluency (Yelland 2007). This is one of the major driving forces for introducing ICT in school: to prepare the current generation of young people for the future workplace (McCulloch, 1997; Roblyer and Edwards 2000; Cuban 2001; Koenraad et al. 2002; Mills and Tincher 2003; Leung et al. 2005; Shaunessy 2005; Staples et al. 2005).

Furthermore, the pressure and high expectations that are placed upon schools and teachers to accelerate the integration of ICT to support and enhance teaching and learning, is also based on the argument that the generation of the twenty-first century, sees ICT as ‘normal’, and something as a non-remarkable feature of its world (Adams & Brindley, 2002; Debevec et al. 2006). There is a widening gap between the ways in which technology is being used in school, and how students use ICT in their homes and communities (Downes, 2002; Peck et al. 2002). New technologies in schools are peripheral to teaching and learning, which are still heavily reliant on old technologies and traditional ways of knowing (Yelland 2007). Consequently, the school ICT use is not engaging enough for the techno-savvy generation of the twenty-first century (Wardlaw 2007). Seldom does technology play the same natural role in a classroom as it does in other areas of students’ daily lives (Grabe and Grabe 2001), while it still awaits acceptance as something that is routine, regular, and necessary for everyone (Stallard and Cocker 2001). It is noted that “children spend more time using a computer outside school than they do in school, that they develop a range of skills that are not always recognised or allowed for in schools’ ICT planning, and that there is, at least among older children, a steadily growing level of frustration with the ICT opportunities provided by schools” (Fox 2003:96). Home ICT use is described as exploratory, collaborative, and readily available which helps the user meaningfully develop ICT skills in authentic contexts (Downes, 2002). Therefore, in order for education to remain at the core of a successful society, it should remain relevant to the lifeworlds of the students (Yelland 2007). The use of ICT in the classroom should become an extension of the students' experiences at home (Adam & Brindley, 2002), and to offer enjoyable, motivating, and beneficial educational experiences to all students (Cook and Finlayson 1999).

1.2.1 Meaningful ICT integration into schools

The growing pressure on schools to integrate technology into their processes often leads to false and not well-thought actions and planning by schools' administration and teachers, so as to promptly introduce rather than integrate technology. In many cases this pressure results in the acquisition of excessive technological hardware, that makes teachers feel compelled to incorporate technology into their classrooms, even without a clear educational agenda in mind. Technology becomes an end of itself rather than a means to a worthwhile educational purpose (Bennett 2003; Littrell et al. 2005; Semenov 2005; Wiske et al. 2005; Plomp et al. 2007). Nevertheless, while teachers have little choice over whether to use ICTs, they retain a great deal of control over how and when they meaningfully use them (Scrimshaw, 1997).

In order to examine the issues related to meaningful ICT integration, it is firstly useful to provide a description of educational technology and subsequently of ICT. It is believed that the field of educational technology is as old as education itself. ICTs, their tools and techniques, are just the latest developments in this ever evolving field, which during the latest decades is constantly expanding and progressing at astonishing rates (Roblyer and Edwards 2000). For this reason, it is quite difficult to pose a comprehensive definition which could describe such a pluralistic field which is often encountered in the respective literature as instructional technology. However, a broad definition that could be used is the following: "instructional technology is the theory and practice of design, development, utilisation, management, and evaluation processes and resources for learning" (Seels and Richey 1994:9). Nevertheless, for many stakeholders in education the phrase educational or instructional technology is synonymous to computer technology, or a set of equipment related to a computer (Roblyer and Edwards 2000; Earle, 2004). It is argued that although these views are correct, "since definitions of state-of-the-art instruction usually mention the most recently developed tools" (Roblyer and Edwards 2000:5), they have created some of the problems related to meaningful technology's integration into education (Earle, 2004).

In this context, many authors in the respective literature note that real and meaningful technology integration in education does not simply mean the purchase and placement of computer hardware and software in the classroom (Roblyer and Edwards 2000; Grabe and Grabe 2001; Russell 2001; Stallard and Cocker 2001; Yelland, 2002; Mills and Tincher 2003; Earle, 2004; Hennessy et al. 2005; Wiske et al. 2005; Yelland 2007). Nevertheless, it is noted that "schools are so eager to purchase and have teachers begin using technology, that they mistake simply having and turning on a computer as integration" (Pierson 2001:426). Integrating technology in teaching and learning is not as simple and superficial as that. Educational technologies "are not like appliances that automatically do their jobs when the 'power' button is pushed" (Wiske et al. 2005:3), nor are they "merely new educational tools waiting to be picked up and used" (Kerr 1991:121). Rather, integrating ICT in education refers to the process of determining which tools and which methods for implementing them are appropriate for given classroom situations and problems (Roblyer and Edwards 2000). In this way, educational technology integration is considered to be a complex process and not just a product or fact (Roblyer and Edwards 2000; Semenov 2005; Plomp et al. 2007), which reflects on how technology-enhanced practices challenge assumptions about what and how to teach and how students can learn most effectively in the 'Information Age' (Wiske et al. 2005).

Furthermore, it is evident that the number of computers and other technological resources in schools has profoundly increased, whilst the ratio of students per computers has dramatically changed. These statistics are often included in reports and publications compiled by Ministries and other educational authorities to show that their planning and policies for technology integration are progressing and succeeding. However, these statistics create false assumptions about what really happens in classrooms with respect to technology integration. It is possible that this equipment is completely abandoned in computer laboratories or in the back of the classroom and is completely unused either by teachers or students (Grabe and Grabe 2001). At the same time, it is possible that technology is only used to complete mundane school tasks which have nothing to do with teaching or learning (Yelland 2007). Finally, it is possible that teachers, with less technological equipment at their disposal, or with out-of-date hardware in their classroom, to find innovative ways to incorporate technology into their teachings, while other teachers with increased access to novel equipment have problems in meaningfully integrating it (Russell 2001).

This situation also has implications to teachers' ICT training and their professional development in technology. In many cases, the nature of teachers training in new technologies is focused on skills and techniques (Loveless and Ellis 2001; Koenraad et al. 2002; Lloyd & Albion, 2005). However, it is noted that "just learning how to use computer hardware and software does not mean that teachers immediately know how to best use this technology for educational purposes in their specific teaching context" (King 2002:9). It is simply inadequate to understand how to operate a computer, since the understanding of its advantages for structuring and delivering instruction is something completely different (Gura and Percy 2005). Dealing with technology as hardware and software, without taking into consideration the teaching and learning processes, overshadows key lessons which were learned from prior experiences in the field of educational technology (Earle, 2004). In this context, it is suggested that "teachers need to be able to make choices about technology integration without becoming technocentric by placing undue emphasis on the technology for its own sake without connections to learning" (Earle, 2004:133). Simultaneously, teachers need to develop understanding not only of the ways in which technological resources can be accessed and used, but also of the teaching strategies which frame different learning experiences with these resources (Loveless et al, 2001; Koenraad et al. 2002; Lloyd & Albion, 2005). This means that through their professional development in technology, they must rethink the curricula and their pedagogy in terms of ICT (Yelland, 2002). Teachers' training in ICT is discussed more analytically in Chapter 5.

The issues examined in this part of the chapter are related to the process followed for the introduction and integration of ICT in the Cypriot educational system. As discussed in Chapter 2, ICT and more precisely computers were abruptly introduced in schools without a prior clarification of the ultimate intention, and also, without a clear educational agenda in mind. At the same time, their introduction concerned only the placement of a basic infrastructure which preceded any form of teacher training or any substantial changes in the curriculum, in its pedagogical direction, in teachers' instructional practices, and in the classroom setting in general. Computers were placed in schools to promote the fulfilment of pre-existing objectives included in the pre-existing curriculum. The target was to make the implementation of the curriculum more effective, and therefore, computers were introduced without determining new educational and pedagogical objectives. Nevertheless, as discussed in the previous paragraphs, it is not useful or meaningful to integrate ICT in curricula which are not designed to serve the needs of the 'Information Age'.

Consequently, the experience and also a number of studies showed that the simple addition of computers in the existing school curriculum, without the clear articulation of technology-induced objectives and philosophical underpinnings, created frustration and confusion among the teachers who were appeared to be unwilling to get involved or were using computers in traditional, ineffective ways. Based on these evidence and experience, the Ministry gradually realised that the successful and meaningful introduction of ICT required a new framework that should incorporate a solid technical infrastructure, effective teacher ICT training, and a novice curriculum which should encapsulate a different philosophical direction, contemporary pedagogical approaches, updated objectives, and also technology literacy. Therefore, in the context of the ongoing reform of the educational system ICT integration is viewed from a completely different perspective. The current philosophy that underpins ICT integration in the educational system is based on contemporary views on learning and is adapted to the needs and demands of the 'Information Age'. These notions are also reflected and expressed in the proposal for the new school curricula which are currently being prepared. Although, this process is quite challenging and requires a substantial and multidimensional change, it remains to be seen if it will actually result in the expected outcomes and in students' enhanced learning.

1.2.2 ICT integration as a process of change

It is suggested that "a walk through a typical classroom today will not reveal much that departs radically from classrooms of fifty or even a hundred years ago, and this, in a world in which change is the only constant of consequence" (Gura and Percy 2005:18). Similarly, it is noted that education has the 'amazing' ability to preserve its traditional form and processes while the rest of the world, following the 'Information Age', is moving on (Schank 2001; Stallard and Cocker 2001). Moreover, it is stressed that the organisational concept that still dominates schools is based on an outdated model designed to serve the needs of a society experiencing the 'Industrial Revolution', which is completely incompatible with the demands of the 'Information Age' (Baines, 1999; Semenov 2005). These are few examples posted in the respective literature that highlight the fact that the pace of change in schools is quite slow. Based on these arguments, schools are criticised that the reason for this stability is their inherent resistance to change, especially profound change that challenges education's established traditions. Similarly, teachers are criticised that are most comfortable in resisting change from the familiar, even if it is to a needed and more sensible future (Gura and Percy 2005). Although initiatives that aim at reforming schools and at promoting innovative ideas and philosophies are constantly being launched, the literature indicates that the intended change is evidently very little (Koenraad et al. 2002; Fox 2003; Hennessy et al. 2005; Staples et al. 2005). One of the reasons for this situation concerns teachers' 'ability' to subvert innovation, and turning it into a version of what they were doing anyway, maintaining in this way the status quo (Cuban 2001; Peck et al. 2002; Fox 2003; Gura and Percy 2005; Hennessy et al. 2005).

Despite this 'nebulous' picture, the promoters of technology's integration in schools persistently advocate that technology will change schools, make them more efficient and productive, and that teaching and learning will be transformed into an engaging and active process connected to real life (Cuban 2001; Schank 2001). This viewpoint is also supported by the educational stakeholders in Cyprus. As discussed in Chapter 2, the Ministry, through its initiatives for educational reform and for the ICT integration, expects that the introduction of ICT in schools will ultimately differentiate the educational process and will transform both teaching and learning. However, in order to achieve these goals, the traditional understanding of school, as well as its purpose and dynamics, need to be altered in order to take advantage of the advances that technology offers. Technology presence in school should not be to make traditional teaching or traditional subjects more effective. The old, outmoded paradigm that schools expounded is not efficient and adequate for the 'Information Age', and therefore, needs to be rejected. Nevertheless, this is not an easy endeavour, since as argued, moving from a traditional classroom to one in which twenty-first-century skills shape the prevailing context, is a difficult uphill push (Gura and Percy 2005). In this way, the adoption and integration of technology in school's processes means that teachers need to accept a profound and challenging change, which, as underscored, makes them feel threatened, uncomfortable, nervous, reluctant, and unsecure (Grabe and Grabe 2001; Gura and Percy 2005).

1.2.2.1 Teachers' difficulty to accept technological change

The reasons why teachers show so much difficulty in accepting the change that technology brings about are diverse. On a first consideration, it is noted that teachers "rather naturally put their trust in tried-out tested methods with which they felt confident rather than an area such ICT with which they generally feel less at ease and which as everyone admits, can sometimes present practical difficulties not only in terms of equipment but also of classroom management" (Monteith, 2004:18). It is off-putting for schools and teachers to abandon their familiar ways and practices, and embrace change to a new state of affairs that is unknown (Gura and Percy 2005; Hennessy et al. 2005; Semenov 2005). This is due to the fact that technology integration's reputation is synonymous with something hard to attain that requires great effort. This discourages teachers from attempting it, and in this way becomes a 'self-fulfilling prophecy' which restricts its success (Gura and Percy 2005). In order to tackle these difficulties, it is suggested that teachers should have the opportunity to experiment with technology. Although presenting teachers with good examples of technology use is definitely useful, it is not adequate enough to successfully bring about the desired change (Monteith, 2004; Hennessy et al. 2005; Wozney et al. 2006). Experimenting with technology will help them 'demystify' technology use as a high-risk activity and increases their confidence and enthusiasm. It will help them understand its advantages and deal with it as a productive and joyful experience, embrace the change it causes as exciting and challenging, and finally, develop ideas that they can implement with the new resources (Grabe and Grabe 2001; Stallard and Cocker 2001; King 2002; Yelland, 2002; Gura and Percy 2005). Through practice and experimentation with ICT, teachers will have the opportunity to assess where they are in the use of technology and to reflect upon their responses, attitudes and philosophy, which will enable them to embrace change and let it occur (Monteith, 2004).

Moreover, teachers' uneasiness with technology is related to the inevitable confrontation with their traditional roles as classroom teachers and their established beliefs about instruction (Earle, 2004). Technology integration means that teachers are compelled to rethink and redefine their established roles. However, this situation increases the bumps in the road to technology adoption, since teachers are threatened of losing their authority and control over the classroom learning environment. Teachers are used to being in control of their environment and in command of the content they teach (Kent and McNergney 1999; Grabe and Grabe 2001; Schank 2001; Stallard and Cocker 2001; Gura and Percy 2005). Meaningful ICT integration denotes that the teacher-pupil dynamics will be shaken up, while teachers in many cases will have to cooperatively work on technology with their students. Nevertheless, teachers' anxiety increases where computers are placed in the classroom without taking into consideration their own perceived needs and if they feel that they are becoming complete novices again when faced with another technical innovation, and especially if they do not feel secure in their own mastery (McFarlane 1997; Cook and Finlayson 1999; Grabe and Grabe 2001).

Furthermore, meaningfully integrating ICT in schools is a complex process, that requires a clear vision about why ICTs should be used in the first place and what impact should they have on teaching and learning (Semenov 2005). The lack of clear vision about the presence of technology in schools and the conflicting views regarding its meaningful integration and its appropriate use in the classroom create confusing and muddled thinking among teachers which essentially reduces the impact of the technology's investment in schools (Twining, 2004). Consequently, teachers' belief and conviction that technology can ultimately transform education is affected and reduced (Stallard and Cocker 2001). It is suggested that many teachers believe that the new technological resources "are just another illusory, magical solution to some imagined educational problem, and that they will almost certainly fail to fulfil the enormous claims that are made on their behalf" (Buckingham et al, 2001:20). The literature indicates that the efforts and planning during the last decades to infuse ICT in education have been haphazard, with many false starts, sidetracks and unfulfilled promises, which have led to many dead-ends, reluctance by teachers to accepts change, and many misunderstandings regarding technology's effectiveness and usefulness (Kent and McNergney 1999; Fox 2003; Gura and Percy 2005). Although planning is a key to the success of technology utilisation, it is noted that too many plans were constructed without insight and vision about technology and its full potential for school environments (Stallard and Cocker 2001; Bennett 2003). Simultaneously, it is argued that it is common to find instances where plans and policies were carefully constructed but their implementation was not soundly promoted so as to bring about worthwhile change in classroom practices (Fox 2003).

The research evidence, concerning Cyprus (Section 2.5.2), indicated that the lack of a clear vision regarding ICT integration was a determinant factor that increased teachers' resistance to the change sought during the early introduction of this innovation in schools. The introduction of ICT in the Cypriot educational was not supported by a clear vision and solid planning, while teachers were not provided with any assurances that ICT integration would actually result in enhanced learning outcomes. Consequently, teachers were unconvinced that the specific innovation would have any significant educational value. In this way, ICT implementation in schools was low, the ICT use by teachers was sporadic, peripheral, and 'traditional', and above all, the intended change was not institutionalised or widespread. Based on these, it can be supported that the introduction of ICT in the Cypriot educational system was grounded on a false start which left unfulfilled promises, increasing in this way teachers' resistance to the changes needed for meaningful integration and use of ICT in the classroom. Although the current effort by the Ministry to introduce ICT in schools is underpinned by a completely different background and philosophy, the previous experience could discourage teachers from believing in this innovation's value which could ultimately prevent them from embracing the changes needed for its successful implementation.

Nevertheless, despite the widely accepted stance that technology's presence in schools causes profound change, the contradictive viewpoint that "technology doesn't change practice; people do – their knowledge, understanding, skills, beliefs and goals change" (Lovelss et al, 2001:73), is also supported by authors in the literature. As mentioned before, it is possible that teachers may adopt technology just to support what they are already doing (Cuban 2001; Peck et al. 2002). This does not mean meaningful change that has an impact on students' learning and understanding. Any profound change in schools will come when teachers deliberately shift to a new pedagogy by changing the norms and routines that shape their daily work and the learning environments they establish. It is noted that the use of ICT should not be used in a vacuum and does not necessarily change these norms and practices; there are also other forces which contribute to this shift (Loveless et al, 2001). Therefore, the ways in which teachers work and the nature of the learning environments they establish in their classroom, are based and reflected in the values and beliefs that underpin their professional knowledge (Loveless, 2002). Teachers' beliefs of the appropriate role of technology are determined by their perceptions of the goals of education itself, the goals they set for their students, their understanding of how students learn, as well as their perceptions about the appropriate instructional methods employed to help students attain these goals (Roblyer and Edwards 2000; Grabe and Grabe 2001; Stallard and Cocker 2001; Adams & Brindley, 2002; Hernandez-Ramos 2005). Although the introduction of ICT challenges teachers to rethink their pedagogical practices and to re-examine the traditional classroom environment (Yelland 2007), real and meaningful change is a very personal process which starts with the individual teacher who is willing to take the risk to rethink teaching and learning (Earle, 2004).

1.3 Overview of the study's context

Based on this background, and before proceeding to the explanation of the study's aims and research questions, it is very important to provide some information on the wider context of the study: namely, the educational system of Cyprus and specifically the introduction and integration of ICT in primary education. However, it should be noted that the context of the study is described in detail in the following chapter of the thesis.

On a first consideration, it must be underscored that the Cypriot educational system, and therefore primary education, is currently undergoing a major reform, which according to the Ministry of Education and Culture (MOEC) and the policymakers responsible, aims at harmonising the educational system to that of the rest of Europe. This necessity has emerged due to the new circumstances that were formed by Cyprus' accession in the European Union (EU) in 2004. The country's presence in a new and challenging socioeconomic environment demanded profound changes in the otherwise highly bureaucratic, centralised, ethnocentric, and anachronistic educational system. Amongst other substantial structural changes, which were prepared and proposed in a comprehensive report compiled by an academic committee appointed by the government, the inclusion of ICT in schools' core processes was placed highly in the agenda. As a result, intensive investments in technology in schools were initiated, which intended to equip schools with a solid and up-to-date technological infrastructure, internet connectivity and networking, as well as with appropriate educational software. At the same time, increased attention was paid on teachers' training in ICT, since it was acknowledged as a key aspect in the whole process.

Nevertheless, it should be noted that this is not the first attempt by the Ministry of Education to introduce ICT in schools. ICT, and specifically computer technology, was firstly introduced in Cyprus primary education in the early 1990s, as an experimental project in a number of primary schools. In a short period of time, computers were placed in all primary schools. The initial objective of this project was to examine the potential of computer as a teaching aid. In this way, computer technology was introduced as a teaching tool to support the effective implementation of the existing curriculum and to facilitate the fulfilment of its general objectives. However, the abrupt and sudden introduction of computers and other ICT resources in primary schools, without prior careful consideration of the numerous and complex factors that affect its integration could be considered as a 'false start'. Some research evidence as well as the overall experience showed that teachers were confused and frustrated about computers and their role in their classrooms, and as result, they were unwilling to get involved and tryout ICT use to support their professional responsibilities. Under these circumstances, computers and other ICT resources in general never managed to be meaningfully infused in schools' core processes of teaching and learning, nor have they transformed or even changed any aspect of the offered educational service in Cyprus primary education.

1.4 Aims and research questions

According to established principles concerning the efficient management of the educational change process, the feelings, thoughts, and perspectives of those involved and experience the change effects, need to be carefully taken into account and addressed. In this way, their actions, reactions, and decisions toward the intended changes can be understood, apprehended, and managed. The integration process of ICT in schools, combined with the belief that it can provoke the immergence of innovative teaching approaches that can transform education into an engaging experience compatible with the needs and demands of the Information Age and the wider society of the 21st century, definitely suggests and denotes a radical, complex, and challenging change process. However, even though well-thought and carefully planned ICT integration initiatives are launched and put into practice, and even though teachers are recognised to be key change agents, their perspectives and views are often ignored and underestimated. This could bring about implementation difficulties which could result in setbacks and even failure.

Cypriot teachers' perspectives and views on the process of introduction and integration of ICT in primary schools were never thoroughly explored nor were they systematically investigated. Any research concerning this issue was conducted by the Cyprus Pedagogical Institute or by researchers acting on behalf of the Pedagogical Institute, so as to evaluate and assess pilot programmes launched by the Ministry of Education. This means that teachers' viewpoints were to a large degree ignored while many decisions made and actions taken by the policymakers were mainly based on implications and examples drawn from the broader international practice and other countries' paradigms. Contextual factors and particularities derived by the characteristics and features of the specific educational system were overlooked and not taken into account so as to support the process of ICT introduction and integration in schools. Therefore, a comprehensive research project concerning the primary education of Cyprus could shed light on teachers' implementation practices and on their perspectives regarding key matters concerning this issue, which in turn could result in more contextual, relevant, and useful conclusions and implications that could facilitate the successful and meaningful integration of ICT in primary schools.

Based on the background described before and within the specific context, the main purpose of this study is to collect data from Cypriot primary school teachers and examine their viewpoints and perspectives on a diversity of issues which are related to the process of introduction and integration of ICT in Cyprus' primary education. More analytically it seeks to explore the following aspects of ICT integration, which are organised in three main research questions. Each research question is comprised of other sub-questions:

- What is the current situation with respect to ICT integration in Cyprus primary education?
  - ✓ To what extent do teachers use ICT resources and other audiovisual aids in their classroom?
  - ✓ How do teachers use ICT, and in which area of their professional responsibilities do they believe it has had the biggest impact?
  - ✓ How do teachers' rate their competence in using ICT both for personal and professional tasks?
  - ✓ What are teachers' attitudes toward ICT?
  - ✓ According to teachers, which factors are hindering and which are facilitating the use of ICT in their teaching?
- What is the current situation with respect to teachers' ICT professional development opportunities?
  - ✓ To what extent do teachers participate in the officially offered ICT professional development opportunities?
  - ✓ What are teachers ICT training needs?
  - ✓ What are teachers' attitudes toward ICT training?
- Which are the factors that affect teachers' use of ICT and which of these variables can predict teachers' use of ICT?
  - ✓ Are teachers' background characteristics (gender, age, length of teaching experience, grade responsibility, occupational status) affecting their use of ICT?
  - ✓ Are teachers' personal beliefs and attitudes (perceived ICT competence, pedagogical beliefs, ICT attitudes, beliefs about ICT use barriers and enablers) affecting their use of ICT?
  - ✓ Has teachers' participation in the officially provided ICT training impacted and affected their ICT use?
  - ✓ Which variables can predict teachers' use of ICT?

1.5 The study's significance and limitations

The study sets out and tackles a number of dimensions which add to its uniqueness and signify the importance of its research questions. On a first consideration, it focuses on the context of Cyprus and specifically on primary education, providing in this way the opportunity to examine the integration and implementation of ICT in an educational system without established research practices and mechanisms which would ensure the continuous assessment, evaluation, and redefinition of its diverse characteristics and practices. Decision and policy making within the specific educational system is mostly based on superficial observations and researches, and on adoption of practices from the wider European and international practice. At the same time, the context of Cyprus provides the opportunity to investigate the process of ICT integration in primary schools from a holistic standpoint and angle. This is due to the fact that Cyprus is a small country, both in population and in area size. A research project can easily include and cover the entire island, while data can be collected from all districts and all schools in both urban and rural areas, including remote places. In the case of this study, a representative for the whole country research sample can be investigated, and not just a sample drawn from a particular area or province, since the total primary school teachers' population is approximately four thousands individuals.

In addition, and as noted before, the educational system of Cyprus is currently undergoing a substantial reform. In the context of this reform, special attention is paid on the redirection and redefinition of the process of ICT integration in schools, after the inexplicit and ambiguous initial introduction attempts. Therefore, the fact that the more systematic and comprehensive endeavour of ICT integration in Cypriot primary schools has been recently initiated – after a number of 'false starts' – provides an interesting context for examining teachers' viewpoints and perspectives concerning diverse matters and aspects of the process of ICT integration in schools' everyday practices. A research project which is based on teachers' experiences and perceptions could reveal their views and attitudes and could shed light on their concerns and worries, which in turn, can provide useful insights and on how to approach, support, and facilitate the challenging process of meaningful ICT integration in the classroom. At the same time, its findings and implications could inform the offered ICT professional development opportunities. As an indispensable prerequisite of the successful use of ICT by teachers so as to adopt and sustain structural changes that can improve educational service, teachers' training could be improved, become more effective and targeted, and in accordance with teachers' actual training needs.

Moreover, the study focuses explicitly on teachers, who, as noted, are the main actors responsible for putting the specific innovation into practice, by finding efficient ways to successfully and meaningfully infuse the available ICT resources into their teaching so as to transform and enhance students' learning experiences. Teachers are key change agents, while the factors that affect the process of ICT integration and are related or are intrinsic to them are very complex, multidimensional, and multifaceted. Also, the relationships between those factors are often unclear and difficult to be determined and distinguished. Therefore, the study's focus on teachers and on the ICT influential factors intrinsic to them can produce useful conclusions that can illuminate the process of ICT integration and can contribute to future ICT implementation planning efforts. At the same time, the study's findings can contribute and add to the general knowledge regarding teachers' attitudes toward ICT, their pedagogical beliefs in relation to ICT use, as well as to their concerns and perspectives on a diversity of matters and issues related to ICT.

What is more, as with any research project, the specific study has some limitations which are primarily inherent to the study's research design, to its research methods, and to its data collection methods. The study is a cross-sectional research project that aims to explore teachers' perspectives on a diversity of matters and issues related to the process of ICT integration in schools. Therefore, the aim is the collection of data at a particular point in time from a representative sample so as to produce a 'snapshot' of a section in the research population concerning the issues under investigation. Nevertheless, as noted before, a substantial reform of the educational system of Cyprus has recently been initiated as is still ongoing, which means that the study, its research questions, and its results are referred to a state of affairs that is about to change while new conditions are about to be implemented and put into practice. Despite the fact that this can be encountered as a limitation of the study, it was argued before that it can also be seen as one of the factors that can support and highlight its significance. The study's findings and implications can result in useful recommendations that could facilitate the endeavour of the successful and meaningful integration of ICT in school's everyday practices.

Additionally, for the study's purposes both quantitative and qualitative research methods are employed, while the main data collection tool is a questionnaire. The specific questionnaire is based on a compilation of selected items derived by a number of instruments developed and used in other studies related to ICT integration in schools. The complexity of the under investigation variables as well as other equally significant reasons, explained in the methodological part of the thesis, led to the decision to use pre-existing instruments and not to develop a new data collection tool. Although the adoption of pre-existing research instruments is a common practice in the field of social research, it could also disorient and detach the study from its specific context. In order to tackle this limitation, several actions were taken to ensure the questionnaire's, and therefore, the study's credibility.

1.6 The thesis organisation

In the following chapters, the study's context, literature review, research methodology, data analysis, and the discussion of the research findings, are presented. Specifically, Chapter 2 provides a detailed description of the context in which the study is being developed. Namely, it focuses on Cyprus and its educational system as well as on the process of ICT introduction and integration in primary education.

The first part of the study's literature review is presented in Chapter 3. Firstly, the chapter offers a theoretical context for the study and it focuses on the prevailing learning theories in relation to ICT integration in education. Secondly, the chapter includes a discussion on the emergence of the Information Age and the pressure on schools and teachers to meaningfully integrate ICT in teaching and learning processes. The second part of the study's literature review is included in Chapter 4.

The chapter addresses issues related to teachers' ICT use as well as to the factors that according to the respective literature and previous research appear to be influencing and affecting the use of ICT by teachers. In Chapter 5, teachers' professional development in relation to ICT is examined.

The methodological framework of the study is outlined in Chapter 6. The study's research design is presented along with the research and data collection methods employed, the sampling method used, as well as the actions taken so as to ensure the study's credibility. The study's results are presented in Chapters 7 and 8. Chapter 7 aims at addressing the issues related to the study's first two research questions, while Chapter 8 aims at addressing the study's third and final research question. An inclusive summary of the study's findings and results is presented in Chapter 9. Also, a number of implications derived by the study's findings are outlined. Finally, based on the study's results, some useful recommendations for the successful and meaningful process of ICT integration in Cyprus primary schools are indicated and discussed.

Chapter 2: The educational system of Cyprus and the introduction of ICT

2.1 Introduction

This chapter aims to present a description of the educational system of Cyprus and specifically of the primary education. Additionally, through the description of the Cypriot educational system, key themes that will be explored in the following chapters of the thesis are introduced. Furthermore, the process of integrating information and communication technologies (ICTs) in the specific educational system is discussed. In this way, this chapter sets up the broader framework within which the thesis will be developed, as well as the background in which the study's research questions will be emerged.

2.2 The island of Cyprus

As Spyrou (1999) suggests, a typical entry point when discussing about Cyprus, is like this:

> Cyprus is the third largest island in the Mediterranean, after Sicily and Sardinia. It is situated in the eastern corner of the Mediterranean… The island's strategic geographical position – at the crossroads of Europe, Asia, and Africa – has been more a curse than a blessing. It is a long history of invasion and occupation by neighbouring powers (p.110).

It is a fact that the history of Cyprus can be traced deep into the centuries. It is an interesting and rich history, since over these centuries the island came under the control of successive conquerors and rulers, which have left multiple fragments of civilisations to the islands' culture (Gregoriou et al, 2005; Eurydice, 2007). The diversity of these characteristics is evident to today's people of the island, which makes Cypriots' idiosyncrasy and culture quite distinct and worthwhile to be explored.

Despite the fact that Cyprus has a lengthy history, it only achieved its independence relatively recent. It gained its independence from Britain in 1960, becoming the Republic of Cyprus. The young Republic had presidential system of government and its formed constitution institutionalised communal dualism between the Greek and Turkish communities on the island in all spheres of government activities (Gregoriou et al, 2005; Eurydice, 2007). However, the island's post-independence period was not peaceful, as it was marked by political troubles, differences and fighting between the two communities on the island, between the members of each community, as well as between the two communities' 'mother-nations', Greece and Turkey. The result of this unsettled situation was the separation of the two communities and the division of the island in 1974, after "a forceful Turkish invasion on the island which resulted in 37% of Cyprus to still be under Turkish occupation" (Eurydice, 2004:7). Despite the intense political negotiations and effort the past three decades, this situation is still unresolved. Therefore, since the two communities in Cyprus have separate educational systems, any reference on Cyprus educational system in this thesis concerns the education provided in the government controlled area (Greek) of the island (Figure 2.1).

Figure 2.1: Map of Cyprus

Moreover, it is important to depict the current situation in the island. According to the Statistical Service of the Republic of Cyprus (2007), the island's total population at the end of 2006 was 867,600 inhabitants. The Greek Cypriot community's population was approximately 660,600 individuals (76.1% of the total population), the Turkish Cypriot community's population was approximately 88,900 individuals (10.2% of the total population), and finally, approximately

118,100 (13.7% of the total population) were foreign residents (immigrants and expatriates). Furthermore, there were approximately 8,400 individuals of different religious groups (Armenians, Maronites, and Latins) that belong to the Greek Cypriot community (1.1% of the Greek community's total population).

Although the division of Cyprus in 1974 had had tragic consequences in all aspects of the social and economical life on the island (Eurydice, 2004), the period after the division was characterised by an impressive rate of growth and a great progress in all areas of activity (Spyrou, 1999; Karagiorgi, 2000; Eurydice, 2007). According to the United Nations' Human Development Report (2008), Cyprus is ranked 28th out of 177 countries, and is considered to be a high human development country. This means that the population has long and healthy life, high knowledge rates, and a decent standard of living. Moreover, the World Bank (2008) considers Cyprus as a high income economy. Finally, it is evident that Cyprus is turning into an international tourist and business centre, and as suggested, this is due to its geographical position, the positive business climate, the high level of manpower education combined with the competitive income and the good functioning of telecommunications, ports and airports (Eurydice, 2007).

Cyprus is also an active member of many international organisations: it joined the United Nations (UN) and the Non-Aligned Movement (NAM) in 1960, the Council of Europe and the Commonwealth in 1961, the Organisation for Security and Co-operation in Europe (OSCE) in 1975, and the World Trade Organisation in 1995 (North-South Centre of the Council of Europe, 2004; Gregoriou et al, 2005).

In addition, Cyprus jointed the European Union (EU) in 2004 and the Economic and Monetary Union, the European System of Central Banks (ESCB) and the Euro Area in 2008 by adopting the 'Euro' (€) as the national currency. The period before Cyprus' accession to the EU, as well as the period following the accession is characterised by a great effort from the successive governments of Cyprus, from other private or public stakeholders, and from the whole society of Cyprus, to meet and confront the challenges that the EU membership necessitated. Furthermore, the accession to the EU has launched a process in which "Cyprus is going through a period of considerable change with regard to how it sees itself as a society and how it interacts with the outside world" (North-South Centre of the Council of Europe, 2004:13). It is generally a period during which the Cyprus' society is trying to redefine itself and cope with the new conditions that are being developed. The Cyprus educational system is definitely an aspect of the society which needs to be reassessed and reformed so as to meet and successfully deal with the emerging challenges and opportunities.

2.3 The educational system of Cyprus

2.3.1 Historical overview

During its later history Cyprus was ruled and administered by a series of conquerors, which as noted, did nothing of value for the education of its people (Eurydice, 2007). During that period, education was informal, non-systematic, and provided locally by different local communities, by the Greek Orthodox Church's initiatives, and by various individuals trained as teachers (Spyrou, 1999; Gregoriou et al, 2005). The cornerstone for the creation of a formal educational system in Cyprus was placed by the British when they took over the administration of Cyprus in 1878, although, the Greek Orthodox Church continued to play a decisive role. The British introduced a system of subsidising primary education which resulted in the rapid multiplication of schools all over Cyprus as well as in the institutionalisation and expansion of education (Spyrou, 1999; Eurydice, 2007). In addition, the British established two boards of education, one for the Greek Cypriot community and another for the Turkish Cypriot community respectively (Spyrou, 1999). At the beginning of the British rule, the newly formed educational system was completely decentralised, giving both communities the right to self-regulate their educational affairs. However, the increasing dependence – of the schools in both communities – on Greece and Turkey, and the spreading of nationalism in both communities, made the Cyprus (British) Administration introduce a series of changes in the educational colonial law that gradually centralised the educational system (Spyrou, 1999; Eurydice, 2007).

When Cyprus became an independent state in 1960, the educational system for both ethnic communities on the island was based on the educational system built by the British. The characteristics of this system were the high degree of centralisation and the adoption to a large extent of the administration of the colonial rule (Eurydice, 2007). It also promoted the communal dualism, since all educational, cultural and religious matters were to be administered by the Greek and the Turkish Communal Chambers with authority for these matters for the respective communities on the island (Educational Reform Committee, 2004a; Gregoriou et al, 2005). However, with respect to the Greek Cypriot community's education, the school curriculum was completely reformed, becoming more interconnected to Greece's educational system (Educational Reform Committee, 2004a), and there was a drastic reduction of the Church's influence over the educational matters (Spyrou, 1999).

After the inter-communal conflict of 1963 (due to a constitutional crisis), which typically separated the two communities on the island, the Greek Communal Chamber was abolished. In 1965 the Chamber's executive powers were taken over by the central government and the House of Representatives assumed its legislative functions. The reason for this abolishment was the wish of the central government to have more say in the education sector, as a part of its plans for development, and the need for financial support and control. In this way, the responsibility for the educational matters was undertaken by the newly established Ministry of Education, which was later evolved to the present Ministry of Education and Culture (Eurydice, 2007).

A significant turning point for the Cyprus educational system was in 1974, after the division of the island and the definitive separation of the two communities on the island. Spyrou (1999) underscores that:

> The impact of the 1974 war on Greek Cypriot education was devastating. Over 30% of elementary schools came under Turkish occupation while 4% fell within the buffer zone. About 42% of children who attended elementary school that year and 41% of teachers became refugees (p.141).

The period after the war signalled a new situation that directly affected the Cyprus educational system. Gregoriou et al (2005) stress that "the trauma of the invasion and occupation created new political and national priorities which, it was felt, had to be served through the education system" (p.55). In this way, there was an educational reform in 1976, which promoted overall changes to the educational system, including its philosophical direction. According to the newly formed national curriculum a part of the general aim of the Cyprus educational system was the liberation of the occupied part of Cyprus. In this context, the Ministry of Education (1996) states that "the Greek Cypriot Education is democratic, combative, and humanitarian in its content, it inspires the love towards the country, strengthens the desire and the decision for the liberation of our occupied land, secures our national, religious and cultural tradition…" (p.17).

Although there were many changes to the educational system the following years, there was not any significant, formal reform that is worthwhile to be mentioned. However, this situation changed when Cyprus joined the EU in 2004, which entailed that the country's society, as well as its education, had to be adjusted to a new and challenging environment. The Ministry of Education suggests that "the European dimension of the country's policy intensifies the need towards harmonising the educational system to that of the rest of Europe" (International Bureau of Education, 2004:5). It was obvious, by all stakeholders in education and also by the general society, that there was an imperative need for changes in education which would totally transform and modernise the obsolete Cyprus educational system.

Under these circumstances, in 2003/2004 an academic committee was appointed by the Government with the objective to examine and evaluate the Cyprus educational system, and to make suggestions that would deeply reform the Cypriot educational system. The result of this effort was a highly inclusive educational reform report which was characterised as "the most complete, detailed, well-documented and visionary document of its kind ever to be submitted in Cyprus" (Gregoriou et al, 2005:57). The publication of the specific report initiated an intensive endeavour for an overall educational reform in Cyprus which is still ongoing up to this day. Table 2.1 presents noteworthy changes in schools in Cyprus up to 2004:

Year	Changes in Educational System
1960	Independence of Cyprus: Separate educational administration for both ethnic communities on the island. Curriculum reform – interconnection to Greek educational system. Drastic reduction of Church's influence on educational matters.
1963	Inter-communal conflict: Separation of communities on the island. Abolishment of the Greek communal chamber. Educational legislation taken over by the House of Representatives. Establishment of the Ministry of Education.
1972	Establishment of the Pedagogical Institute of Cyprus. Developmental mission: pre and in-service training of teachers, educational research and evaluation, educational documentation, educational technology and curriculum development.
1974	Turkish military invasion in Cyprus. Devastating impact on education. New political and national priorities served through the educational system.
1976	Reform of the Educational System that promoted overall changes to serve the post-war state of affairs.
1981	New national curriculum for primary education as a result of the 1976 reform.
1993	Initial introduction of computer technology in Cyprus' primary schools as an experimental project in a number of pilot schools.
1994	Revision of the national curriculum for primary education.
1996	Re-edition of the national curriculum for primary education – inclusion of improvements
2000	Launch of a five-year action plan ("Evagoras") for the introduction of computer technology and ICT in all primary schools of Cyprus.
2002	Re-edition of the national curriculum for primary education – inclusion of improvements. Launch of an EU funded project for the overall improvement of the public education in Cyprus.
2004	Cyprus accession in the EU. Examination and evaluation of the educational system by an academic committee appointed by the Government. Initiation of a radical and long-term reform of the educational system of Cyprus, ongoing up to this day.

Table 2.1: Noteworthy changes in Cyprus' Educational System

2.3.2 Basic principles

As mentioned before, the general objective of the Cyprus educational system was formed under specific circumstances and historical events:

> The general objective of the Cyprus Education is the intellectual, emotional and psychomotor development of children, with respect to the principles derived from the Christian Orthodox Religion and the Greek culture; the preparation of citizens who are firmly oriented to universal values like freedom, democracy and justice; the strengthening of the national and combative morale of the children without chauvinistic spirit and intolerance; knowledge on our occupied homeland and the preservation of its memory by the children; preparation of the children for the diversity of aspects and roles of life in the context of our changeable world, especially in a semi-occupied homeland with European orientation, that struggles for

> freedom and simultaneously needs to cope with the challenges of the 21st century (Ministry of Education and Culture, 1996:13).

The specific objective is written in the school curricula which are still valid and being used in schools. However, the new circumstances that were formed by the accession of Cyprus to the EU, the new social state of affairs at the beginning of the 21st century, as well as the effects of the report by the Educational Reform Committee, obligated the Ministry to reorientate and redefine the objective of the educational system. In this way:

> The general aim of education in Cyprus is the development of free and democratic citizens; with a fully developed personality, being mentally and morally refined, healthy, active and creative citizens who contribute generally with their work and their conscientious activity to the social, scientific and cultural progress of the country and to the promotion of cooperation, mutual understanding, respect and love among individuals and people for the prevalence of freedom, justice and peace (International Bureau of Education, 2004:5-6).

It is therefore obvious that there is a significant attempt to shift the Cyprus education from its introvert and nationalistic character, to a more democratic, humanistic, anthropocentric and global one.

2.3.3 Organisational structure

It is generally admitted by all educational stakeholders that the educational system of Cyprus was, and, although improvements were made, still is, highly centralised. In many cases, the system's administrative structure is characterised as conservative, inflexible, oppressive, bureaucratic, inelastic and obsolete (Spyrou, 1999; Karagiorgi, 2000; Educational Reform Committee, 2004a; 2004b; Eurydice, 2004; International Bureau of Education, 2004; Gregoriou et al, 2005; Eteokleous, 2008). The highest authority for educational policy is the Council of Ministers, but the overall responsibility for education rests with the Ministry of Education and Culture. The organisation of the Ministry of Education and Culture, presented in Figure 2.2, reveals the 'top-down', hierarchical structure of the educational administration.

The centralised administration of the Cyprus educational system was rigorously judged by the Educational Reform Committee (2004a; 2004b). It was argued that the educational system of Cyprus was highly centralised which meant that all issues regarding education were formed and controlled by the centre (the Minister, the General Director and the Administrators of each level of education). It was also highlighted that the individuals behind these roles – a politician, a permanent public officer, who may not be specialised in educational matters, and a group of administrators – wielded in varying degrees the educational policy. Moreover, it was identified that the contribution of local stakeholders, school units, teachers, and the local community, was very restricted and in many cases, completely ignored. It was also stressed that the diverse services and departments of the Ministry were fragmented and isolated and this prevented the ease of communication between them, creating in this way coordination problems. The 'top-down' hierarchy of the educational system created many delays and immobility to the school units, which had completely restricted independence to act, even for ordinary matters. As a result, "all personal initiative is stricken down while very different individuals and schools with diverse needs are covered with the same damp cloth of uniformity" (Gregoriou et al, 2005:56).

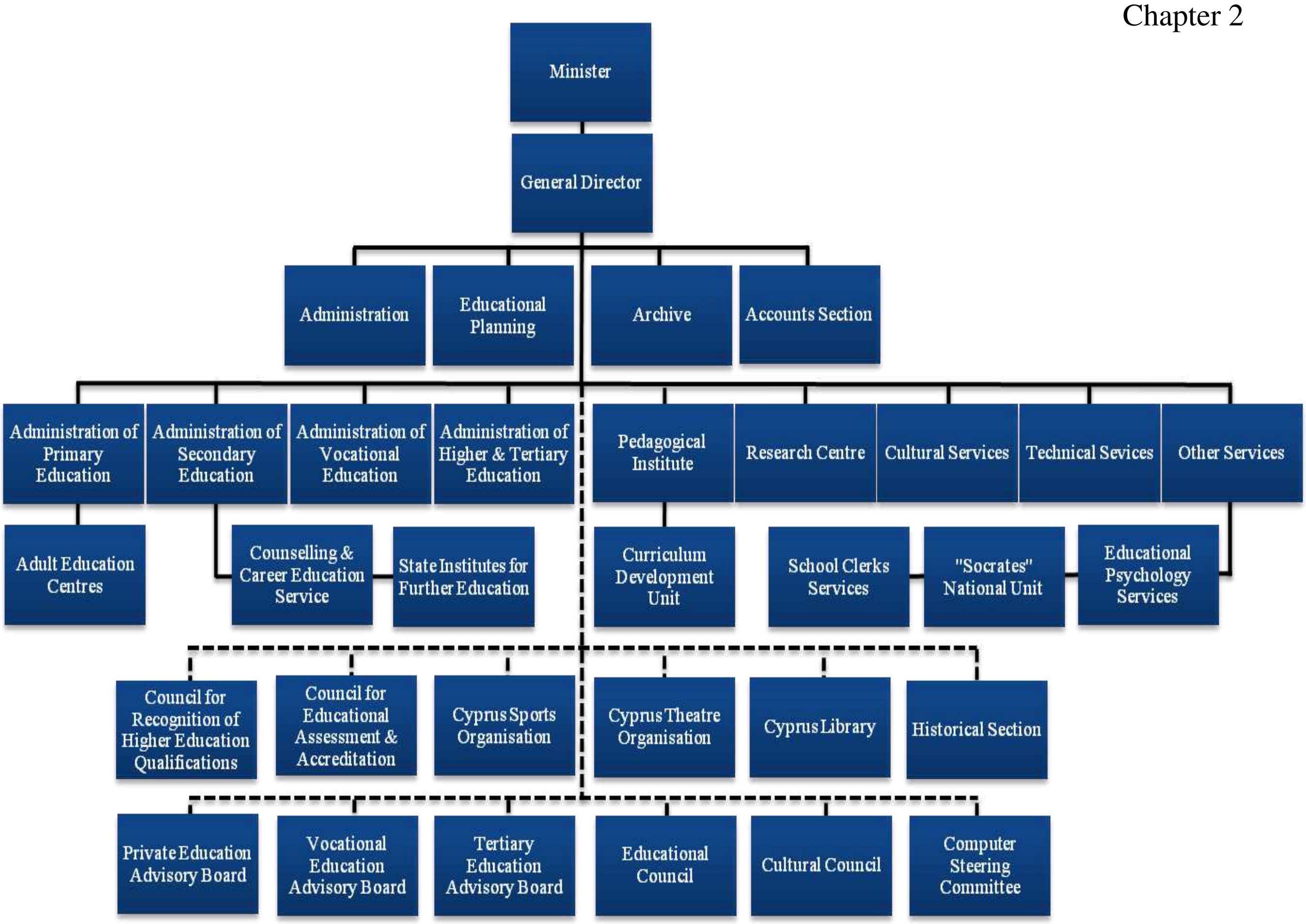

Figure 2.2: Organisation chart of the Ministry of Education and Culture (Ministry of Education and Culture, 2008:13)

Following the recommendations provided by the Educational Reform Committee, the Ministry established, in 2005, three types of Councils to restrict the centralised character of the educational system. These were the Educational Council, the Primary and Secondary education Advisory Board and the Tertiary education Advisory Board. According to the Ministry's 'Annual Report 2005' (2006), the establishment of the specific bodies constituted a great step towards the ongoing reform of the Cyprus educational system. Educational stakeholders like teachers' unions, parents' and students' associations, the Cypriot universities, as well as the political parties of the country were represented on these boards, and therefore, there was an expectation that the decisions made on educational matters would be collective and consensual.

2.3.4 Levels comprising the educational system of Cyprus

Figure 2.3 presents the present levels of the educational system of Cyprus.

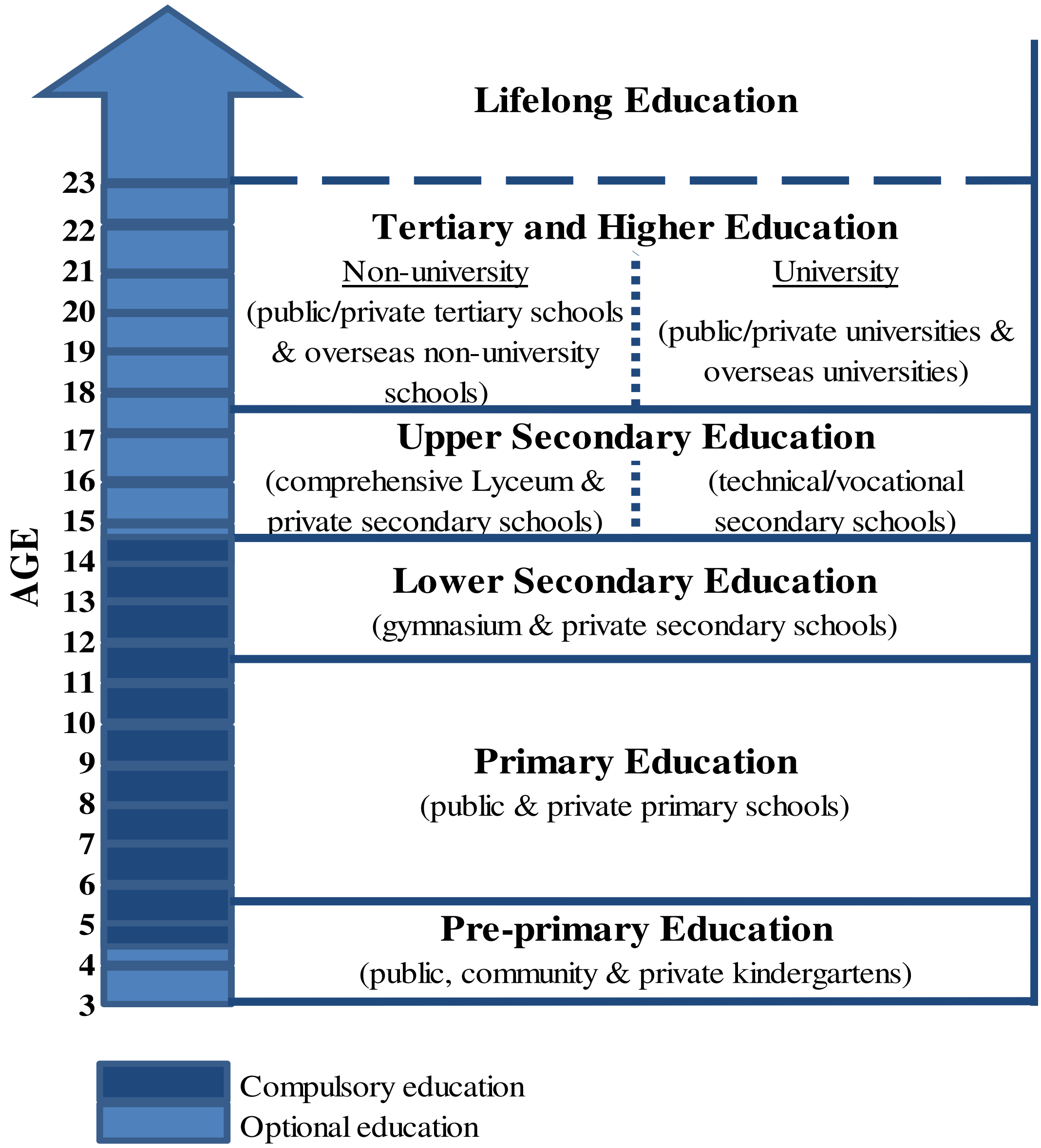

Figure 2.3: Levels of the educational system of Cyprus

Before exploring the primary level of the Cyprus educational system (Section 2.4), it is useful to study some statistics with respect to pupils' population, teaching personnel, and the number and type of schools in Cyprus in each of these levels. According to Statistical Service of the Republic of Cyprus (2008), and as presented in Table 2.2, in 2007 at all levels, there were 1,011 educational institutions, 164,971 students and 14,445 teachers in Cyprus. Of the total number of students in Cyprus, 78.2% were enrolled in public educational institutions and 21.8% in private. The enrolment of students in each level of education was as follows: pre-primary 19,462, primary 57,492, secondary (upper and lower, including technical/vocational education) 65,790, and tertiary

22,227. Moreover, there were 21,188 students abroad studying in tertiary institutions. The last column of the table shows the pupil teacher ratio for each level and type of school. It should be noted that, in 2008 the Cyprus University of Technology initiated operation by accepting its first students. Also, during the same year, three out of the thirty private non-university institutions (colleges) were accredited by the Government and were upgraded into universities. Therefore, six university-level institutions are now operating in Cyprus, three from the public sector and three from the private.

Level of Education	Schools	Pupils			Teaching Personnel	Pupil teacher ratio
		Male	Female	Total		
Pre-primary	**445**	**10049**	**9413**	**19462**	**1333**	**14.6**
Public	246	5090	4723	9813	632	15.5
Community	63	915	867	1782	96	18.6
Private	136	4044	3823	7867	605	13.0
Primary	**368**	**29507**	**27985**	**57492**	**4442**	**12.9**
Public	341	27697	26179	53876	4142	13.0
Private	27	1810	1806	3616	300	12.1
Lower&upper secondary	**160**	**33558**	**32232**	**65790**	**7151**	**9.2**
Public	124	28651	27754	56405	6227	9.1
Private	36	4907	4478	9385	924	10.2
Tertiary	**38**	**11090**	**11137**	**22227**	**1519**	**14.6**
Public University	2	1648	3692	5340	310	17.2
Public Non-University	6	1025	787	1812	198	9.2
Private Non-University	30	8417	6658	15075	1011	14.9
Overseas University	**-**	**9964**	**11224**	**21188**	**-**	**-**

Table 2.2: Statistics of the educational system's levels (Statistical Service of the Republic of Cyprus, 2008)

2.4 Primary education

This section is concerned with the primary education of Cyprus. As noted, the primary education is the context in which this thesis is being developed. Therefore, it is useful to examine some of its key aspects which will set up the thesis' wider framework.

2.4.1 Curriculum

The Ministry of Education and Culture (1996; 2008) notes that the primary education constitutes the main and fundamental stage of education, which lays the foundation for the harmonious development of children in the cognitive, emotional and psychomotor sector. The

National Primary Education Curriculum constitutes the context in which primary education's objectives are assumed to be fulfilled. The curriculum was prescribed by the Council of Ministers, based on the proposals made by the Ministry of Education after considering the suggestions and guidelines made by the inspectors. The current curriculum, which is common to all public primary schools, was compiled in 1981, revised in 1994 and re-edited with additional improvements in 1996 and in 2002. The compulsory subjects included in the curriculum, as well as their weekly teaching periods, are presented in Table 2.3. The Curriculum Development Unit is responsible for the preparation of the text-books and audiovisual material that teachers and pupils use during their lessons. Also, many books used in schools are provided by the Greek Ministry of education. All books and materials are provided free of charge and are the same in the public primary system (Eurydice, 2007). Any changes regarding the curriculum, timetable or textbooks of primary schools requires a relevant decision from the Council of Ministers (International Bureau of Education, 2004).

Subject	**Teaching periods**					
	1st Grade	**2nd Grade**	**3rd Grade**	**4th Grade**	**5th Grade**	**6th Grade**
Religious Education	2	2	2	2	2	2
Modern Greek	14	14	14	13	10	10
Mathematics	7	7	7	6	6	6
History	0	0	2	2	2	2
Geography	0	0	2	2	2	2
Science	1	1	2	2	2	2
Environmental Studies	3	3	0	0	0	0
English	0	0	0	2	2	2
Art	2	2	2	2	2	2
Music	2	2	2	2	2	2
Physical Education	2	2	2	2	2	2
Design & Technology/Home Economics	2	2	0	0	2	2
Free activities	0	0	0	0	1	1
Total	35	35	35	35	35	35

Table 2.3: Subjects included in the primary school curriculum (Eurydice, 2007:83)

2.4.2 Teaching practices

Although the Ministry of education does not prescribe definite guidelines for preferable teaching methodologies to be used in schools, teachers are expected to employ modern teaching techniques and to utilise the best methods according to the needs of their class and the requirements of the curriculum. Teachers ought to organise their teaching based on the aims included in the curriculum, the broader aims of education, but also on pupils' abilities. When teachers are defining the specific aims of their lessons, they are advised to consider that the school is a place in which all children are accepted as they are, with their own capabilities and weaknesses, and are treated as individual personalities with particular needs and talents, which must be met accordingly. Also, they are advised to promote an interdisciplinary approach in order to provide consistency in education, in a context of a pleasant, friendly and encouraging working environment, which offers each student the opportunity for success (Eurydice, 2008).

These are the theoretical guidelines that the teachers are expected to follow in the context of their work. However, what is the real picture of the primary school classroom and what are the teachers actually practicing during their teaching? According to the influential report of the Educational Reform Committee (2004a; 2004b), the prevailing teaching practices in the primary school classrooms are mostly 'teacher-centred'. The members of the committee argue that there is a persistent focus on 'teacher-centred' pedagogical approaches which are not consistent with the students' learning processes and also with the nature and objectives of the primary education. Although, they recognise that the Ministry made efforts for the improvement and modernisation of the educational system, they underscore that most of them failed to be institutionalised, while many of them were not applied in all schools.

Whilst, they recognised that the official documents published by the Ministry included some contemporary and progressive insights and notions, like, the formation of free and democratic citizens who respect the humanistic principles and rights, and the development of critical thinking, cooperation, fantasy, and creativity, they also stressed that there is a disharmony between what is phrased and what is actually being practiced in the classroom. The worded objectives of the educational system do not correspond with what is prescribed in the curriculum, the textbooks used, and the pedagogical climate of schools. On the one hand, it is officially supported that the educational system should promote democracy and freedom, but in reality the entire function of school is completely undemocratic. They ascribe this situation to the inadequate, inarticulate, and inconsistent pedagogical and philosophical direction/orientation of the Cypriot educational system.

In this context, they argue that the curriculum is highly ‘traditional’, obsolete, and information-based, while its content is similar to a catalogue of ready made information to be taught. Therefore, teaching becomes a mechanistic procedure which views students as passive information recipients and consumers who are only interested in repetition of specific pieces of information needed for success in pencil-paper exams. They argue that the school simply offers training and not education in its broader sense, while its actual aim is the provision of ‘codified knowledge’, indicating a ‘banking concept of education’. In order to confront this dreary state of affairs, the members of the committee pinpointed the need for a solid education which would promote the development, not only of the students’ ‘mind’, but also of their ‘spirit’. They proposed that attention should be paid to cognitive skills and abilities like critical and logical thinking, and problem-solving strategies. They also highlighted that the focus should be directed on students’ ability to learn how to learn, using every possible ways and means available to them.

The remarks made by Educational Reform Committee reveal that teachers’ teaching practices are in a great degree determined by the characteristics of the educational system. Although teachers are expected and are requested to use contemporary teaching methodologies, the educational system itself directs their work toward more ‘traditional’ and ‘teacher-centred’ approaches. Parallel with this, the centralised character of the educational system is considered to be a significant factor that prevents teachers from practicing progressive, ‘student-centred’ teaching approaches. Eteokleous (2008) notes that teachers’ work in the centralised Cypriot educational system can be described as curriculum-driven which is based mostly on content/book-oriented activities. She argues that teachers are hindered by the lack of time and the pressure to cover the curriculum, and also by the lack of freedom to practice their craft. In this context, she notes that the centralised, bureaucratic educational system restricts teachers in applying innovative and progressive approaches in their teaching practices, and at the same time the flow of information and instructions from the government to the schools is continuous and overwhelming for the already multitasking role of the teachers. Similarly, Karagiorgy and Symeou (2006) indicate that teachers' culture in the context of the Cypriot educational system is characterised by lack of motivation for self-initiated action. They note that although schools are semi-autonomous institutions and teachers can develop initiatives to some extent, curriculum developments and reform have always been top-down procedures.

Based on the criticism made by the Educational Reform Committee and also on the general agreement by all educational stakeholders that the educational system of Cyprus needed a new pedagogical direction, the Ministry of Education and Culture (2007) acknowledged in its strategic plan for the educational reform that the content of education required modernisation and update. The Ministry notes that the student population is consisted of children with mixed capabilities, and therefore, the school should provide the necessary conditions which would facilitate all students' pedagogical needs. Students should have equal chances for access, participation, learning, and success in a school which will allow them to strengthen their potential, their inclination, their talents, and their individual interests. In order to achieve this vision, the Ministry argues that the school curricula and timetables ought to become more flexible and adaptable. More importantly, it argues that the emphasis should be directed on contemporary teaching methodologies and teaching means and tools, in the context of a democratic and humanistic school. The Ministry notes that the new curricula, which are currently being prepared in the framework of the ongoing reform of the educational system, intend to move the epicentre from information acquisition by students, to one which facilitates students to be able to acquire the skills, stances, and broad learning experiences, which go beyond the narrow space of the school classroom. The Ministry argues that the reform of the school curricula will take into account the needs of the Cypriot society, as well the new European and international developments.

2.4.3 Teaching staff

The primary schools in Cyprus are staffed with teachers who are university graduates. The majority of them are graduates from the Department of Education, part of the Faculty of Social Sciences and Education at the University of Cyprus. Also, a considerable number of teachers are graduates from public universities in Greece, and a smaller number are graduates from overseas universities. Nevertheless, graduates from non-Greek speaking universities must go through a process of accreditation of their qualifications. At the same time, the three private universities which began operating in October 2008 are offering bachelor degree programmes in primary education (Eurydice, 2008).

Graduate teachers are appointed by the Educational Service Commission to public primary schools when vacancies are announced following consultation with the Ministry of Education and Culture. The Educational Service Commission is an independent body that does not come under the Ministry of Education and Culture. It is consisted of five members who are directly appointed by the Council of Ministers for a six-year period. Its role is to appoint, confirm, place in permanent posts, promote, transfer, second, retire and exercise disciplinary control over teachers of all levels. Primary teachers become public servants after completing a two-year probationary period. During that period a teacher is frequently evaluated by an inspector who makes recommendations to the Education Service Commission for either making the teacher a permanent public servant, extending the required probationary period or for dismissing the teacher. The inspector and also the school Headteacher are required to complete an evaluation report on the progress of teachers during the two-year probationary period every six months. The evaluation of permanent teachers is also exercised by the Ministry’s Inspectors and the school Headteachers (Eurydice, 2008).

The inspectors’ multidimensional role does not just involve the evaluation and efficiency of the work and evaluation of the teaching staff. They are also responsible for the general evaluation of education for improvement purposes. They constitute the link between the schools and the educational administration and promote the Government's educational policy. At the same time, they are responsible for coordinating the teaching effort and for providing guidance, instructional assistance, and in-service training opportunities to the teachers (see Section 2.4.4). Finally, they provide the Ministry, schools, and teachers with suggestions about educational issues as well as suggestions about the curriculum, the school textbooks, and other teaching materials (Eurydice, 2004; 2008).

The fact that the Educational Service Commission concentrates the responsibility for so many aspects of teachers' service, as well as the inspectors' dominant role in their working lives is an indication of the high centralisation of the educational system of Cyprus (Karagiorgi & Symeou, 2006). This state of affairs has not remained uncommented by the Educational Reform Committee (2004). The members of the committee argued that teachers' evaluation system was counterproductive and traditional. They noted that the evaluative role of the inspectors supplanted their consultative role, which is essentially forcing them to act like a type of school 'police', aiming at assessing and marking the teachers. The Ministry responded to this criticism, and in the context of the ongoing reform of the educational system, it assigned external experts to design a new evaluation system, which as suggested should have been based on more objective and rational criteria (International Bureau of Education, 2004). The new system of teacher evaluation was prepared and it was handed to the educational stakeholders for consideration and suggestions. It is expected that after the essential negotiations and discussions, the new system will be introduced into the educational system (Ministry of Education and Culture, 2006).

2.4.4 Professional development practices and in-service training

The task of providing opportunities for teachers' development and in-service training rests primarily on the Pedagogical Institute of Cyprus and secondarily on the Ministry's inspectors (Karagiorgi & Symou, 2006). A historical overview of the teachers' in-service training is offered by Theofilides & Dionysiou (1990), who indicate that the systematic professional development of teachers was initiated by the colonial Government of Cyprus in 1946 when a small number of teachers were sent to the United Kingdom for training so as to staff administrative posts in the educational system. These teachers, as well as several others who followed, were also responsible for providing in-service to their colleagues. When Cyprus became an independent state in 1960, the new objectives that were set by the establishment of a new National Curriculum, and new teaching approaches that were adopted, highlighted the need for enhanced in-service training. This need became more intense because of the constant increase of the student population, the lengthening of compulsory education, and of the international development in education. Based on these, the Ministry realised that a structural framework for a systematic programme for teachers' professional development was essential. Therefore, an expert in UNESCO, professor Wedell, was requested to propose a programme which would enable teachers' of all levels to receive effective training. As a result of his proposal, the Pedagogical Institute of Cyprus was established in 1972, which among other tasks, is responsible for providing teachers with in-service training.

The establishment of the Pedagogical Institute in 1972 systematised and enhanced the provided in-service training, which until then, was exclusively provided by the inspectors. The Ministry of Education and Culture (2008) describes the Pedagogical Institute's mission:

> The Cyprus Pedagogical Institute has a developmental mission which covers all levels of education. Its main activities are the in-service training of teachers, the pre-service training of secondary school teachers, educational research and evaluation, educational documentation, educational technology and curriculum development (p:290).

The pedagogical institute offers non-compulsory training courses to all teachers of all levels on a variety of educational topics and also compulsory educational administration courses mainly to Headteachers and deputy Headteachers. These courses are offered through a series of seminars at the institute's premises and in schools (operating as training centres) all over Cyprus, and are conducted by experienced teachers who have been seconded to the institute, by permanent staff of the institute, highly-qualified individuals from the private sector, and academics from universities and abroad (Ministry of Education and Culture, 2008). By the end of each course, the participant teachers are awarded a certificate, which is used for their self-evaluation forms as an indication of interest in in-service training (International Bureau of Education, 2004). It should be noted that teachers' participation in training courses does not have a significant impact on promotion as there are not specific requirements for professional development that teachers need to meet so as to maintain their jobs (Karagiorgi & Symeou, 2006). Moreover, the Cyprus Pedagogical Institute plays a key role in the endeavour of introducing Information and Communication Technology (ICT) into the educational system by providing teachers training on Information Technology. This matter will be explored in more detail in Section 2.5.3.1.

The optional training courses constitute the main form of training offered by the pedagogical institute. These courses, which as mentioned are available to teachers of all levels, are offered in all five districts of the island after school hours and usually consist of five afternoon sessions. Their aim is to meet the needs of teachers, as they are identified by the Pedagogical Institute and the Ministry, and focus on school subjects, social and psychological issues, educational research skills, and ICT skills. The seminars are defined in terms of their audiences as primary education, secondary education, vocational education, and interdepartmental (Karagiorgi & Symeou, 2006; Karagiorgi et al., 2008). Along with the optional training courses, the Pedagogical Institute organises school-based seminars on specific topics of interest to the staff of a school after agreement with the Pedagogical institute. Finally, it organises seminars, one-day workshops and conferences in cooperation with the Teachers' Unions and teachers' associations of specific subjects (Karagiorgi & Symeou, 2006).

The general aim of teachers' in-service training in Cyprus is to improve the quality of the teaching and learning process by enhancing the knowledge and skills of teachers; improving teachers' understanding of different teaching methodologies and classroom management; supporting the professional development of teachers; by updating teachers on the use of modern technology as a teaching and learning tool; and by disseminating new ideas and supporting teachers in the introduction of innovations in the educational system (Eurydice, 2008). However, how well does the professional development programme offered to teachers by the Pedagogical Institute address and facilitate the fulfilment of these aims? According to the members of the Educational Reform Committee (2004) the Cyprus Pedagogical Institute encounters many weaknesses which are derived from its ill-defined role and from other problems which are related to its staffing and administration structure. Although they recognise the institution's contribution and service to the Cypriot educational system, they argue that many things can be changed and improved.

Likewise, a number of authors and researchers indicate that the teachers' in-service training opportunities provided in Cyprus by the Pedagogical Institute are inadequate and in many cases inefficient to bring about meaningful results. For instance Karagiorgi and Symeou (2006) argued that the teacher-training system available in Cyprus is centrally determined, supply driven, and functions on a purely individual basis in isolation to teacher and school needs. They argue that the existing training scheme is mainly informal, individual and voluntary, and has not evolved into structured practices. They suggest that a number of teachers are offered training in training centres and then sent back to unchanged schools, and there are no explicit connections between national priorities and school or individual needs. Based on these, they suggest that there is a need for a multi-dimensional continuous professional development scheme, which would incorporate different forms of instruction in a holistic, long-term approach to continuing teacher professional development. This scheme should promote and facilitate the development of alternative forms of in-service training, the establishment of links with school improvement, the shift of organisational models from central to the local level, and the enhancement of teacher involvement in in-service training activities.

Karagiorgi et al (2008) provide a detailed examination of the training courses offered by the Pedagogical Institute. They note that the specific courses, which as discussed are consisted of seminars, share a degree of homogeneity with regards to their design. They are a structured approach to professional development that occurs outside a teacher's classroom and involve an expert and participants who attend sessions at scheduled times after school. They are of short duration which does not provide opportunities for in-depth discussions and reflection of content, teacher conceptions/misconceptions, and pedagogical strategies. More importantly, the participant teachers are not given the chance to try out new practices in the classroom restricting thereby control over their own learning. Finally, these courses do not encourage collective participation of teachers, or participation of groups of teachers from the same schools. In the light of these remarks, the authors argue that the optional seminars offered by the Pedagogical Institute constitute a traditional form of professional development inheriting all the weaknesses attributed to such approaches (see Chapter 5). These issues are also highlighted by Angelides (2002) who notes that the seminars that constitute the main in-service approach in Cyprus follow a traditional pattern of teacher development. He underscores that they promote individual learning without direct links with the actual classroom practice. He finally stresses that the limited attention paid on teachers' development is an important factor behind the unsuccessful attempts of the Ministry of education to improve teaching in Cyprus schools.

The Ministry of Education and Culture shares the viewpoints presented in the previous paragraphs, and in the context of the ongoing reform of the Cypriot educational system, it has prepared a proposal for the reorganisation and enhancement of teachers' in-service training. The author of the proposal (Charalampous, 2007) notes that due to the lack of explicit policy and of a strategic plan, the Pedagogical Institute never manages to provide training to all teachers in Cyprus, even though this was one of the core aspect of its mission. He notes that only 10% of teachers are taking part in the voluntary training scheme provided by the institute and of them the majority are pre-primary and primary teachers. It is therefore concluded that most of the teachers throughout their career receive little in terms of systematic professional development. The author of the proposal also discusses the features of the optional training courses. He notes that these courses are prepared without systematic inquiry of teachers' actual training needs, while their content is not coherent because of the dissimilar and uneven group of trainers who just teach fragmentary courses for few hours. Moreover, the teaching methods employed by the trainers are traditional and lecturetype that do not incorporate the basic principles of adult learning. Finally, the learning environment in which these courses are taking place is poor and therefore, it does not represent a positive pedagogical model for the teachers who participate.

Based on these conclusions, the Ministry of Education proposed an updated scheme of teachers' in-service training, which as argued, should take into account: (a) the educational system's needs and to promote the priorities and the objectives set by the educational policy; (b) each school's individual needs as they are determined by the developmental plan of each school; and (c) teachers' training needs in the context of their personal professional development. The new scheme will incorporate a mixture of compulsory and optional in-service training activities. The compulsory training will include systematic training of all teachers of all levels when they reach the 10^{th} and 20^{th} year of their service, school-based training three times a year (the teacher's only day), as well as compulsory education for candidate Headteachers, Deputy Headteachers, mentors, and teachers' councillors. The optional training will include updated training courses based on teachers' training needs, school-based training, distant training, school-based training projects, participation in European training programmes, and teachers' funding for participation in educational conferences.

The Ministry of Education and Culture (2007b) indicates in its strategic plan for education that in the context of the updated scheme of teachers' in-service training, the Pedagogical Institute of Cyprus will be reconstructed and will be staffed appropriately so as to become adequately efficient to successfully correspond to its updated role and to the new programmes for teachers' in-service training. At the same time, it is indicated that particular attention will be placed on teachers' school-based training which will be facilitated by the teachers' councillors. Teachers' councillors, who will take up the role of teachers' mentors, will be responsible for enquiring into teachers' developmental needs and for guiding teachers' in-service training. It is expected that these propositions will be gradually introduced and implemented in the educational system in the framework of the ongoing educational reform.

2.5 The introduction of ICT in Cyprus primary schools

According to the Ministry of Education and Culture (2007) the rapid developments in science, technology, economy, and in the wider society in general, necessitate the constant knowledge and skills renewal by all citizens, so as to become capable of dealing with the increasing challenges in their personal and working lives. The Ministry notes that the Cypriot public education must be adapted to the needs of the modern society, and based on the hypothesis that ICT could help fulfil this objective by enhancing the teaching and learning processes, it acknowledges that the integration of ICT in the teaching and learning processes is a pressing necessity. Therefore, it notes that the endeavour of introducing ICT in public schools was timely initiated with the investment of significant amounts of money for the specific cause. It also notes that although this process specifically concerns the individual and unique needs of the Cypriot educational system, it is also permeated with common actions of the European Union member-states in the framework of the objectives set in the Lisbon Treaty.

2.5.1 Historical overview

The official decision for the introduction of computers in Cyprus primary education was made in 1991 (Michaelidou-Evripidou 1995). In this context, the Directorate of primary education launched in 1993 an experimental programme for the introduction of computers in primary schools. At the same time, the ICT Development Unit (part of the Department for programmes development of the Ministry of Education and Culture) was established as the executive agent that would coordinate and supervise the implementation, not only of this programme, but also the whole process of introducing ICT in Cyprus public education (Ministry of Education and Culture, 2001).

During the first phase of the programme (1993-1994), eight pilot schools were equipped with two computers and a printer each. Additionally, brief implementation guidelines were sent to the participant teachers, while the Cyprus Pedagogical Institute offered a number of teachers, a set of training seminars for computer skills. The second phase of the programme took place during the following school year (1994-1995). Nineteen additional pilot schools were incorporated in the programme, which were equipped with two computers, a printer, and educational software packages. The pedagogical institute continued offering the training seminars, while, a second set of seminars about multimedia applications in education was initiated. During this phase, four district ICT coordinators were assigned to offer support to the teachers in the pilot schools.

During the third phase of the programme (1995-1996) the pilot schools were provided with an additional computer and with educational software packages. Simultaneously, the existing technical infrastructure was upgraded and informed. Also, a series of training seminars were organised and offered to a number of teachers in cooperation with the government of Israel. At the same time, the Pedagogical Institute and the Directorate of primary education organised school-based training sessions to a number of pilot schools. During the fourth phase (1996-1997), a second series of training seminars in cooperation with the government of Israel was offered to teachers. Also, the pilot schools were equipped with an additional computer, while training sessions on the use of the Internet were offered to a number of teachers. In 1998-1999 five more schools joined the programme and were equipped with three computers and a printer each. At the same time, the training programme offered by the Pedagogical Institute was updated with the inclusion of additional series of seminars. The participating schools were equipped with additional computers and printers (Ministry of Education and Culture, 2001).

Moreover, during the same school year (1998-1999), and based on the results of the experimental programme, the Ministry of Education and Culture prepared a five-year action plan for the introduction of ICT in all primary schools. The plan, which was named ‘Evagoras’, was developed on five fronts: a) the update of the national curriculum in order to include computer technology applications; b) teachers’ professional development in three levels (computer literacy, use of computer applications as teaching and learning tools, and use of other technological methods and mediums); c) the use of computers for school management; d) the integration of Internet applications in primary education; and e) the continuous provision of hardware, software, as well as provision of technical support and maintenance within schools (Ministry of Education and Culture, 2001). It is noted that 'Evagoras' was the first formal ICT policy document that described the action plan for the introduction of new technologies in all primary schools for the years 2000 to 2005. Through this document the Ministry justified the political decision to introduce ICTs in primary education by putting forth economic, pedagogical, and national reasons (Eteokleous 2008). In the context of the 'Evagoras' plan, the Ministry decided in 2000 to equip all primary schools, and specifically all classrooms of the upper cycle (4^{th} grade, 5^{th} grade, and 6^{th} grade) with a computer and a printer. Also, it was decided to provide Internet connectivity to all primary schools (Ministry of Education and Culture, 2001).

At this point it is useful to examine what the research says about the experimental programme for the introduction of ICT in Cyprus primary schools. Kanaris et al (1995), conducted a study on behalf of the Pedagogical Institute, to evaluate the experimental programme of the introduction of computers in primary education. A questionnaire was sent to 45 teachers who participated in the programme and were asked to indicate their perspectives on the training they had received, the technical and pedagogical support available to schools, the available software packages, as well as the problems they were facing with respect to school and classroom management. The study showed that the participant teachers were aware of many issues regarding the use and integration of computers in the classroom. However, the majority of them clearly indicated that they needed more support. In this way, the researchers noted that the lack of technical and pedagogical support was a significant problem that hindered teachers' efforts to successfully use computers in their work. Moreover, the study showed that the ICT training provided was inadequate while teachers were found to be unsatisfied with their professional development. In this context, the researchers suggested that the available ICT training programmes needed reformulation and to be based on a new theoretical background. An equally significant barrier that was found to hinder teachers' use of ICT was the lack of time, not only for teaching preparation, but also for actual teaching with the use of ICT.

What is more, Michaelidou-Evripidou (1995) carried out a study, also on behalf of the Pedagogical Institute, to investigate teachers' viewpoints regarding the use of computers in Cyprus primary schools. The study was based on a survey of 473 randomly selected teachers, and its target was to produce results and conclusion which would help the successful implementation of the experimental programme of the introduction of computers in primary schools and would facilitate the decision making process by the policymakers. The study showed that many teachers were concerned and unsure about the consequences brought about by the computer use in the classroom. However, the majority of them appeared to be willing to get involved with the experimental programme. At the same time, all teachers were found to be willing to learn more about the integration of ICT in education and to participate in the provided ICT training programmes.

Furthermore, the period before the accession of Cyprus in the European Union signalled a state of affairs in which the need for significant changes, that would adapt the Cypriot educational system to the European standards, became apparent to all educational stakeholders. Therefore, in 2002 the Cypriot Government came to an agreement with two European Banks (Council of Europe Development Bank and European Investment Bank) to finance with 265 million Cypriot pounds (approximately 400 million British pounds), a project for the overall improvement of the public education provision. 65 million pounds concerned the introduction and integration of ICT in public schools. Although the completion of the project was expected in 2007, due to unpredictable circumstances it was decided to extend the completion deadline until 2009. In the context of this effort, in 2002, a parallel project was launched for teachers' training in ICT so as to become capable of integrating ICTs in teaching and learning processes. It must be noted that the specific project is jointly funded by the Cypriot Government and the European Social Fund.

Although these projects are separate and involve different implementation processes, the Ministry (2007) notes that the whole endeavour of introducing ICT in Cyprus public education is dealt as a national educational strategy for all stages of education. Therefore, in 2005 the Ministry formed a Project Implementation Unit (PIU) to accomplish the goals that derive from these projects.

The Ministry's strategic plan is based on three themes each assigned to an implementation team in the framework of the PIU. These themes concerned: a) the development of an adequate and effective technical infrastructure in all schools that incorporates the most modern technology; b) the systemic and multilevel professional development of teachers of all levels; and c) the update of the national curriculum at the level of aims and activities in order to include ICT use (Ministry of Education and Culture, 2005; 2007; Eurydice 2007).

With respect to the first theme, the intention is, until 2009, to equip all classrooms, as well as computer laboratories of all schools, with desktop and laptop computers, printers, scanners, video projectors, interactive whiteboards, camcorders and other technical means. Videoconferencing rooms have been established in schools to allow active and live participation of students in local and European educational programmes. A Learning Management System has been established in order to provide a range of differentiated services to all educational stakeholders (teachers, students, and parents). The particular digital portal will eventually lead to the creation of an online 'virtual school', available to all stakeholders 24 hours per day (Ministry of Education and Culture, 2007). It must be noted that the system has been piloted in seven secondary and vocational schools since January 2008 and its expansion in all schools is planned for 2009. According to the Ministry of Education (2007), the system, which was named DIA.S (ΔΙΑ.Σ.), will represent a dynamic and amplifying tool in teachers' hands. The teachers will have the opportunity to exploit the numerous technological tools offered by DIA.S so as to support their students based on their own individual learning needs, which, as expected, will eventually lead to improved learning outcomes.

With respect to the second theme, the Pedagogical Institute undertook the responsibility to implement the project of teachers' training in ICT. According to the overall strategy, teachers' training concerns two major objectives: to help teachers develop basic computer use skills (digital literacy), and to learn how to use and integrate ICT in the context of different subjects of the curriculum. The Ministry (2005; 2007; 2008) notes that through the fulfilment of these two objectives the teachers will become familiar with the new technologies, their teaching approaches will be enhanced with the addition of ICT, their teaching efficacy will be increased, which will result in the overall improvement of the quality of the provided schooling. Based on this philosophy, the Pedagogical Institute designed and offers various sets of seminars to cover the training needs of all teachers. The issues regarding teachers' professional development in ICT will be discussed in further detail in Section 2.5.3.

In addition, the implementation team (the curriculum department of MOEC) responsible for the revision of the national curriculum (Egglezakis et al. 2006) has prepared a detailed proposal for the introduction of ICT in the Cypriot education system. According to the Ministry of Education (2007) the proposal was prepared after investigating the current situation in Cyprus regarding the level of ICT integration in schools of all levels, after investigating how other European countries (Greece, UK, Finland, Germany, and Malta) are dealing with ICT in education, and after considering the agreement between the Cypriot Government and the European Banks that are financing the endeavour. The authors of the proposal clarify the philosophy that should underpin the introduction of ICT in the Cypriot education system, and in that sense, they indicate how ICT should be integrated in the teaching and learning procedure. They suggest that ICT should be dealt with as a mean of promoting the teaching and learning objectives of the different subjects in the curriculum. At the same time, the authors indicate the most appropriate teaching approaches and practices when using ICT, as well as the different roles that teachers and student ought to assume because of technology implementation.

2.5.2 Philosophy and aims

The philosophy that underpins and conditions the introduction of ICT in Cyprus' primary schools, but also the introduction of ICT in Cyprus' education system in general, has significantly evolved since the initiation of the endeavour in the early 1990s. Similarly, the integration aims that are put forth by the Ministry of Education and other educational stakeholders have also evolved during these years so as to be adapted to the prevailing philosophy, but also to the dominant trends regarding ICT in education.

The basic objective of the initial pilot programme, which was launched in primary schools in 1993, was the investigation of the potential of computers and other technology as a means of providing teaching and learning aids in primary schools. A further goal was to examine effective teaching methods for the application of ICT in the classroom. In this context, ICT was integrated not as a separate subject in the national curriculum, but as suggested, as a dynamic tool in the teaching and learning process, aiming at a more effective implementation of the curriculum, as well as the promotion of computer skills for students in order to become capable of finding, storing, presenting, and processing pieces of information (Ministry of Education and Culture, 2001; Eurydice 2007). In this sense, the Ministry of education aimed to help student's gain a basic perception of computers, as well as to help them realise their potential and limitations (Kombogianni-Boltsi 2004). Also, ICT and more specifically computers, was simply provided as an additional educational tool which could be used in the teaching process to facilitate the fulfilment of pre-existing objectives found in the curriculum (Pitsillides 2002).

As discussed, ICT was implemented in schools on an experimental basis. In this way, the policy of this endeavour was open-ended without predefined technological educational and pedagogical goals. Although it was a centralised initiative launched by the Ministry of education, schools and teachers were left responsible for putting the innovation into practice. However, it was evident that the introduction of this innovation was not supported with clear educational and pedagogical objectives and a solid philosophical background, leaving teachers feeling insecure and uncertain of how to deal with it. As it was found by a number of studies (Karagiorgi 2003; Karagiorgi and Charalambous 2004; Karagiorgi 2005; Hadjithoma and Karagiorgi 2008), the lack of explicit objectives and the lack of a clearly defined philosophical background, resulted in to teachers receiving conflicting messages about the aims of ICT as well as the level of change sought by this innovation.

In this context, Karagiorgi (2005) published an article which was based on a study conducted in 1997 in four pilot schools that participated in the ICT experimental programme launched in 1993. The specific schools were chosen because of their serious attempts to develop the innovation, as indicated by the Ministry's Curriculum Development Unit. The study's results showed that the level of implementation was low and the intended change was not institutionalised in schools. Moreover, the participant teachers were found to hold positive attitudes toward ICT only in theory, since most of them hesitated to get involved, while they were frustrated and confused about their roles. Teachers were found to be not only confused about the goals of implementation, but also about the ways to pursue them, as they were not sure whether the computer should be used as a medium or as an object. Karagiorgi argues that this was due to a lack of faith in the educational value of ICT, but also because of the inappropriate curriculum and the lack of clear ICT goals. She notes that the Ministry did not try to establish certainty about ICT learning outcomes, and as a result, the teachers were unconvinced of the value of this innovation for their students. Also, Karagiorgi's study showed that the dominant feeling in schools was that of uncertainty and abandonment which was attributed to the lack of good planning by the Ministry.

Furthermore, Karagiorgi and Charalambous (2004), in a joint article that reports on the findings of two independently conducted studies regarding the introduction of ICT in Cyprus' primary schools, note that the extent of ICT integration in pilot schools that participated in the 1993 experimental programme, was rather limited. Only a small number of teachers were involved, and in terms of the content of practice, different patterns emerged, which were shaped by incidental individual initiatives. However, the applications developed by teachers referred to 'learning about ICT' as well as 'learning with aid of ICT', with the computer either as a tutor or as neutral tool, but not as a cognitive tool. The authors note that these outcomes suggested that policy makers needed to clarify and define desired ICT uses, which needed to be translated into specific pedagogical goals. They also argue that the national curriculum needed reformulation so as to include ICT. The two studies were conducted in 1997 and in 1998 respectively, and the data were collected through interviews and questionnaires.

Eteokleous (2008) conducted a study in primary schools in the district of Nicosia to evaluate the situation in Cyprus primary classrooms regarding computer technology integration. She collected quantitative and qualitative data from 292 teachers in 2003 and she found that teachers' use of computer was sporadic. The ICT resources were used as supporting tools or as fancy chalkboards but not as educational tools. The study also showed that only few teachers were using computers in any sort of progressive way. Along with several barriers and constraints that inhibited ICT's successful integration, the study also found that the philosophy of the educational system and also the philosophy that supported the computer technology integration were also hindering factors. The teachers, who took part in the study, and specifically the high computer users, indicated that technology integration should have been part of a holistic change of the Cyprus' educational system. At the same time, the teachers supported that the philosophy of computer technology integration needed alteration. Eteokleous argues that the study's results showed that the ICT integration in primary schools, and specifically the implementation of the 'Evagoras' plan, was partial, vague, and some of the intended goals were postponed. Eteokleous notes that the centralised, curriculum-driven, content-oriented and bureaucratic nature of the primary education system prohibited teachers from incorporating computer as a transformational tool in their classroom.

These findings and conclusions were not only supported by individual researchers but also by other stakeholders within schools and the Ministry of Education. In this way, after the completion of the experimental programme launched in 1993, the Ministry made changes to the basic philosophy and rationale that underpinned the introduction of ICT in primary education, differentiating in this way the ICT implementation into schools. The Ministry of Education (2001), and more specifically the ICT Unit, notes that in the context of primary education, the aim is to help students become familiar with the various ICT tools which will enable them to acquire basic ICT usage skills. Therefore, they will become capable of using ICTs as dynamic tools, not only for knowledge acquisition and discovery, but also for information communication. It is noted that these skills should complement each other to constitute a logical and systematic model of information processing, and at the same time, they should be directly interrelated with other knowledge bases and subjects included in the national curriculum. It is also argued that these skills should be dynamic so they can be easily adapted to the developments and changes in the area of technology and of educational technology as well. Finally, it is argued that although ICT skills are essential, it is more important that the students are capable of using them for self-learning and communication. With respect to teachers, the Ministry (2001) notes that the ultimate goal was for all teachers to use ICT in the teaching and learning process. In this way, computers and ICT resources were considered to be tools that could be used to facilitate the learning and teaching process.

Further and more substantial changes to the philosophy that underpins the introduction of ICT in the Cypriot educational system were made after the initiation of the programme funded by the European Union. The implementation team responsible for the revision of the national curriculum suggested significant changes to the ICT philosophy, but also to the intended ICT aims, in the context of its proposal for ICT integration in the Cyprus education system. The authors of the proposal (Egglezakis, et al. 2006) argue that ‘digital literacy’ is an integral part of the ‘holistic literacy’, and should aim at a more effective, qualitative, and upgraded education. They note that in the context of the ‘Information Age’ any citizen should be capable of researching and assessing pieces of information. Other essential skills should be complex decision making, effectiveness in work, and continuous knowledge renewal. They support that the introduction of ICT in education could help students acquire these essential skills which will eventually support their unhindered accession and creative activity in their community and society in general.

With respect to education, Egglezakis et al. argue that the introduction of ICT has the potential to radically transform both teaching and learning, as well as to promote and facilitate the fulfilment of the pedagogical aims of different subjects in the curriculum. Similarly, the Ministry (2008) in its annual report notes that the implementation of ICT in primary schools aims not only to either the technological enrichment of the learning environment, but also the essential differentiation of the educational process. In this sense, the authors of the proposal (Egglezakis et al. 2006) note that ICT is being introduced as a dynamic tool with the potential to transform and upgrade the teaching and learning processes. They argue that the integration of ICT in schools can differentiate the existing teaching approaches toward a more individualised learning process adapted to each student's learning needs. Additionally, it can facilitate and promote different types of communication, new learning experiences, access to a diversity of information resources for creative use, opportunities for research inquiry, knowledge discovery, and problem solving, as well as for the development of critical thinking, lifelong learning, and constant knowledge renewal.

In this framework, the authors suggest that the successful integration of ICT in schools necessitates a substantial pedagogical change in the national curriculum. They argue that the curriculum should clearly indicate that the integration of ICT must promote and facilitate a constructivist model of learning. They note that the introduction of ICT provides the opportunity for enhancement of the traditional teaching approaches with student-centred and constructivist practices that could place the student in the centre of learning process. Nevertheless, they warn that embedding ICT in schools will not provide solutions to all problems that trouble education. In this context, the authors provide specific suggestions of how these aims would be accomplished. They suggest that the existing curricula should be enhanced with ICT-based activities, as well as with new skills and objectives as they derive by the use of ICT in teaching and learning (for instance information management). Also, they suggest that an ICT curriculum should be elaborated which will include a detailed description of the evolutionary ICT skills that the students of all levels should acquire through the use of ICT as a teaching and learning tool.

Also, the authors indicate in their proposal that the introduction of ICT in the teaching and learning processes should provoke changes to teachers' and students' roles in the classroom. It is supported that the teacher needs to be a counsellor that helps student work and learn. Also, he/she ought to be a learning facilitator who does not offer ready-made knowledge, but allows the students to construct their own learning. Finally, the teacher is a partner who discovers knowledge along with his/her students. At this point, the authors argue that in order for teachers to handle their new roles, an organised and systematic professional development programme is needed. With respect to students' roles, they note that the student needs to discover knowledge, which will allow him/her to develop knowledge discovery and construction skills. They stress that the student has to be in a position to comfortably and competently use ICT and to realise its effect in the general society. Therefore, they argue that the student must be capable of finding, analysing and assess pieces of information. They also must know how to solve problems, make sound decisions, communicate, and cooperate. Finally, they have to develop critical thinking and participate in lifelong education.

2.5.3 Teachers' professional development in ICT

As discussed, the Pedagogical Institute is responsible for teachers' training in the use of ICT, offering to teachers training opportunities through seminars since the initiation of the experimental programme in the early 1990's. Simultaneously, school-based support and training is offered to teachers by visiting ICT coordinators.

2.5.3.1 Training offered by the Pedagogical Institute

In the context of the programme funded by the European Union, the Pedagogical Institute has designed and offers an ICT training scheme that includes six training programmes to four major categories of teachers of all levels: teachers with no or minimal skills in the use of ICT, teachers who are skilled in the use of ICT, teachers who need specialised training in ICT, and skilled teachers who want to become ICT trainers for their colleagues. Table 2.4 presents the training programmes offered by the Pedagogical Institute as well as their duration:

Programme	Description	Duration (teaching periods)
P1	Basic skills	50
P2	Basic skills + Spreadsheets and Databases	50 + 20 = 70
P3 (primary teachers)	Basic skills + Applications of ICT in primary education	50 + 20 = 70
P3 (secondary teachers)	Basic skills + Applications of ICT in secondary education	50 + 20 = 70
P4 (primary teachers)	Review of basic skills + Applications of ICT in primary education	20 + 50 = 70
P4 (secondary teachers)	Review of basic skills + Applications of ICT in secondary education	20 + 50 = 70
P4 (Vocational teachers)	Review of basic skills + Applications of ICT in secondary vocational education	20 + 50 = 70
P5	Training for teachers trainers	70
P6	Specialised training for computer teachers	70

Table 2.4: Training programmes offered by Pedagogical Institute (Ministry of Education and Culture, 2007)

More specifically, the first programme (P1) includes a section (4 teaching periods) about basic computer concepts like hardware and software, and also about security and health issues when using computers. Moreover, it includes a section (8 teaching periods) about Microsoft Windows operating system and file management within the specific operating system. The following two sections (16 and 12 teaching periods respectively) are about Microsoft Word and PowerPoint and concern the development of a word document as well as of a presentation. The final section of the programme (12 teaching periods) is about communication technologies and the Internet and concerns the use of Internet for information inquiry and communication. The content of first part (50 teaching periods) of the second training programme (P2) is exactly the same with the content of the first programme (P1). It however includes two more sections (10 teaching periods each) about Microsoft Excel and Microsoft Access and concerns the development of a spreadsheet, a database, as well as the creation and processing of tables and forms.

Similarly, the content of the first part of the third training programme (P3 for primary and secondary teachers) is the same with the content of the first programme (P1), but it also includes a second part, of 20 teaching periods, which is about educational applications of ICT. These applications are differentiated for primary and secondary teachers. In general, the content of the second part of this programme is concentrated on ICT practical applications deriving from the prevailing learning theories (behaviourism, cognitivism, and constructivism). More specifically, 4 teaching periods concern behaviourism and the practical use of closed-type software packages in teaching. Also, 4 teaching periods are about cognitivism and constructivism. This concerns training on the use of opened-type software packages in teaching, as well as new teaching approaches like project-based learning. Moreover, 4 teaching periods are about the use of the Internet in teaching for information inquiry, communication and assessment. Furthermore, 4 teaching periods concern training on new teaching approaches and practices that involve the integration and use of ICTs as cognitive tools. The final 4 teaching periods are spent for the development of a small-scale project by the participant teachers.

The first part of the fourth programme (P4 for primary, secondary, and vocational teachers) includes a revision of ICT basic skills. Its duration is 20 teaching periods and concerns a revision of the content of the first programme (P1). The second part (50 teaching periods) is about educational applications of ICT and is adapted to suit the needs of primary, secondary, and vocational teachers. This part intends to help teachers develop philosophical stances regarding the use of ICT in teaching and to learn how to integrate and apply ICT to support the fulfilment of teaching objectives.

The fifth programme (P5) is addressed to teachers who are quite skilled in the use of ICT and the objective is to train and prepare them to become ICT trainers for other teachers. In this context, the programme includes 16 teaching periods about learning theories in relation to ICT use. The aim is to help teachers develop philosophical stances with respect to the use of ICT in the teaching and learning process. At the same time, the trainees are exposed to examples of ICT applications that are of high pedagogical value. Moreover, 8 teaching periods are allocated to help teachers learn how to organise and prepare ICT based learning environments. The programme also includes presentation of closed type software packages (8 teaching periods). 16 teaching periods are about concept mapping, mental tools, model building, project-based learning, and online inquiry. The last part of the programme concerns presentation of educational software which is differentiated according to teachers' level (primary, secondary, and vocational) and subject specialism. The final training programme (P6) offered by the pedagogical institute is addressed to computer teachers (secondary) and its aim is to train them on new issues regarding their specialism which are related to the school curriculum.

It must be noted that at the end of each programme the participant teachers are assessed to ensure that the programme's objectives were achieved. The assessment procedures are different for each programme, and also different for primary and secondary teachers. The primary teachers, and in relation to the training programme they choose to attend, must submit a small scale essay showing that are capable of applying the computer skills they acquired and developed. At the same time, they have to develop and apply a teaching plan which embeds ICTs. The assessment procedures for secondary teachers are also differentiated according the programme the teachers choose to participate. Teachers can attend ECDL examinations for computer skills, ECDL-CTP examinations, as well as Cisco examinations. Also, they have to develop and apply a teaching plan with the use of ICT. Teachers, who successfully complete their chosen programme, are awarded a certificate by the Pedagogical Institute. The secondary teachers, who participate in the examinations mentioned before, are awarded certificate from the respective organisations.

In addition, teachers' participation in the training scheme offered by the pedagogical institute is encouraged with a monetary allowance offered to teachers who successfully complete their chosen programme. Successful completion of the programme means that the participant teachers have attended all meetings, and have passed the respective examinations or their submitted essays are satisfactory and adequate.

According to the Ministry of Education (2007) the training scheme offered by the pedagogical institute is expected to be concluded in 2008 for secondary education and in 2009 for primary education. Teachers' (of all levels) participation in the training scheme is presented in Table 2.5:

Time Period	Programme					Total
	P1	P2	P3	P4	P5	
Spring 2003			✓		✓	490
Summer 2004	✓	✓	✓			728
Autumn 2004	✓	✓	✓			646
Autumn 2005	✓	✓	✓			501
Spring 2006	✓	✓	✓			351
Summer 2006					✓	20

Table 2.5: Primary teachers' participation in the training scheme (Ministry of Education and Culture, 2007)

2.5.3.2 Training offered by the ICT coordinators

The second way that the teachers receive training and support is through the ICT coordinators in the context of the Ministry's ICT unit. There are two types of ICT coordinators: the district and local ICT coordinators. The roles and tasks that each type of ICT coordinators are required to perform are prescribed by the Ministry of Education (2001). The major responsibility of the district coordinators is to transfer the Ministry's educational policy regarding the ICT implementation in schools of their district. Furthermore, they are responsible for training teachers in the use of the existing software packages and equipment, but also for suggesting teaching activities that incorporate ICT in the teaching of subjects included in the curriculum. What is more, they should inform other educational stakeholders about the processes that are followed regarding the introduction of ICT in schools. They are also responsible for delivering and installing new software packages in schools as well as for providing solutions to problems faced by the local coordinators and teachers. They also supervise and oversee the whole endeavour of introduction ICT in the schools of their district. Finally, one of their roles is to explain and clarify the philosophy that underpins the integration of ICT in schools, underscoring particularly issues that are related to school and classroom organisation as well as the pedagogical aspect of ICT in schools. In this context, they should be capable of providing answers to inquiries put forth by the teachers, the parents' associations, and other educational stakeholders.

The local coordinators should become familiar with the new software packages available to schools and train teachers in their use as well as in the use of the available equipment. At the same time, they encourage teachers to participate in the training scheme offered by the Pedagogical

Institute and other ICT professional development opportunities (conferences, workshops, etc) offered by recognised agents. They should provide information to the Headteacher and to teachers regarding issues related to ICT and about their contacts with the ICT unit and the district coordinators. They supervise the introduction of ICT in schools and provide related information to the district coordinators. They plan and conduct joint, technology-based teachings with other teachers. Finally, they are responsible for other practical issues within schools like technical support, equipment troubleshooting, and regular use of the computer labs within schools.

2.6 Summary

This chapter concerned the educational system of Cyprus, focusing more specifically on primary education and the introduction and integration of ICT in primary schools. It included a historical overview of this process, as well as the discussion of the current developments. Furthermore, there was a discussion about the development of the philosophy that underpins the introduction of ICT in schools. It was indicated that there was a significant evolvement of the ICT philosophy through the years. Although the philosophy that underpins the integration of ICT in schools and its derived objectives were initially blurred, the latest developments in the educational system in the context of the ongoing educational reform facilitated the clarification of the objectives sought by the use of ICT in schools. Finally, the training provided to teachers so as to become capable of effectively using ICT in their teaching was examined.

The following chapter constitutes the first part of theoretical background of the thesis and concerns an exploration of the major learning theories and how they support and inform the ways in which ICT could be used and employed in education.

Chapter 3: Learning theories and ICT integration in schools

3.1 Introduction

The first objective of this chapter is to create a theoretical context, wherein the diverse pedagogical applications of ICT can be discussed and examined. It is the first part of the theoretical background of this study, and aims at presenting the major learning theories, and the ways in which their practical inferences inform and support the different applications of technology in the classroom. Particular attention is paid to 'constructivism' since the specific pedagogical epistemology represents the contemporary trend in education.

The second objective of the chapter is to examine the emergence of the 'Information Age' as a driving force for the increased interest in ICT integration in schools, based on the principles derived by constructivist approach to learning. In this context, the intense pressures on schools and teachers to integrate ICT are discussed. At the same time, what constitutes meaningful ICT integration in the framework of the 'Information Age' and of constructivism is explored. Finally, the meaningful integration of ICT as a process of change is discussed.

3.2 Educational psychology, learning theories and ICT

After disassociating from Philosophy, Psychology appears as an independent scientific field approximately at the second half of the 19th century. The quest of finding how humans learn was a central interest for the researchers of the newly appeared science (Blackman, 1984; Mangal 2005; Pritchard 2005). Nevertheless, the diversity of theoretical and philosophical perspectives and orientations among the researchers resulted in the generation of different psychological directions (Pittenger and Gooding 1971; Koliadis 1996; Lefrançois 1997; Mangal 2005). The supporters of each direction tried to investigate their underlying concepts in various ways, using different methodological approaches which ultimately gave Psychology a pluralistic perspective.

The conclusions generated by psychological research were accepted and applied in the field of education, as a scientific way of dealing with problems and issues in teaching and learning. In this way, a distinct branch of Psychology was generated and is referred to as Educational Psychology (Child 1997; Dash 2002; Santrock 2004). According to the contemporary and prevailing definition, Educational Psychology is a scientific field in which conclusions, findings, and inferences from Psychology are selected, assessed, developed, and implemented in order to progress and improve the elements that constitute the educational context (Koliadis 1996; Dash 2002; Mangal 2005). Even though these elements are diverse, Educational Psychology primarily investigates the central concepts of learning and teaching, because they comprise the fundamental facets of any educational process in school practice (Gage and Berliner 1992; Koliadis 1996). Since Educational Psychology is a branch of Psychology, its developmental course is closely connected to that of the Psychology science (Dash 2002).

Through the exploration of the concepts of learning and teaching by Psychology, and therefore by Educational Psychology, specific learning theories were derived (Pittenger and Gooding 1971; Lefrançois 1997). These theories are mainly intervening strategies and techniques which are applied in educational settings to examine educational phenomena and to give solutions to difficulties in teaching practice (Koliadis 1996). The existence of diverse learning theories is a result of the different approaches that the educational theorists employed in their efforts to investigate and explain the process of learning (Pittenger and Gooding 1971; Cotton 1995; Pritchard 2005). The respective literature provides a number of ways for classifying the diverse learning theories. For the purposes of this study, the learning theories are roughly classified into three major branches of educational psychology. The first branch is Behaviourism, the second one is the Cognitivism, and the last one is Constructivism. In each broad category, numerous theories are included which are not necessarily in total agreement with one another (Hergenhahn 1988; Dash 2002), but are conveniently categorised in this way since they share a common philosophical background and assumptions (Child 1997).

What is more, the ‘enforcement’ of inferences generated by Psychology science into the educational field, to explain and resolve learning and teaching issues, is now proven to be ineffective (Koliadis 1996; Long 2000). Experiences by educationalists indicate that abstract principles and strategies which are detached from the actual teaching practice, provide no practical support in dealing with everyday school challenges (Pittenger and Gooding 1971; Koliadis 1996; Long 2000). Consequently, nowadays there is a tension to consider that learning is a complex and multifaceted process with a wide spectrum of dimensions (Koliadis 1996; Lefrançois 2000; Santrock 2004; Pritchard 2005). In this sense, a single learning theory derived from a particular psychological direction cannot entirely describe and explain such a complex phenomenon as learning (Child 1997; Ormrod 2003). Nevertheless, it is recognised that each learning theory can provide useful choices, insights and support to a classroom teacher to deal with everyday practical teaching issues. It is characteristically noted that "theories are useful not because they answer all questions or indicate the correct way of managing all learning situations, but because they do a reasonable job of organising the vast amount of experimental and empirical information about the learning process" (Pittenger and Gooding 1971:68).

Critically examining ICT as a learning and teaching tool denotes that there is a need to relate the prevailing learning theories to ICT integration into teaching practice. In order to be in a position of assessing the diverse educational applications of ICT, as well as using ICT in pedagogical sound ways, it is essential to comprehend the wide spectrum of theoretical approaches to learning (Raptis and Rapti 2001; Earle, 2004). Moreover, the process of infusing ICT resources into instruction by teachers ought to be informed by pedagogical theories of learning. The presence and use of technology in the classroom cannot solely enhance students' learning (McDonough 2001). It needs theoretical and pedagogical underpinnings (Rabinowitz and Shaw 2005), which will ensure that its presence and use in the particular learning environment is purposeful and meaningful. Successful technology integration requires a connection between how students learn and how teachers employ technology to assist and enhance this learning (Koc 2005).

Finally, it is argued that educational technology and educational psychology, are increasingly influencing each other (Salomon and Almog 2000; McDonough 2001). It is believed that the interrelations and interactions between the two fields could result in classroom instruction improvement. On the one hand, technology's introduction and use in the classroom facilitates the kinds of pedagogies that emanated from the changing zeitgeists and from prevailing psychological conceptions, and on the other hand, it challenges education by requiring novel psychological explanations and pedagogical justifications (Salomon and Almog 2000).

3.3 Behaviourist approach to learning

Early attempts, by educational psychologists to investigate and understand the phenomenon of learning, led to the behavioural approach which mainly suggests that learning is apparent through desirable changes in an individual's behaviour (Lefrançois 1997). Behaviour-oriented researchers focused their interest on the observable behaviour and its modification, and in this way identified behaviour as everything that we can do that can be directly observed (Santrock 2004). The contribution to learning, of unseen and not directly observable mental processes, is ignored (Lefrançois 2000; Santrock 2004; Mangal 2005; Pritchard 2005). Thoughts, feelings, and motives that an individual experiences, and are examples of mental processes, are not being taken into account.

Behaviourism is based around the central notion of a reaction being made to a particular stimulus (Pritchard 2005). Namely, behaviourists attempted to explore the relationships which exist between given stimuli and responses. In this context, they sought "to analyse learning situations, to divide learning phenomena into small elements and to investigate the simplest possible stimuli – response relationships in order to better understand the more complex total phenomena" (Dash 2002:206). The resulting learning theories from the behavioural approach were developed on the concepts of stimuli and responses. Some of these theories incorporate the concepts of reinforcement and punishment, as well. On the one hand, reinforcement (positive or negative) is a determinant mechanism (stimulus) which increases the probability that a desirable behaviour will occur. On the other hand, punishment is a mechanism (stimulus) which decreases the probability that a non-desirable behaviour will occur (Raptis and Rapti 2001; Santrock 2004).

The behaviouristic approach to learning is divided into two subcategories: 'classical conditioning' and 'operant conditioning'. Classical conditioning was developed by I. Pavlov whose experiments verified that when two stimuli are presented together and the response originally elicited by one of them come to be elicited by the other (Dash 2002). Also, Pavlov identified four stages in the process of classical conditioning. The attributes of each stage are displayed in Table 3.1:

Acquisition	Extinction	Generalisation	Discrimination
The initial learning of the conditioned response	Once learnt, a conditioned response will not remain indefinitely	After a conditioned response to a stimulus has been learnt, it may also respond to similar stimuli without further training	An individual learns to produce a conditioned response to one stimulus but not to another similar stimulus

Table 3.1: Stages in the process of classical conditioning (Pritchard 2005:8-9)

J. B. Watson, who is considered to be the founder of the school of Behaviourism, was influenced by Pavlov's work (Mangal 2005), and through his own work suggested that people are born with a limited number of reflexes. Based on this, he explained learning as a matter of classical conditioning involving these reflexes (Koliadis 1996; Lefrançois 1997).

B. F. Skinner is regarded as having been the architect of 'Operant conditioning'. Skinner's views are built on E. L. Thorndike's theory of trial and error learning (Dash 2002; Santrock 2004; Mangal 2005). In general, according to Thorndike's trial and error learning, a person who is faced with a specific problematic situation tries a number of different responses until a response is made that provides a solution (Lefrançois 1997). That response is then learnt because it causes satisfaction, and it is quite possible to be reemployed in similar situations (Koliadis 1996). In this way, behaviours followed by positive outcomes are strengthened and behaviours followed by negative outcome are weakened (Santrock 2004). Operant conditioning is based on the fact that the consequences of a behaviour produce changes in the probability that the behaviour will occur. With respect to Skinner's model of operant conditioning the changes in probability are a result of reinforcement or punishment (Lefrançois 1997).

The behaviouristic approach to learning had been dominant in education since the early part of the 20th century until the 1970s (Jonassen 1985; Jonassen 1991; Rabinowitz and Shaw 2005; Boghossian 2006). Behavioural learning theorists definitely left their mark in the educational, as well as in educational technology field (Vaney & Butler, 2001), as discussed in Section 3.3.1. It is suggested that behaviourism has shed light on many aspects of learning (Raptis and Rapti 2001), and in this way, novel, innovative, and powerful techniques for analysing as well as modifying students behaviours were produced (Lefrançois 2000; Long 2000; Mangal 2005). In this sense, a teacher can understand and manage specific behaviours of the pupils as well as interactions in the classroom environment, which consequently improve their instructional capabilities and effectiveness (Raptis and Rapti 2001; Santrock 2004). Finally, due to the behaviouristic findings, the classroom, as a learning situation and environment, was organised and developed better (Mangal 2005), while the educational objectives included in school curricula became more specific and measurable, with unambiguous description of what changes should occur in a students' behaviour (Hergenhahn 1988; Raptis and Rapti 2001; Bush 2006).

Nevertheless, there are opponent views which argue that behaviourism cannot provide a complete picture of learning (Lefrançois 2000; Ormrod 2003), and that behaviouristic techniques are simplistic and mechanistic, ignoring to a great extent students' mental processes (Jonassen 1991; Long 2000). In this way, it cannot explore higher forms of learning and cognitive processes (Dash 2002; Mangal 2005), making students passive entities who simply react to the environmental stimuli (Burton et al, 2001). Their natural and inherent motivation for learning is damaged and is geared solely towards external reward, which ultimately makes their work superficial (Long 2000; Pritchard 2005).

Consequently, behaviourism is associated with traditional, teacher-centred instructional strategies (Koc 2005; Boghossian 2006; Bush 2006). This is due to the fact that behaviourism is based on the 'objectivism paradigm' which supports the notion that "knowing and learning are processes for representing and mirroring reality" (Jonassen 1991:5). Accordingly, for behaviourism:

> …knowledge is fixed and independent of the knower. There are ‘truths’ that reside outside the knower. Knowledge is the accumulation of the ‘truths’ in a subject area. The more ‘truths’ one acquires, the more knowledge one possesses (Airasian and Walsh 1997:62).

In this framework, behaviourism underpins the transmission of knowledge as an instructional strategy (McDonough 2001; Handal 2003), and considers that ‘teaching is telling’ (McDonough 2001). However, it is self-evident that it is not possible to define and agree what reality is (Jonassen 1991), and that this reality is not universally processed, interpreted, and understood similarly by everyone (Jonassen 1991; Raptis and Rapti 2001). Essentially, the messages and information transmitted by the teacher are differently processed, interpreted, and assimilated by each student (Raptis and Rapti 2001). Therefore, prefabricated knowledge which derives from a prescribed reality, as well as its dissemination and imposition to all students does not ensure effective learning.

3.3.1 ICT use and behaviourism

It is supported that educational technology “evolved with a behaviouristic foundation, so its theory base was naturally influenced by many of the behaviouristic assumptions” (Jonassen 1991:6). As a result, the first true technology of instruction was based on an application of Skinner’s operant conditioning, the programmed learning (Jonassen et al. 2003). Programmed learning’s main concept is the shaping learner’s behaviour by reinforcement of desired learning behaviours (Hergenhahn 1988; Jonassen 1991). Programmed instruction was firstly presented by means of teaching machines, which were inspired and introduced in education by Skinner. It is noted that “Skinner believed that machines were useful as teachers because good instruction requires students to immediately know whether they were doing something correctly or not by receiving rewards or recognition for right answers” (Rabinowitz and Shaw 2005:50). He also thought that teaching machines could provide all students instruction with instant feedback which was not possible to be achieved by a single teacher in a classroom of over twenty students (Rabinowitz and Shaw 2005). At the same time, teachers could gain a bonus of free time for more creative activities. Based on these benefits, in a short period of time, programmed learning techniques and teaching machinery spread "from the psychologist's laboratory through the business world into education" (Child 1997:40).

3.3.1.1 Computer-assisted instruction (CAI)

The developments in computer science and the increased availability and affordability of computers in the classroom enabled the computer-based delivery of programmed instruction or other kinds of instructional materials. When a computer is used to deliver instructional material in the classroom the process is called computer-assisted instruction (CAI) (Hergenhahn 1988; Ormrod 2003). The literature indicates many of the potential benefits and limitations inherent in the use of CAI which are mainly related to conventional methods of instruction. Table 3.2 presents some of these benefits and limitations:

Potential benefits and advantages	Potential limitations and disadvantages
Students can be individualised treated, while the student-computer interaction can be personalised.	CAI could be considered to be dehumanising and socially isolating since the student is interacting with a machine.
Students' knowledge evaluation is more immediate saving the teacher the boring task of reviewing and scoring students' work.	Students' creative thinking and opportunities for self-expression could be negatively affected.
Students can progress in their own pace	There is no guarantee that students will be working to the best of their ability. It could provide them the opportunity for slacking.
The materials are presented via exciting visual displays, creating in this way a game-like atmosphere.	CAI could become boring and monotonous once the novelty of the method worn off

Table 3.2: Potential benefits and limitations of CAI [Compiled from (Hergenhahn 1988; Gage and Berliner 1992; Child 1997; Long 2000)]

In this context, through the years many researchers have tried to explore the effectiveness of CAI with respect to students' learning outcome. They tried to find evidence that students learn more from CAI than from students who are exposed to conventional instruction methods (Cotton 1991; Kulik 2003). The great number of researches on CAI effectiveness allowed researchers to conduct meta-analyses which helped the more trustworthy review of CAI. The general conclusion from these meta-analyses is that students who had received CAI learnt more than the students who had received conventional instruction (Kulik et al. 1985; Cotton 1991; Kulik and Kulik 1991). They also liked their classes more, and they developed more positive attitudes towards computers.

Nevertheless, it was shown that the average value of effect size was relatively too small to be considered educationally meaningful, which caused concerns about CAI effectiveness and cost effectiveness (Kulik et al. 1985; Kulik and Kulik 1991).

CAI typically refers to drill-and-practice activities and tutorials offered either by themselves or as supplement to traditional, teacher-directed instruction (Cotton 1991). Table 3.3 present some of their characteristics as well as some of their benefits and limitations.

Drill-and-practice		**Tutorial**	
• Activities that refer to the repetition of the material to be learned until it is mastered. • They allow the learner to demonstrate that is able to perform quickly or freely with few or no errors. • The majority of the early computer-based applications in schools were individualised drill-and-practice activities. • Are considered to be the most effective application of CAI • They were probably the most commonly found applications of computers in education. • They are mainly used at the elementary level to help students obtain basic skills in mathematics and vocabulary.		• A version of CAI that incorporates many assumptions derived from Skinner's programmed instruction. • Replicates a personal tutor's behaviour, by supplementing normal classes and providing opportunities to students for one-to-one, individualised instruction and practice. • It typically contains sequences of content broken into sections, with end-of-section questions to determine whether the learner requires remedial content or is ready to move to the next section. • Progressively, it is able to adjust the level and complexity to suit the level displayed by the student.	
Benefits	**Limitations**	**Benefits**	**Limitations**
• support, for short periods of time, high levels of task engagement by the students. • save time for the teacher which would otherwise be spent for grading and preparing routine tasks for practice.	• limit educational goals to the attainment of lower-order skills. • provide weak motivation and conceptual aids to understanding. • support teacher-centred instructional approaches • waste of computer's instructional power.	• powerful means that enhance learning via independent work. • provide motivation for the lesson. • offer opportunities for interaction. • correct mistakes and misunderstandings. • encourage success. • enable the storage of vast amounts of instructional material, which is then presented with sophisticated graphics, animations, and audio.	• are merely electronic page-turners or electronic versions of traditional workbooks. • are characterised by repetition, offer superficial reward learning, and may become boring for the students. • effective only for presenting information, facts, concepts, rules and principles, and therefore facilitate. lower forms of learning • are not sufficient or flexible enough to meet all learners' needs.

Table 3.3: Characteristics, benefits and limitations of drill-and-practice and tutorials [Compiled from (Hativa 1988; Simonson and Thompson 1990; Vazquez-Abad and LaFleur 1990; Norman and Spohrer 1996; Conrick 1998; Gibbons and Fairweather 1998; McLoughlin and Oliver 1998; Oh 1999; Dalgarno 2001; Hung 2001; Handal et al. 2003; Luik 2007)]

3.3.1.2 Integrated learning systems (ILS)

A second technological classroom application that derives from the behaviourist learning theory concerns the integrated learning systems (ILS) (Purcell 2000; Landis 2002; Koc 2005). ILS can be described as "a computer-based system that manages the delivery of curriculum materials to individual learners and is capable of providing comprehensive feedback to the learner and the teacher" (Fitzgerald and Fitzgerald 2002:1). An ILS is consisted of three components which are presented in Table 3.4:

Curriculum content:	some of which is computer-based, covering a wide range of content and appropriate to a wide range of abilities.
Student record system:	which maintains information on the performance of individual learner.
Management system:	that records the responses of individual students, decides without or with teacher input the order of presentation of curriculum materials, controls the delivery of the materials and provides feedback to the learner and the teacher.

Table 3.4: Components included in ILS [Compiled from (Baker 1997; Brush 1997; Purcell 2000; Fitzgerald and Fitzgerald 2002; Alotaiby et al. 2005)]

The management system and the student record system are the attributes that makes ILS different from CAI. ILSs extend CAI, since they keep records of students' performance and move them through some levels of difficulty as appropriate (Alotaiby et al. 2005). As presented in Figure 3.1, ILSs are basically networked CAI systems that manage individualised instruction in core curriculum areas (Means et al. 1993), which are often called courseware (Baker 1997; Lefrançois 1997). It is suggested that the management system gives the ILS its power (Purcell 2000), due to the fact that it allows the management of students' registration, the assignment of students' to classes or classrooms, the preparation of reports on students' progress for teachers, and more importantly, the management of students' progress toward intended outcomes or objectives (Kulik 2003). Simultaneously, the constant monitoring of pupils through the management system provides the teachers with access to a lot of data with respect to pupils progress, while it may predict their future performance (Baker 1997), via strong diagnostic-prescriptive analysis systems (Becker 1990).

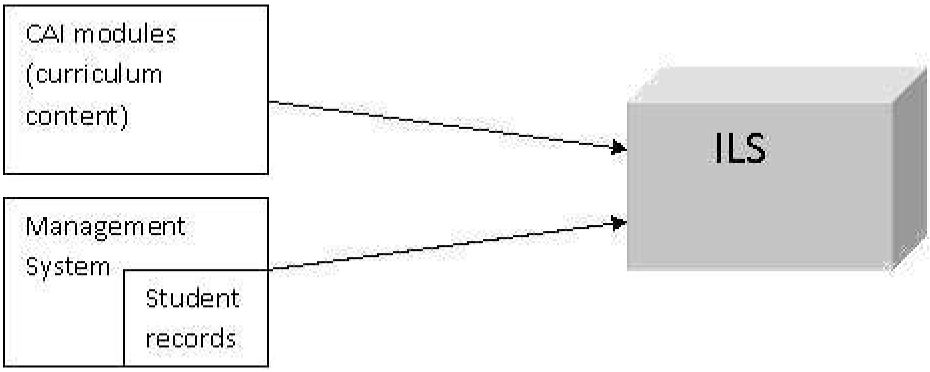

Figure 3.1: ILS components (Baker 1997)

Table 3.5 presents some of the potential benefits and advantages as well as limitations and disadvantages of ILS's use in the classroom.

Potential benefits and advantages	Potential limitations and disadvantages
• The pupils can work individually at their own pace. • It is non-judgemental and gives immediate feedback. • It produces and individually tailored programme of study with reinforcement and repetition as necessary. • extensive diagnostic reports readily available which can provide teachers with useful information for their students.	• the content and the learning sequences included in the ILS are not flexible for changes and additions by teachers or students. • the instruction provided is teacher-dominated, with teachers doing most of the talking and student talk confined or selected by the teachers. • students have little responsibility for selecting goals or deadlines and little chance to explore issues in depth. • students are generally isolated from one another, and are discouraged from sharing information or provide assistance to other students. • the knowledge is presented as mastery of isolated bits of information and discrete skills.

Table 3.5: Potential benefits and limitations of CAI [Compiled from (Means et al. 1993; Brush 1997; Landis 2002; Alotaiby et al. 2005; Jervis and Gkolia 2005)]

Based on these benefits and limitations, the effectiveness of ILSs was thoroughly investigated by many researchers. The results of these researches, as well as meta-analyses of these researches, were similar to those of CAI (Landis 2002). ILSs have shown positive effects on learning (Becker 1990; Fitzgerald and Fitzgerald 2002; Landis 2002; Kulik 2003) and are motivating for the students (Presland and Wishart 2004). Nevertheless, there is a controversy whether the ILSs' effect size is educationally meaningful and significant, so as to be justified that they are more effective and cost-effective than conventional instructional methods (Fitzgerald and Fitzgerald 2002; Kulik 2003).

3.4 Cognitivist approach to learning

Behavioural-oriented researchers tried to explain learning and how it occurs, by merely observing and measuring the overt behaviour of their under examination subjects. In an effort to ensure Psychology's objectivity, they totally excluded from their research the mental processes that are taking place in their subjects' minds. The mind was considered as a 'black box' which was of no concern, since it was not scientifically feasible to justify that the mental processes affect a subject's behaviour (Bargh and Ferguson 2000; Hung 2001). Nevertheless, the behaviourism's inability to explain complex, high order human functioning (Bargh and Ferguson 2000), and its failure to provide adequate explanations of human cognition (Vosniadou 1996), had led to its decadence as the dominant direction in the Psychology field. It is characteristically noted that "if Psychology was going to continue as a science of the mind, it would have to shift focus from observing behaviour to studying mentalistic processes and concepts" (Bush 2006:15). The place of Behaviourism was taken up by Cognitivism, a shift which was characterised as 'the cognitive revolution' (Jonassen 1991; Vosniadou 1996; Hjorland 2002). The 'revolution' concluded by not only acknowledging the mind, but also studying its functions and processes (Jonassen 1991).

In this context, cognitivism can be succinctly described as the scientific study of mental processes (Pritchard 2005), which has as its primary focus the research of the internal processes and structure processes inferred through the observation of behaviour (Ho 2000). From this description, it becomes obvious that cognitivism, and its respective generated learning theories, try to explore the variables that intervene between stimuli and responses (Koliadis 1997; Bush 2006). The cognitive processes that are taking place in an individual's mind involve the development of mental representations of events, things or ideas which can act as the basis of thought. It is noted that "some of these take the form of direct experiences, such as sensations and physical movement, or visual representations which involve imagery" (Long 2000:17). In this way, the individual does not remain a passive recipient of the various external stimuli, rather, he/she receives, processes, and selectively uses the information, generating in this way cognitive structures (Koliadis 1997).

Therefore, a cognitive approach suggests "a more organistic view of the learner" (Jonassen 1991:6). It is stressed that:

> People have the power to influence what they do and to make things happen. They are not just onlooking hosts of brain mechanisms orchestrated by environmental events (Bandura 2001:13).

The emergence of cognitive psychology was not an abrupt event. Many of the ideas incorporated in cognitivism can be found in the work of a number of psychologists and philosophers who lived at a much earlier time (Vosniadou 1996; Winn & Snyder, 2001). The theoretical foundations of cognitivism can be traced back to the work of W. Wundt regarding mentalism at the end of the 19th century, which had resulted in the establishment of 'introspection', as a method of examining the working of the mind (Bargh and Ferguson 2000; Ho 2000; Winn & Snyder, 2001). Moreover, many principles and assumptions of cognitivism were also derived from Gestalt psychology, as well as from the work of other psychologists like E. Tolman and K. Lewin, during the early decades of the 20th century (Child 1997; Koliadis 1997; Ho 2000; Hung 2001).

The technological developments and specifically in the area of computer science have facilitated the emergence of cognitivism. It is suggested that "it is doubtful that the cognitive revolution would have taken place without the invention of the digital computer" (Vosniadou 1996:97), and especially without the development of the 'Artificial Intelligence' in computer sciences (Doolittle 2001; Hung 2001; Hjorland 2002; Bush 2006). The information processing architecture of computers framed much of the early thinking in modern cognitive psychology (Ho 2000). It is argued that "if computers can perform cognitive operations that solves problems, regulative thought could not be denied to humans" (Bandura 2001:2). Based on these, in the context of cognitive psychology the individual is thought as a processor of information, in much the same way that a computer takes in information and follows a programme to produce an output (Long 2000). The mind is considered a manipulator of symbols that interprets stimulus information through various kinds of general information processing strategies to produce cognitive performance (Vosniadou 1996). At the same time, the role of memory is highlighted since it comprises the storage component of learning (Long 2000). Representations and cognitive structures of conceptual and procedural knowledge are acquired and organised in memory so as to be used in both routine and non-routine cognitive activities (Billett 1996).

With respect to learning, cognitive psychologists consider the mind as the agent of learning, and in this way, they believe it was appropriate and necessary to study it from a mentalistic perspective (Jonassen 1991). For cognitivist researchers, learning is viewed as a process of inputs, managed in short-term memory, and coded for long-term use (Siemens 2004). Through their studies, a number of basic assumptions about the ways that people learn emerged, and are summarised in Table 3.6. A number of learning theories have derived from cognitivism. Although these learning theories have differences, they share many of the assumptions presented in Table 3.6.

Cognitive processes influence the nature of what is learned.	People learn new information more easily when they can relate it to something they already know. They learn several pieces of new information more easily when they can relate them to an overall organisational structure.
People are selective about what they process and learn.	People are constantly bombarded with information… People can handle only so much information at a given time, and so they must be selective: They focus on what they think is important and ignore everything else.
Meaning is constructed by the learner, rather than being derived directly from environment.	The process of construction lies at the core of many cognitive theories of leaning: People take many separate pieces of information and use them to create an understanding or interpretation of the world around them.
Prior knowledge and beliefs play a major role in the meaning that people construct.	Most cognitive psychologists believe that existing understandings of the world have a major influence on what and how effectively people can learn from their experiences. Perhaps this is the reason that different students in the same classroom learn different things.
People are actively involved in their own learning.	Cognitive psychologists do not believe that people simply 'absorb' knowledge from their surroundings. Instead, people are, and in fact must be, active participants in their own learning. Cognitive processing and knowledge construction require a certain amount of mental 'work'.

Table 3.6: Cognitive psychology's assumptions about learning [From (Ormrod 2003:191-194)]

3.4.1 Social cognitive approach to learning

Social cognitive theory is a considerable variation of cognitive approach. It can be understood as an alternative or internal movement within the cognitive science (Hjorland 2002; Santrock 2004). Bandura is one of the main architects of social cognitive theory. According to his theory, social and cognitive factors, as well as behaviour, play important roles for learning (Santrock 2004). Figure 3.2 depicts the model of social cognitive theory. It is illustrated that environmental factors (E), cognitive and personal factors (CP), and behaviour (B), are reciprocally interacting and influencing each other (Compeau and Higgins 1995; Money 1995; Santrock 2004). In this sense, individual cognition is approached from the social context, not from the isolated mind or brain (Hjorland 2002).

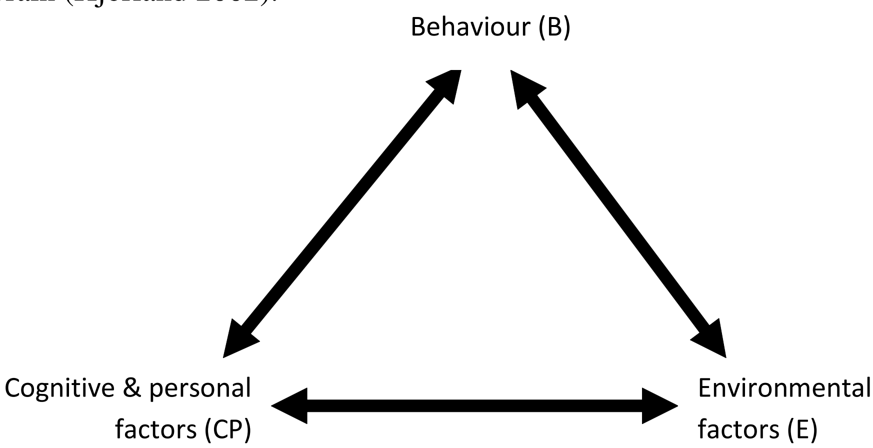

Figure 3.2: Model of social cognitive theory

In the context of this theory, ‘observational learning’ or ‘learning through imitation’ was developed which is based on the principle that much human learning is a function of observing and imitating the behaviour of others who are functioning as models (Lefrançois 1997). An individual compiles various pieces of information through multiple social interactions, with multiple models, so as to generate new forms of behaviour (Koliadis 1997; Raptis and Rapti 2001). It is also believed that when a student observes a behaviour but makes no observable response, he/she may still have acquired the modelled response in cognitive form (Santrock 2004). Table 3.7 shows the processes that are involved in observational learning as they are derived from Bandura’s theory:

Attention	Before students can imitate a model's actions, they must attend to what the model is doing or saying. Attention to the model is influenced by a host of characteristics. Students are more likely to be attentive to high-status models than to low-status models.
Retention	To reproduce a model's actions, students must code the information and keep it in memory so that it can be retrieved. A simple verbal description or a vivid image of what the model did assists students' retention.
Production	Children might attend to a model and code in memory what they have seen but, because of limitations in their motor ability, not be able to reproduce the model's behaviour. Teaching, coaching, and practice can help children improve their motor performances.
Motivation	Often children attend to what a model says or does, retain the information in memory and possess the motor skills to perform the action, but are not motivated to perform the modelled behaviour.

Table 3.7: Processes involved in observational learning [From (Santrock 2004:228-229)]

Another significant concept which has resulted from social cognitive theory, as well as from observational learning, is 'self-efficacy'. Self-efficacy represents one of the personal and cognitive factors (Santrock 2004), which are included in the model of social cognitive theory (Figure 3.2). Self-efficacy refers to judgements we make about how effective we are in given situations (Lefrançois 1997). This can be both helpful and hindering, since, the stronger the perceived self-efficacy, the higher the goals individuals may set for themselves and the firmer the commitment to those goals (Money 1995). Consequently, students with high self-efficacy tend to adopt better quality learning strategies and are more efficient in self-monitoring of their learning outcomes (Zimmerman 1989). In the context of social cognitive learning, the concept of self-efficacy is boldly highlighted and placed in central a position, since it powerfully influences the behaviour (Money 1995; Lefrançois 1997). It is noted that it "influences choices about which behaviours to undertake, the effort and persistence exerted in the face of obstacles to the performance of those behaviours, and thus, ultimately, the mastery of the behaviours" (Compeau and Higgins 1995:191).

3.4.2 Critical views on the cognitivist approach to learning

Despite the widely acknowledged fact that 'cognitive revolution' has produced enormous advances with respect to the overall understanding of learning and instruction (Vosniadou 1996), there are opposite viewpoints and perspectives. On a first consideration, a cognitive approach is seen no more than an "advancement over the behavioural perspective in that it included consideration of the learner… by taking into account external influences in combination with internal influences to determine behaviour" (Rabinowitz and Shaw 2005:50). In this sense, cognitivism has not provided a convincing paradigm shift for instructional methodologies and learning processes, since many behaviouristic assumptions continued to played significant role in educational settings (Jonassen 1991).

Moreover, the advances in instruction and learning caused by cognitive psychology were not due to its original epistemology and its implicit theory of learning, but because of its methodology (Vosniadou 1996). This is due to the fact that cognitivist epistemology is based on the same philosophical foundations as behaviourism (Jonassen 1991; Anderson et al. 1999; Bargh and Ferguson 2000). Namely, just like behaviourism, cognitive psychology is based on objectivism. This means that cognitive psychologists consider that the role of mental processes is to represent the 'real' world and a socially accepted reality (Jonassen 1991; Dalgarno 2001), while knowledge can be transferred from the outside of the mind into the inside of the mind (Ho 2000; Tam 2000). Finally, both behaviourism and cognitivism attempt to simplify knowledge by decomposing and decontextualising it, in an effort to improve the efficiency of their applied instructional approaches (Jonassen 1991; Anderson et al. 1999; Bargh and Ferguson 2000; Jonassen et al. 2003). Therefore, the instructional approaches in the classroom remained teacher-centred and their aim was to transmit knowledge to the novice learners who must acquire the objective reality (Jonassen 1991; Ho 2000; Doolittle 2001; Hung 2001).

3.4.3 ICT use and cognitivism

Essentially, the cognitive revolution affected technology's use in classroom instruction. It was suggested that:

> as the role of cognitive theory in educational technology has enlarged, there has been less emphasis on the behavioural manifestations of learning and more emphasis on the mental skills involved in learning. The mental processes engaged in by learners while using

> technologies are more important than the technology used or any attributes of that technology in determining what is learned (Jonassen 1985:31).

In this sense, technology-mediated instruction and instructional material is developed in such a way, to help students practice their mental skills which are employed during the learning process (Jonassen 1985). At the same time, they should promote the development of learning strategies by the learners so as to become capable in organising, integrating, storing, and retrieving information in and from their memory (Jonassen 1985; Hung 2001).

An applied example of cognitive theory in educational technology is the Intelligent Tutoring Systems (ITS). An ITS can be described as "a programme that takes into account the learner's strengths and weaknesses and modifies its offerings accordingly – very much as a good teacher does" (Lefrançois 1997:441). Namely, these computer-based instructional systems are consistent with the cognitivist view that the instruction should be dependent on the learner's current cognitive state (Dalgarno 1996; 2001), by making inferences about a student's mastery of topics or tasks in order to dynamically adapt the content or style of instruction (Murray 1999; Snowman and Biehler 2003). Simultaneously, they allow 'mixed-initiative' tutorial interactions, where students can ask questions and have more control over their learning (Murray 1999).

ITSs mainly consist of an instructional content model, which is a database that specifies what to teach (Figure 3.3, Domain expert). They also include a student model (Figure 3.3) which is a data structure, representing characteristics of a student and his/her problem-solving performance. Finally, they incorporate teaching strategies (Figure 3.3, Tutor), that specify how to teach a specific subject content (Murray 1999; Self 1999), using Artificial Intelligence techniques to dynamically generate a sequence of instruction to suit the needs of the learner (Dalgarno 2001). The system tries to determine what a student knows (or needs to know), by analysing his/her interactions with the system, and by his/her given answers and problem solving abilities. Then, it draws from its databases experiences and instructions that will be most effective for the particular instance (Lefrançois 1997). Figure 3.3 presents the structure of an ITS:

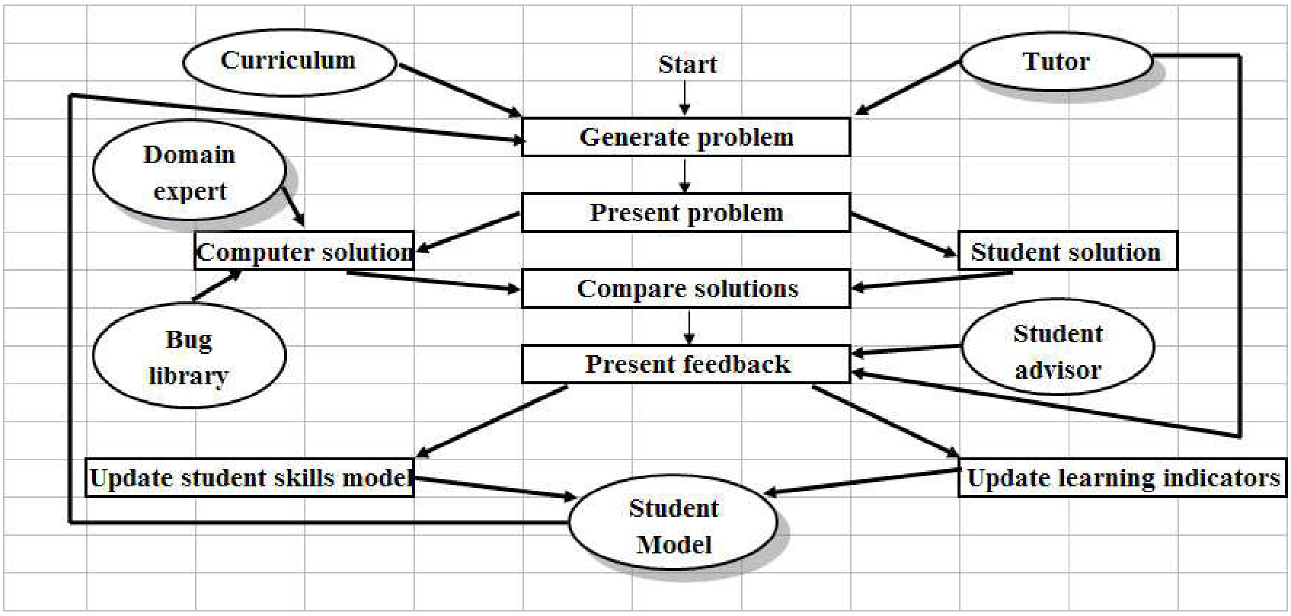

Figure 3.3: Structure of an ITS. Boxes = programme decisions & actions; Ellipses = programme knowledge bases; Shaded ellipses = core ITS components [From (Shute & Psotka, 2001:575)]

It is admitted that ITSs can be quite successful. Their use in the classroom can produce significant learning gains, while they can engage most students' attention and interest for hours (Graesser et al. 2001). However, the role of technology in the ITS approach is not so different from the role that it assumes within the CAI paradigm. Both CAI and ITS serve instruction by posing problems and by providing feedback to the learner (Koschmann 1996). Just like CAI, ITS approach considers knowledge as given and it is assumed that there is a single correct representation of a given body of knowledge (Koschmann 1996; Dalgarno 2001). Finally, the instructional method entailed in ITS is transmissive, while teaching is thought as merely delivery of prescribed content, and the teacher is the final authority in the learning process (Koschmann 1996).

3.5 Constructivist approach to learning

It must be firstly underscored that 'constructivism' is included in the broader field of a cognitive perspective to learning (Chen 2003; Snowman and Biehler 2003; Pritchard 2004; Pritchard 2005; Bush 2006), since it shares with cognitivism many of the assumptions presented in Table 3.6. Nonetheless, it is usually considered as a separate epistemology in educational psychology, because it is based on a different philosophical paradigm. A constructivist philosophical paradigm is contrasted to the philosophical paradigm of objectivism, on which behaviourism and cognitivism are based. Table 3.8, presents the contrasting assumptions inherent in objectivism and constructivism:

	Objectivism	Constructivism
The real world…	has entities that can be categorised on the basis of their properties and relations.	is structured by our individual minds on the basis of our interactions (this limits what we can know about the real world).
Reality is…	fully and explicitly structured in a way that is shared by all who perceived it. Because of this commonality, reality can be modelled and shared with others.	local (personal) to ourselves in a universe of multiple realities. Our realities are modelled by the way in which we personally construct them.
Symbols are…	representations of reality, and are only meaningful to the degree they correspond to reality.	products of culture that are used to construct reality.
The human mind…	processes abstract symbols and fashions them so that they mirror nature.	perceives and interprets the world by creating symbols.
Human thought is…	symbol-manipulation and is independent of the human organism.	is imaginative, and develops out of perception, sensory experiences, social interaction.
Meaning…	exists objectively and independently of the human mind – and is external to the knower.	is a construction that is the end result of an interpretive process that depends on the experience and understanding of the knower.

Table 3.8: Assumptions inherent in objectivism and constructivism [From (Cronje 2006:390)]

Table 3.8 indicates that constructivism clearly represents a shift from a view in which truth is a given, to a view in which truth is constructed by the individual. Consequently, this shift also entails a fundamental change in all aspects of the teaching and learning processes (Alesandrini & Larson, Tam 2000; 2004).

In general, although the term constructivism has come to serve as an umbrella term for a wide diversity of views (Duffy & Cunningham, 2001), they all share the same core assumption that learners construct their own knowledge (Lefrançois 1997; Snowman and Biehler 2003; Boghossian 2006). They construct and create their own knowledge from the interaction between their existing knowledge or beliefs, and the new ideas or situations they encounter (Airasian and Walsh 1997; Marlowe and Page 2005). In this sense, when learners face a new situation, they attempt to 'meld' incoming information with their existing understandings, skills, and current structure of knowledge (Pritchard 2005; Straits and Wilke 2007). Therefore, learners are not considered 'empty vessels' to be filled with ready-made knowledge (Siemens 2004; Marlowe and Page 2005). Rather, they are 'knowing beings' who bring previous knowledge and experience to any learning event (Handal and Herrington 2003), while they are active participants in the learning process, by seeking to find meaning in their experiences (Boghossian 2006). Knowledge construction is thought as a natural process, since humans' natural inclination is to attempt to reconcile new information with their pre-existing knowledge so as to understand it (Brooks and Brooks 2001; Jonassen et al. 2003). Additionally, learners not only actively construct the knowledge acquired, but also the strategies used to acquire it (Child 1997).

One of the earliest proponents of constructivism, whose influential work has greatly contributed to the formation of the basis of the constructivist movement, is Jean Piaget (Rice and Wilson 1999; Brooks and Brooks 2001; Marlowe and Page 2005; Pritchard 2005). His substantial body of research led him to conclude that the growth of knowledge is the result of individual constructions intrinsically made by the learners (Brooks and Brooks 2001; Snowman and Biehler 2003). Piaget viewed the mind as a dynamic set of cognitive structures (schemas) that are used to help humans make sense of what they perceive. These structures grow in intellectual complexity along with maturation, through interactions with the world, gained experiences, and new information (Long 2000; Brooks and Brooks 2001). Table 3.9 shows the processes that according to Piaget are responsible for how individuals use and adapt their schemas and therefore learn and expand their existing knowledge bases:

Assimilation	Accommodation	Equilibration
The process whereby new knowledge is incorporated into existing mental structures. The knowledge bank is increased to include new information.	The process whereby mental structures have to be altered in order to cope with the new experience which has contradicted the existing model.	The process of arriving at a stable state where there is no longer a conflict between new and existing knowledge.

Table 3.9: Processes included in Piaget's model of learning [From (Pritchard 2005:25)]

More specifically, when a person interacts with the environment, he/she assimilates complementary components of the external world into his/her existing cognitive structures (Long 2000; Marlowe and Page 2005). According to Paget's theory, when new information is not consistent with the existing cognitive structures, a situation called disequilibrium is caused. In order to resolve the conflict between the existing and new information (Pritchard 2005), the individual will have to alter those structures to accommodate the new information (Marlowe and Page 2005). Eventually, the conflict is resolved and a cognitive balance or equilibrium is achieved (Brooks and Brooks 2001; Santrock 2004).

3.5.1 Teaching and learning within the constructivism epistemology

Applying constructivism in education essentially presupposes a radical shift from traditional teaching practices. In the context of constructivism epistemology, knowledge cannot be instructed, and therefore transmitted by a teacher, since it only can be constructed by the learner (Larochelle et al. 1998; Anderson et al. 1999). In this way, teaching is not a process of presenting and transmitting information that takes place through the teacher's explanations. Nor is it a process that aims to transfer information and ready-made knowledge from the mouth of teacher to the pupil's mind, "like the transfer of electrical current from one end of the wire to the other" (Al-Weher 2004:170). Rather, the focus of teaching should be the guidance of the learners to build and modify their existing mental models (Dalgarno 2001). It is noted that constructivism incorporates two premises with respect to instruction: (a) instruction must take as its starting point the knowledge, attitudes, and interests students bring to the learning situation, and (b) instruction must be designed to provide experiences that effectively interact with these characteristics of students so that they may construct their own understanding (Howe & Berv, 2000).

Therefore, teachers should focus their efforts on the development of learning environments, activities, and methods (Tam 2000; Brooks and Brooks 2001; Richardson 2003), which are not based on information transmission, but on suitable conditions that allow the student to actively be involved in the learning process (Snowman and Biehler 2003; Al-Weher 2004; Marlowe and Page 2005). The emphasis should be on learners' activity rather than on the teaching instruction (Dalgarno 2001). Consequently, the active participation by all students will ensure that each one of them have a say in what they are learning, and their different learning styles will be catered for (Dalgarno 2001; Karagiorgi and Symeou 2005). Finally, it must be noted that constructivism does not relieve the teacher of the responsibility to teach (Marlowe and Page 2005; Semenov 2005). Contrarily, it expands the definition of teaching by calling upon the teacher to design experiences that encourage and enable learning by all students (Lattuca 2006).

Furthermore, the assessment process within a constructivist framework is clearly differentiated from the traditional assessment methods -, while there are obvious trends for alternative assessment methods (Chen 2003, Santrock 2004). For constructivists, traditional assessment is distinct and separate form learning, and is considered to be a process that follows students learning (Marlowe and Page 2005). The distinction between teaching and assessment is viewed as unnecessary and counterproductive (Brooks and Brooks 2001). Traditional assessment techniques, like pencil-and-paper tests, are structured to determined whether students know information related to a particular body of knowledge (Brooks and Brooks 2001). Nevertheless, as important as information is, receiving it does not necessarily equal learning (Marlowe and Page 2005). Furthermore, traditional assessment is structured around judgemental feedback, which compels students to alter their thinking in an effort to predict the answer the teacher wants, and not because of some internal realisation. This sort of feedback makes students teacher-dependent (Brooks and Brooks 2001).

Alternatively, constructivists consider assessment as a tool in service to the learner, and requires teachers to rethink the dynamic relationship between teaching and assessment (Brooks and Brooks 2001). For constructivists, students' demonstration of knowledge acquisition and their learning products are only part of the assessment, since the learning process ought to be assessed as well (Anderson et al. 1999; Chen 2003). In constructivist classrooms assessment occurs simultaneously with the learning process (Marlowe and Page 2005), and in contexts that are as rich and complex as those used in instruction (Chen 2003). Assessment through teaching and during the learning process can be more informative with respect to students' learning than tests and externally developed assessment tasks (Brooks and Brooks 2001). In this sense, assessment must be authentic, which means “evaluating a student’s knowledge or skill in a context that approximate the real world or real life as closely as possible” (Santrock 2004:536).

Nevertheless, in many cases, constructivism is misunderstood to be a teaching method, a technique, or an instructional approach that should be learned and followed by teachers (Airasian and Walsh 1997; Larochelle et al. 1998; McDonough 2001; Jonassen 2006; Straits and Wilke 2007). This is not the case, since constructivism is an epistemology, a philosophical explanation about the nature of knowledge, as well as a theory about learning (Airasian and Walsh 1997; McDonough 2001; Richardson 2003; Marlowe and Page 2005; Lattuca 2006). Therefore, it is argued that “although there is general agreement on the basic tenets of constructivism, the consequences for teaching and learning are not clear cut” (Dalgarno 2001:184). It is also recognised that the application of constructivism in classrooms is neither widespread nor systemic (Bonk and king 1998; Richardson 2003; Marlowe and Page 2005), since “there is a difference between an epistemology of learning and a well-thought-out and manageable instructional approach for implementing it” (Airasian and Walsh 1997:65). There are only suggestions for methods that are likely to foster student construction of knowledge (Airasian and Walsh 1997). However, it is suggested that “there are numerous reports that empirically validate the ability of innovations based on a constructivist epistemology” (Jonassen 2006:43). This is quite encouraging, if it is taken into account that “very little of the knowledge that learners construct can be predicted by any model of instruction or theory of learning” (Jonassen 2006:44).

3.5.2 Teachers’ and students’ redefined roles

A teacher-dominated instructional system in which ‘teacher-telling’ and ‘student-listening’ is the main approach, is rejected by constructivism epistemology (Marlowe and Page 2005). Altering the traditional classroom practices toward constructivist approaches demands the redefinition of teachers’ and students’ traditional roles (Winn 1993; Airasian and Walsh 1997; Zhu, 1998). On the one hand, constructivism challenges teachers to provide teaching techniques that support students' construction of their understanding, and on the other hand, it places the learner in centred of the learning process (Chen 2003).

More analytically, it is pointed out that:

> Traditionally, teachers' primary responsibility and activity have been directly instructing students, where teachers were the purveyors of knowledge and students the recipients. That is, the teacher told the students what they knew and how they interpreted the world according to the curriculum, textbooks, and other resources they have studied. Teachers were hired and rewarded for their content expertise (Jonassen et al. 2003:13).

On the contrary, constructivism replaces the teacher as the centre of knowledge with the learner (Boghossian 2006). Constructivism reminds teachers that knowledge is constructed by the learners, therefore, when imposing their thoughts to their students they rob them of the opportunity to create knowledge and understanding themselves (Brooks 1990). In this sense, constructivist teachers tend to think of themselves as the 'guide on the side' rather than the 'sage on the stage' (Zhu, 1998; Lattuca 2006). They assume themselves as facilitators for the learning process, who coach their students as they try to construct their own knowledge and understanding, and to set their own personally meaningful goals (Winn 1993; Tam 2000; Al-Weher 2004; Alesandrini, 2004). More analytically, the tasks that a teacher performs when acting as a facilitator are illustrated in Figure 3.4:

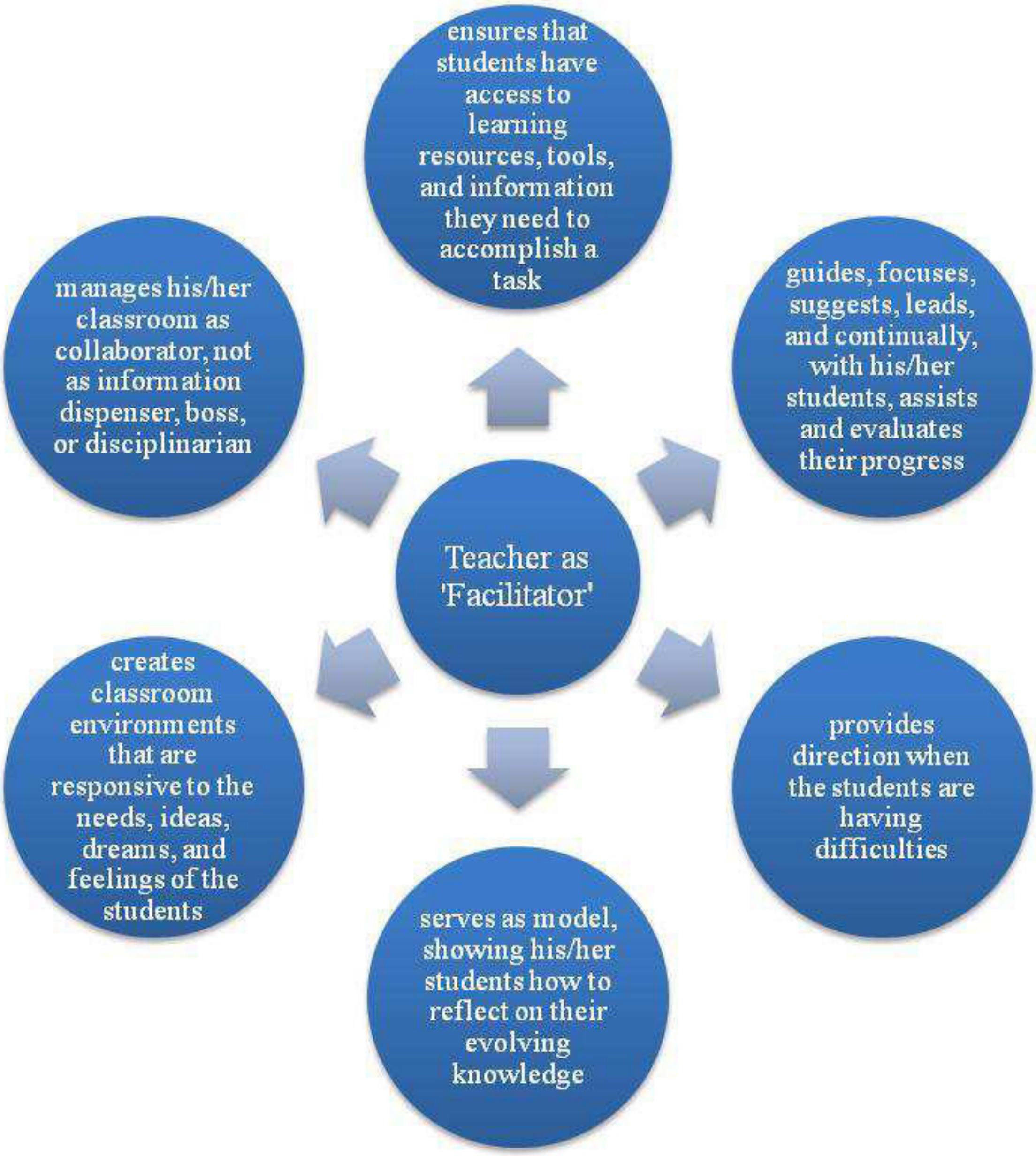

Figure 3.4: Teacher as a 'facilitator' tasks [Compiled from (Oldfather et al. 1999; Tam 2000; Marlowe and Page 2005; Lattuca 2006)]

At the same time, the students' role, as passive recipients of information who merely memorise the content and repeat it on tests and assignments (Chen 2003), is rejected within the constructivist framework. For constructivism, students direct and control their own learning (Marlowe and Page 2005), while they are permitted to assume responsibility for their learning, and are encouraged for self-initiated inquiry (Brooks and Brooks 2001). Consequently, they are prompted to actively participate in their learning, either through discussion, or through the design and implementation of projects, which enables them to become active, independent, and autonomous learners (Brooks and Brooks 2001; Al-Weher 2004). Simultaneously, they are responsible for defending, proving, justifying, and communicating their ideas to the classroom (Chen 2003), while they are permitted the freedom to think, to question, to reflect, and to interact with ideas and objects so as to construct meaning. Students also need to understand that they have the right of being wrong without negative consequences, since being wrong is often the first step in the path to greater understanding (Brooks and Brooks 1999).

Furthermore, in a constructivist classroom, the student/teacher system is a reciprocal one. That is, both student and teachers initiate classroom dialogue and raise questions, while teachers respect the students' abilities to start or add to a discussion and to ask productive questions. Also, teachers and students are considered to be senders and receivers of information. There are constant clarifications, interpretations, and re-creations of messages (Marlowe and Page 2005). All these elements contribute to the creation of a productive, non-threatening classroom environment or culture (Al-Weher 2004). Classroom culture can be described as "a set of taken-as-shared understandings regarding roles, rules, relationships, and notions of authority" (Oldfather et al. 1999:13). Teachers are the key to the establishment and maintenance of classroom culture, while students develop a sense of their active roles as producers, and not only consumers of knowledge. The responsibility of making rules, which was traditionally belonged to teachers, is rejected, since in constructivist classrooms, this process is a part of the general atmosphere of mutual respect. Therefore, it is acknowledged that allowing students to have a voice in developing classroom rules could have many benefits for them (DeVries & Zan, 2004).

3.5.3 Social constructivism

It is noted that "like most intellectual movements, constructivism is both diverse and moving" (Bredo, 2000:128). Hence, within constructivist theory there are different interpretations of the basic ideas of the construction of knowledge and understanding (Pritchard 2005), indicating that there are many different types or versions of constructivism (Palincsar 1998; Boghossian 2006). Within the broad spectrum of constructivist variations there is a considerable approach which underpins the importance of human communities in the construction of knowledge (Au

1998). The particular constructivist approach is known as social constructivism, and holds that "meaningful learning occurs when people are explicitly taught how to use the psychological tools of their culture (like language, mathematics, diagrams, and approaches to problem solving) and are then given the opportunity to use these tools to create common, or shared, understanding of some phenomenon" (Snowman and Biehler 2003:304). In this context, it is obvious that the proponents of social constructivism do not support the notion that the locus of knowledge is in the individual (Palincsar 1998), since they believe that exclusively focusing on individual construction of knowledge is inadequate (Karagiorgi and Symeou 2005). Rather, they believe that learning is constructed through interactions with others, and that is taking place within a specific socio-cultural context (Oldfather et al. 1999).

The development of social constructivist approach to learning was greatly influenced by the writings of the psychologist L. Vygotsky (Au 1998; Oldfather et al. 1999; Snowman and Biehler 2003; Pritchard 2005). Vygotsky, like Piaget, believed that children actively construct their knowledge, however, he emphasised that this is done through social interactions with others, and that the content of this knowledge, as well as the children's cognitive development, are influenced by the culture in which they live (Rice and Wilson 1999; Long 2000; Santrock 2004). Moreover, Vygotsky regarded language to be a key feature of children's intellectual development, since it is the 'vehicle' by which ideas are considered, shared and developed (Long 2000; Pritchard 2005). The dialogue and cooperation between peers, as well as between more knowledgeable individuals, can be very valuable for the intellectual development (Pritchard 2005). The support by more knowledgeable individuals, enables children to function in an area he named the Zone of Proximal Development (ZPD). Figure 3.5 depicts Vygotsky's ZPD:

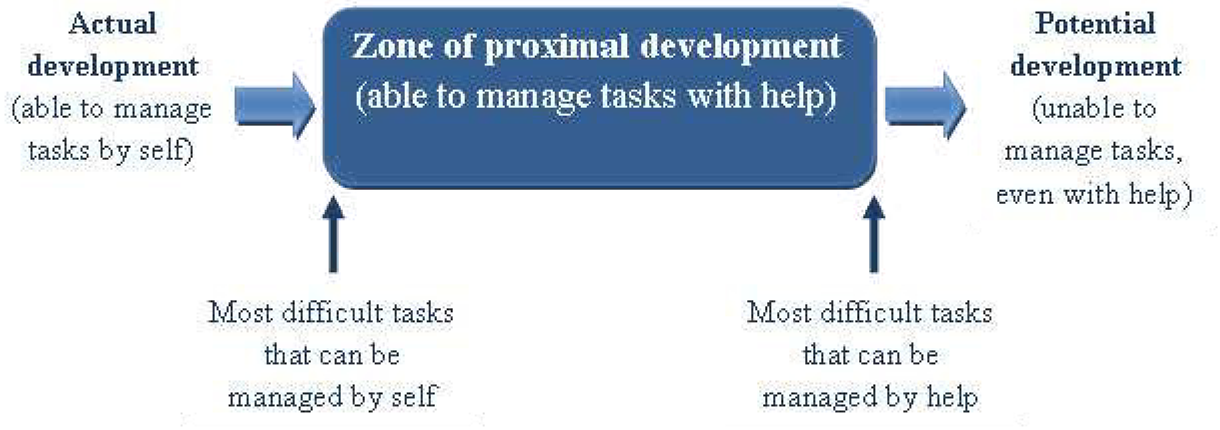

Figure 3.5: Zone of Proximal Development [From (Long 2000:36)]

It is noted that "ZPD is Vygotsky's term for the range of tasks that are too difficult for children to master alone but that can be learned with guidance and assistance from adults or more-skilled children" (Santrock 2004:51). Thus, the process of learning, which is in a way related to the child's cognitive and social development (Palincsar 1998; Rice and Wilson 1999), involves moving into and across the ZPD and looking forward to the next level of understanding, which will involve a similar journey through a newly created zone (Pritchard 2005).

The process by which children can be taught within the ZPD is similar to the process of 'scaffolding' (Long 2000). Scaffolding is a technique for changing the level of support to students, and it is closely linked with Vygotsky's idea of ZPD (Santrock 2004). As the word 'scaffolding' suggests in a metaphorical way, the student is provided support either by a teacher or other peers when needed to successfully complete a task. The given support (scaffolding) is adjusted and gradually removed as soon as the student can work independently to complete the task, and construct his/her own understanding (Long 2000; Daniels 2004; Santrock 2004). It is argued that "researchers have found that when scaffolding is used by teachers and peers in collaborative learning, students' learning benefits" (Santrock 2004:317). Scaffolding can be presented in many ways, such as through discussion, through the provision of materials, or by designing tasks which match and give help appropriate to the individual (Pritchard 2005).

Furthermore, Vygotsky's theory has stimulated considerable interest in the view that knowledge is situated and collaborative, which is now regarded as an important assumption of the social constructivist approaches (Santrock 2004). Vygotsky's theory underscores that humans' "thinking processes are deeply rooted in cultural activity" (Harley 1993:47). The term 'situated learning' refers to the idea that all learning takes place (is situated) in social and physical contexts, and not necessarily within an individual's mind (Santrock 2004; Pritchard 2005). Since knowledge is distributed among people and environments, knowing can be best advanced through interaction with others in cooperative activities (Santrock 2004). At the same time, it is suggested that learning will be meaningful only if it is embedded (situated) in the social and physical context within it will be used (Herrington and Oliver 1995). Therefore, meaningful situated learning occurs when students work on 'authentic tasks' whose execution takes place in a 'real-world' setting, and not when students are taught decontextualised knowledge and skills (Winn 1993; Karagiorgi and Symeou 2005).

Consequently, the teacher ought to create learning environments which will provide: authentic context that reflects the way the knowledge will be used in real-life; authentic activities; access to expert performances and the modelling of processes; multiple roles and perspectives; collaborative construction of knowledge; coaching and scaffolding at critical times; opportunities for reflection to enable abstractions to be formed; opportunities for articulation to enable tacit knowledge to be made explicit; and opportunities for integrated assessment of learning within the tasks (Herrington and Oliver 1995). In these environments, students are encouraged to engage in open-ended discussions with peers and teacher "about such things as the meaning of terms and procedures, the relationships among ideas, and the applicability of knowledge to specific contexts" (Snowman and Biehler 2003:305). Simultaneously, narrow curricular goals are excluded from these learning situations, in which the broad objective is to promote students' self-knowledge, development of their identities, and the belief that they can make a difference in the world (Oldfather et al. 1999).

3.5.4 ICT use and constructivism

Technology use within the behaviouristic, as well as the cognitivist pedagogical paradigm, was conceived as an attempt to imitate, and in some cases to replace, the teacher. Also, technology-enhanced learning was developed around the transmission and retention of information through taught knowledge and skills (Young 2003). Technology employment intended to directly teach students, assuming that they would learn the knowledge embedded in the various technological means (Montgomery and Whiting 2000). It is characteristically noted that:

> Educators have almost tried to use technologies to teach students in the same way that teachers had always taught. So information was embedded in the technology (e.g., the context presented by films and TV programmes or the teaching sequence in programmed instruction), and the technology presented that information to the student. The students' role was to learn the information presented by the technology, just as they learned information presented by teacher (Jonassen et al. 2003:10).

Nevertheless, it is indicated that simply using technology to achieve the same traditional objectives is counterproductive, meaningless, and unworthy to bother with (Marlowe and Page 2005). In the same context, it is suggested that the media which are only used as vehicles that deliver instruction "do not influence the student achievement any more than the track that delivers our groceries causes changes in our nutrition" (Clark 1983:445).

Within the constructivist framework of learning, the narrow notion that technology presents and represents information (Snowman and Biehler 2003) is rejected. Similarly, using the various technological media as conveyors of information, communicators of knowledge, or tutors for students (Jonassen 1995; Jonassen et al. 1998; Jonassen 2001), are considered to be meaningless. Based on these, constructivism's supporters suggest that the ways in which technologies are applied in schools must be changed from 'technology-as-teacher' to 'technology-as-partner' in the learning process. Students do not learn from technology nor can they be taught directly by technology. Rather, students ought to learn from thinking and to use technology to teach themselves and others (Jonassen et al. 2003). These theoretical viewpoints can become applied practice, if the various technological means are used by the classroom teachers as cognitive tools that extend their power to create rich learning environments (Earle, 2004). More importantly, these cognitive tools should be used by students as intellectual partners that enable and facilitate the development of critical thinking and high-order learning. They should also be used by students to help them organise, restructure, and represent what they know (Jonassen & Reeves, 2001; Jonassen et al. 1998; Liu and Bera 2005).

Cognitive tools, which are often mentioned in the respective literature as 'mindtools' (Jonassen et al. 1998; Snowman and Biehler 2003; Willis and Miertschin 2005), are referred to "technologies, tangible or intangible, that enhance the cognitive power of human beings during thinking, problem solving, and learning" (Jonassen & Reeves, 2001:693). There are many technologies which can be used as cognitive tools and to support and complement the constructivist classroom (Marlowe and Page 2005). Databases, semantic networks (concept mapping programmes), spreadsheets, expert systems, microworlds, search engines, visualisation tools, hypermedia, and computer conferencing (Snowman and Biehler 2003), are a few of the available tools which can be exploited. All these tools can help students learn with technology, and not from technology which was proven to be ineffective (Jonassen et al. 2003; Snowman and Biehler 2003). If they are not exclusively used by teachers just to traditionally instruct students and deliver curriculum content, they can help students analyse the world, access information, interpret and organise their personal knowledge, as well as present what they know to others (Jonassen 2001).

Based on these, it is underscored that cognitive tools need to be placed in the students' hands (Duffy & Cunningham, 2001). If cognitive tools are used by the students in the context of student-centred approaches to learning, they can redefine both the experiences available to them and the processes required to engage them (Land and Hannafin 1997). Contrarily, if they are used to support only teacher-controlled or curriculum-driven tasks, they are less likely to be effective (Jonassen & Reeves, 2001). Well designed cognitive tools, which are used in constructivist learning environments, could have the following attributes: represent knowledge; engage learners in critical thinking about the subject; assist learners to acquire skills that are generalisable and transferrable to other contexts; are simple but powerful in encouraging deeper thinking and processing of information; and, are relatively simple to use (Willis and Miertschin 2005). However, an attribute that cognitive tools do not have, from the constructivist point of view, is intelligence. They are unintelligent tools relying on the learners to provide the intelligence. Planning, decision making, and self-regulation are responsibilities of the learner, and cognitive tools can facilitate these skills (Jonassen & Reeves, 2001; Jonassen 1995; Jonassen et al. 1998). It is argued that "tools do not inherently enhance cognitive activity or skills in particular ways, rather, they provide a means through which thinking can be enhanced, augmented, and/or extended" (Hannafin 1994:49). They cannot directly cause thinking, just as they cannot directly cause learning (Montgomery and Whiting 2000).

Although teachers should let students exploit the various cognitive tools in order to construct their own understandings and learning, they have a significant role to carry out. It is noted that teachers should acquire the role of 'pedagogical engineers' (Hung 2001), who use the capabilities of technology to set up learning environments, consisted with the constructivist assumptions, in which complex concepts can be represented, manipulated, and explored (Land 2000). In such learning environments, cognitive tools are essential components (Jonassen & Reeves, 2001), and should be readily available to students in order to stimulate them to make maximum use of their own cognitive potentials (Tam 2000). Therefore, it is stressed that these technology-enhanced, student-centred learning environments:

> organise interrelated learning themes into meaningful contexts, often in the form of a problem to be solved or an orienting goal, that bind functionally their features and activities. They provide interactive, complimentary activities that enable students to address unique learning interests and needs, study multiple levels of complexity, and deepen understanding. They establish conditions that enrich thinking and learning, and use technology to enable flexible methods through which the process can be supported (Hannafin and Land 1997:168).

It must be noted however, that it is relatively easy to 'place' technology in physical locations, and to equip a classroom, as a learning environment, with all of kinds of technological tools. Nonetheless, focusing exclusively upon technology, without taking into account the teaching and learning processes, will result in repeating mistakes of past with respect to other technological innovations (Earle, 2004; Rice and Wilson 1999). It is stressed that, "cognitive tools could become another casualty in the difficult struggle to improve teaching and learning" (Jonassen & Reeves, 2001:695). The focus, in the constructivist, technology-enhanced learning environments, is not on the equipment to be used, rather, is on how that equipment is used so as to facilitate the students (Strommen and Lincoln 1992). Cognitive tools should be thought as 'chameleon-like' tools which can be used with any content and learning situation, and not merely as add-on media (Strommen and Lincoln 1992). At the same time, their role in these environments is not to make learning fun and easy. Instead, their role is to activate complex cognitive learning strategies and critical thinking (Jonassen & Reeves, 2001; Jonassen et al. 1998).

Furthermore, telecommunication technologies, like the Internet, computer networks, and e-mail, could create new visions about learning (Herring 2004). Technologies like these, are tools which provide students with opportunities to engage in collaborative learning, to reach outside the classroom to include the real world and the entire world, and to communicate with people in locations that otherwise would be inaccessible to them (Santrock 2004). Simultaneously, these tools can easily lend themselves to constructivist principles because they can allow students conduct research, to discuss issues collaboratively with peers and others all over the world, and they can allow the creation of more diversified and socially rich learning contexts (Rice and Wilson 1999; Tam 2000). Moreover, these tools can embed learning in real-world contexts (Snowman and Biehler 2003), in which students can learn by socially negotiating the meaning of various issues (Jonassen et al. 1998), while the opportunities they offer for collaboration can help them evaluate multiple perspectives and engage in more authentic activities (Duffy & Cunningham, 2001).

It is argued that “despite the plausibility of a link between educational technology and constructivism, however, vision statements outnumbered practical implementations and far outnumbered empirical validations” (Cobb 1999). This is due to the fact that constructivists’ theorists have not provided practicing teachers with the practical means to reconstitute and embed constructivist ideas within their personal philosophies and teaching practices (Bonk & Cunningham, 1998). Using technologies as constructivist tools assumes that teachers’ conceptions of education ought to be alter (Jonassen et al. 2003). As already noted, teachers need to confront their established beliefs about instruction as well as the roles they exercise in the classroom (Cauleyet al. 2004). They need to understand that technology should not be merely integrated into the curriculum or represent a merging of something new with something old. They need to understand that technology in constructivist learning environments means an entirely new state of affairs (Rice and Wilson 1999). For these reasons, it is stressed that teachers’ technology training results in failure when it is only focused on how to use computers (Earle, 2004). The forest is being missed for the trees, when teachers’ training does not also aim to alter their pedagogical beliefs, which will eventually help them embed the various technological tools in the learning environments they create for the students.

3.6 Summary

In the context of this chapter three major learning theories were discussed. It was examined how they support and inform the different ways in which ICT can be used in the classroom to underpin the teaching and learning processes.

The first two approaches regarded behaviourism and cognitivism, which support teacher-centred, curriculum-driven, and strictly structured, instructional practices. For behaviourism learners are merely passive recipients of information, while for cognitivism learning is though as a process of information processing. Technology use within these approaches is developed around these notions, so the diverse technological applications (like CAI, ILS and ITS), aim at replacing the teacher and offering ready-made knowledge embedded in the various technological means.

The third and more contemporary theory discussed was constructivism. This theory represents a shift from the assumption that reality is nonnegotiable, and based on this, it is argued that learners construct their own knowledge depending on their pre-existing cognitive structures and experiences. Constructivism rejects the notion that ICT can teach students; rather, it is supported that students can learn with it.

The second part of the literature review (Chapter 4) will concern issues about the successful integration of ICT in the everyday learning process. This will include the factors that affect teachers' successful integration of ICT in their teaching practices.

Chapter 4: Teachers' use of ICT and the influential factors

4.1 Introduction

In the previous chapter it was explored how the prevailing learning theories pedagogically inform and support the various ways in which ICT could be integrated and applied in the classroom, to underpin teaching and facilitate student learning. It was argued that technology could either be used to directly teach students, or could be used in ways which could help students effectively learn with technology. The latter view is a contemporary constructivist approach to learning, which holds that knowledge and understanding are individually or socially constructed by the learners. However, the specific discussion was based on theoretical assumptions of how ICT could effectively be used to promote student enhanced learning. Therefore, there are issues that need to be examined and are related with how teachers are actually using ICT, how do they progress with ICT integration in their teaching practices, and finally what are the factors that affect and influence their use of ICT. These issues will be addressed in this chapter, which constitutes the second part of the theoretical background of this study.

4.2 Teachers' use of ICT

In the light of the emergence of the 'Information Age', the pressures on schools to successfully and meaningfully integrate technology into their core processes, as well as the changes that these modern tools bring about, teachers' use of ICT is worthwhile to be explored. As mentioned before, despite technology's expansion to all aspects of society, and the intensive pressures to teachers to incorporate technological resources into their teaching and alter their pedagogy and instruction toward more constructivist, student-centred approaches, it is evident from the related literature and the respective research that the desirable transformation of schools, intended by the policy-makers, is not happening (Earle, 2004; Cuban 2001; Peck et al. 2002). Even though in many cases the research reveals that the use of ICT by teachers is increasing and that technology is permeating the curriculum, there is no hard evidence that schools are being transformed (Grabe and Grabe 2001; Tearle 2003; Condie et al. 2005), while, for the majority of teachers ICT is still a tool that is used in the margins of the educational process (Plomp et al. 2007). It is common to find examples of schools and teachers who have embraced the technology eagerly and managed to successfully integrate it into their practice and extend and improve children's learning and performance, but at the same time, there are many more who are nowhere near this (McFarlane, 1997; Kozma 2003; Norris et al. 2003; Gura and Percy 2005; Hernandez-Ramos 2005).

Based on these, it is concluded that "instructional technology is happening, but it's not happening systematically, not happening as a cultural shift, it hasn't happened as a chemical reaction, so to speak, and above all, we haven't seen the critical mass of understanding that will drive this change, regardless of budgets, politics, or conditions" (Gura and Percy 2005: ix). It is believed that this is due to the fact that teachers' use, attitudes and experiences with respect to technology vary enormously, while the growth and enthusiasm are not universal (Grabe and Grabe 2001; Condie et al. 2005; Wozney et al. 2006; Zhao 2007). Simultaneously, as it will be discussed in this chapter, the use of ICT in teaching and learning is influenced by a wide spectrum of factors (Plomp et al. 2007).

4.2.1 Developmental stages of teachers' ICT use and school technology integration

A number of researchers and authors indicate that teachers progress through stages or developmental schemas as they develop technology integration competence and their use of ICT. Each schema suggests a progression and shares a pattern of increasing confidence and adaptation. In general, at the first developmental stage, teachers experience of the diverse technological tools and their use is either inexistent or inconsiderable, while the final stage in all schemes is one which is typified by a reinvention or creative application (Lloyd & Albion, 2005). It is however noted that in order for teachers to progress through these stages particular support and professional development is needed (Rosenfeld and Martinez-Pons 2005).

The most well-known and widely-used schemas were derived from the Apple Classrooms of Tomorrow (ACOT) research. The ACOT project was initiated in 1985, and set out to investigate how routine use of technology by teachers and students would affect teaching and learning (Sandholtz et al. 1997). Through this project, it was observed that teachers' approach to use of classroom technology evolves through a few orderly stages: entry, adoption, adaptation, appropriation, and invention (Apple 1995). Table 4.1 shows examples of teachers' use of technology during each stage, as they were observed by researchers of the ACOT project, and by other researchers who applied these concepts in other research projects:

Stage	**Examples of what teachers do**
Entry	Learn the basics of using the new technology. They use text based materials and instruction to support teachers-directed activities. The style of classroom instruction is predominantly the same as before the introduction of technology. Teachers also have concerns involved with technical and managerial issues as they become familiar with new technology.
Adoption	Use new technology to support traditional instruction. They use technology for keyboarding, word-processing, or drill-and-practice activities. They also use conventional teaching approaches like lectures. Their focus is more on how to integrate technology in instruction than on technical issues.
Adaptation	Integrate new technology into classroom practice, but most of classroom time is still spent in conventional ways of teaching. Here, they often focus on increased student productivity and engagement by using word processors, spreadsheets, graphic tools, and computer-assisted instruction (CAI).
Appropriation	Focus on cooperative, project-based, and interdisciplinary work – incorporating the technology as needed and as one of many tools. They begin to understand the usefulness of technology and students work at computers frequently as project-based instruction begins to take place. Teachers at this stage show personal mastery of the technology and are fully confident in the use of computers which is regularly integrated into daily routine.
Invention	Discover new uses for technology tools, for example, developing spreadsheets macros for teaching algebra or designing projects that combine multiple technologies. Learning becomes more student-centred as multi-disciplinary, project-based instruction, peer tutoring, and individually paced instruction occur, since they come to view learning as an active, creative, and socially interactive process. They also experiment new ways of networking students and colleagues and they create new learning environments which differ radically from previous forms of instruction.

Table 4.1: Teachers' ICT use, according to the ACOT developmental stages [Compiled from (Apple 1995; Sandholtz et al. 1997; Kent and McNergney 1999; Cuban 2001; Mills and Tincher 2003)]

Similarly, King (2002; 2002) describes the process of technology integration and teachers' ICT use in teaching and learning as a 'journey of transformation'. She notes that "along this journey of transformation, educators develop a fluid, interdependent patent from inexperienced, hesitant, and sometimes fearful technology users to those who are independently learning technology and discovering new ways to change their teaching and learning and their ways of understanding" (2002:6-7). According to her research, as educators go through a specific process of learning educational technology application they become excited, creative and revived (King 2002). This process is comprised of the following stages: fear and uncertainty, testing and exploration, affirming and connecting technology and education, and finally, new perspectives. Table 4.2, includes the characteristics of teachers in each stage:

Stage	**Teachers' characteristics**
Fear and uncertainty	They are hesitant, fearful, uncertain, faltered, embarrassed, and they need nurturing.
Testing and exploration	They are gaining confidence to pursue more activities, test and explore how different functions and applications work on their own. They begin to see similarities in computer functions and have more accurate ideas about how these functions likely work.
Affirming and connecting technology and education	They typically begin to appreciate that they know more about using technology that they thought they did, and they also realise they have a lot to offer through technology application. With growing confidence, they begin to use technology to further their educational purposes. They are moving toward collaborative relationships among teaching, learning, and technology.
New perspectives	They begin to carefully examine their pedagogy to see if technology use can benefit their curricular goals. This stage is a time of great excitement and creativity, constructivism in action, bringing together new thoughts to create new connections, reaching beyond previous curricular boundaries to see possibilities for further development that they may never have considered in the past. As they complete the journey's cycle, teachers are renewed with a vision of great possibilities for their professional work and that of their students.

Table 4.2: Journey of transformation: teachers' characteristics during each stage [From (King 2002:21-26)]

Additionally, Anderson and Weert (2002) presented a model of technology integration which they called 'stages of teaching and learning with and through ICT', which shows how teachers discover, learn about, understand, and specialised in the use of ICT tools. The model consists of four broad stages in the way that teachers, learn about and gain confidence in the use of ICT. The model is depicted in Figure 4.1:

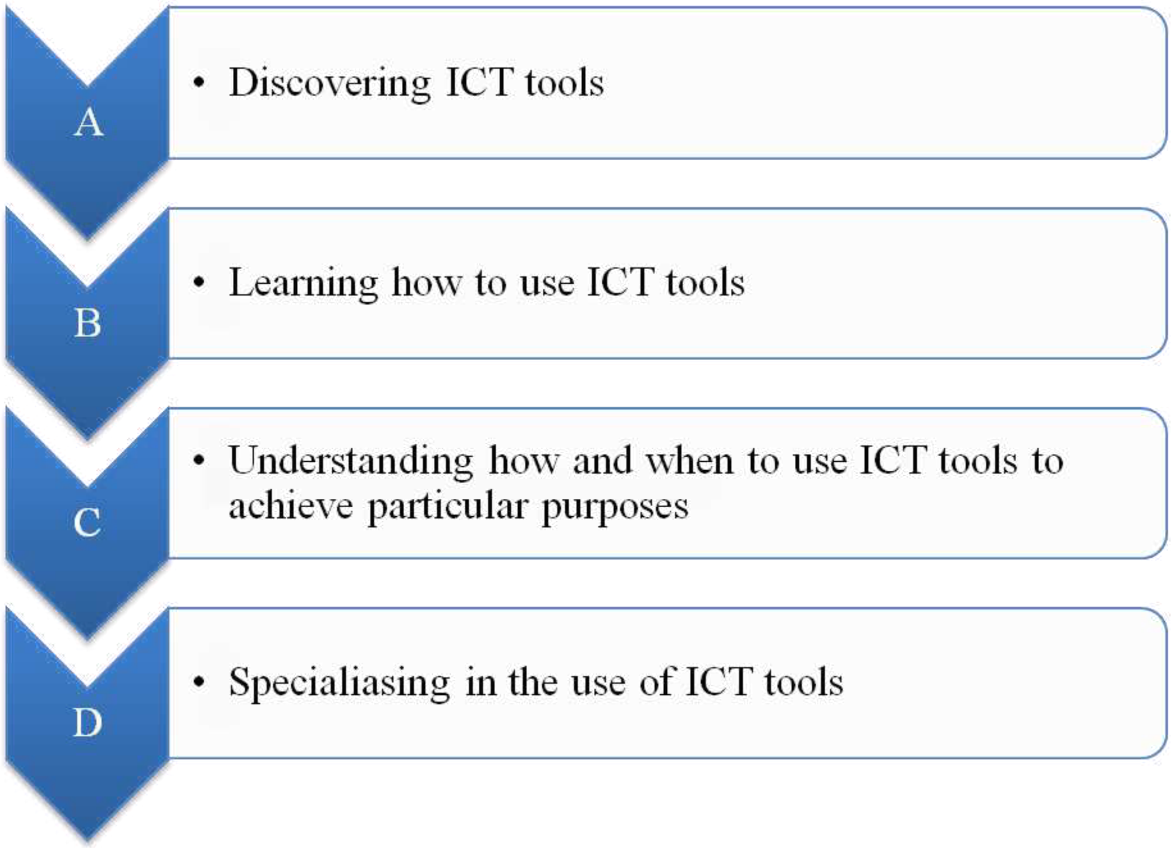

Figure 4.1: Model of stages of teaching and learning with and through ICT [From (Anderson and Weert 2002:17)]

The authors note that during stage A, teachers discover ICT tools as well as their general functions and uses. Consequently, their emphasis is usually put on ICT literacy and basic skills. At stage B, teachers begin to make use of ICT tools in different disciplines. They mainly use general or particular applications of ICT. Stage C involves the understanding of how and when to use ICT tools to achieve particular tasks, such as in completing a given project. This stage implies the ability to recognise situations where ICT will be helpful, choosing the most appropriate tools for a particular task, and using these tools in combination, to solve problems. The final stage, involves in specialising in the use of ICT tools such as occurs when one enters more deeply into the science that creates and supports ICT. However, it is argued that this kind of specialisation in ICT does not concern general education.

Finally, Semenov (2005) describes a similar continuum of stages of ICT integration in schools and use of ICT by teachers, which as he notes, can serve to determine indicators of successful ICT integration in education. Figure 4.2 presents the continuum:

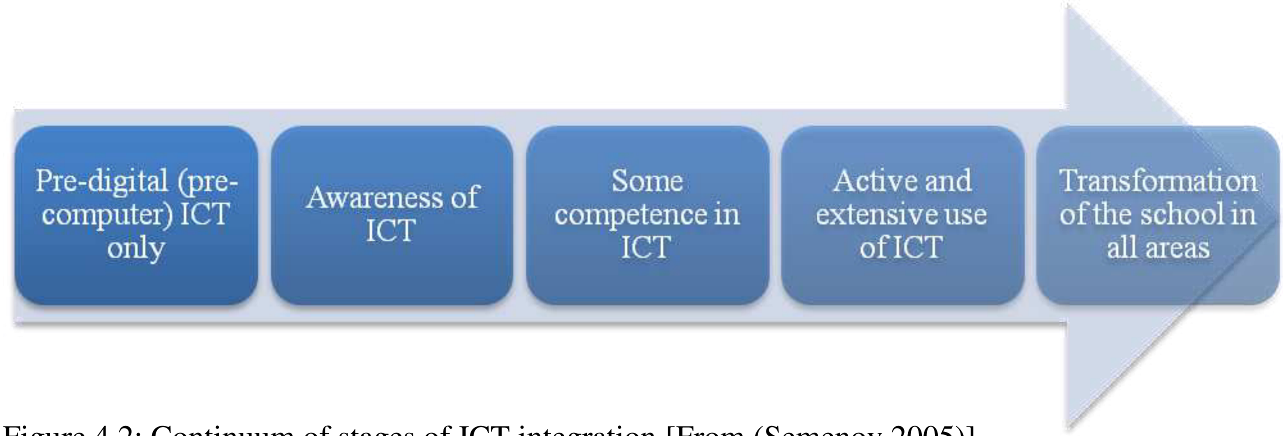

Figure 4.2: Continuum of stages of ICT integration [From (Semenov 2005)]

The earliest stage is the presence of pre-digital (pre-computer) ICT only. During this stage there is development of information-communicative competence based on pre-digital forms, like use of photography, encyclopaedias, and library resources. Also, information processing activities are developed with texts and objects of the material world. The second stage, awareness of ICT is based on demonstration of ICT with occasional hand-on activities. The stage of some competence in ICT involves opportunities to use ICT resources by both teachers and students, while the next stage involves active and extensive use of ICT in learning and teaching across all subjects in the curriculum. At the final stage, the school is transformed with respect to the curriculum, the organisational model of work, and the relations with the community. It is noted however, that schools do not necessarily progress through these stages sequentially. It is possible for teachers in schools with fewer resources and infrastructure to begin a real transformation in parts of their work.

4.2.2 Research on teachers' use of ICT

It is useful to begin this section with the studies conducted by Larry Cuban and his associates, which showed that the educational reformers' assumptions, that increased access to technology in schools and classrooms will result in increased ICT use by teachers and students, which will in turn transform teaching and learning, are not so feasible. In his influential book

'Oversold and Underused: Computers in the Classroom' (2001), he suggests that while teachers and students have far more access to technological resources than previously, the classroom use continues to be uneven and infrequent. The book is based on studies conducted in schools located in the Silicon Valley, an area in California which is "the home to thousands of computer and Internet companies and acknowledged throughout the world as the epicentre of the ongoing electronic revolution" (Cuban 2001:24-25). Although the technology infrastructure in these schools is quite developed, the studies revealed that less than 5% of teachers integrated computer technology into their regular curriculum and instructional routines. Simultaneously, in the classrooms of serious and occasional users, the use of computers was peripheral to their primary instructional tasks. In this sense, computers were frequently used by teachers just to support and not to alter their existing teacher-centred practices, adapting in this way innovations to fit their customary practices (Cuban 2001; Peck et al. 2002). In this context, "the pedagogical revolution sparked by technology is still waiting to begin" (Peck et al. 2002:51).

Nevertheless, in an effort to justify these results, Cuban apposes an interesting explanation called 'the slow revolution' which says that "small changes accumulating steadily will create a gradual transformation in how teachers teach" (Cuban 2001:152). Namely, he argues that teachers change all the time and that their adoption of computers for classroom preparation and communication, along with the evolution of hardware and software, are early signs of deep changes to come. He notes that slow revolution's incremental view is "anchored in the belief that technological change in the larger society inexorably reshapes all institutions, including conservatives ones such as schools" (Cuban 2001:155).

Becker and Ravitz (2000; 2001), through the data collected from the Teaching, Learning, and Computing survey (TLC), tried to explore Cuban's viewpoints and criticism regarding technology's integration in education. The survey was conducted in 1998, and 4,000 teachers in over 1,100 schools across the United States took part. The data from TLC revealed that the number of computers in schools in the US had increased profoundly. However, it was found that they were primarily used in four contexts: separate courses in computer education, pre-occupational preparation in business and vocational education, various exploratory uses in elementary schools classes, and finally, use of word processing software for students to present work to their teachers (Becker 2000; Becker and Ravitz 2001). In the light of these results, the researchers suggested that Cuban remained correct with respect to the issue that computers were generally a central vehicle of instructional activities in classrooms. They noted that computers had not transformed the teaching practices of a majority of teachers. Although many of them had students use word-processing software during class, frequent use of all other applications was limited and usually occurred outside of students' academic work, as part of separate skill-based instruction about computers (Becker 2000; Becker and Ravitz 2001). Nevertheless, they differentiate from Cuban's criticism, arguing that, under the right conditions, which are relevant to personal characteristics of teachers, as well as other related contextual factors, computers can clearly become a valuable and well-functioning instructional tool.

The conclusions of a study conducted in English schools by Hennessy et al (2005), are consistent with the results mentioned previously. This study was about teachers' perspectives on integrating ICT into subject teaching and showed that appropriate and effective classroom use of ICT was rare. It was also found that established curricula and teaching methods remained in place under a "thin coating of technological glitter" (p:158), while the available technology was often underused and poorly integrated into classroom practice. There was little evidence of transformation of fundamental aspects of teaching and learning, and the pedagogical evolution did not appear to be taking place, since the use of ICT by teachers was to support, enhance, and extend existing practices. Furthermore, it was shown that teachers were committed to incorporate technology, since there was a feeling of inevitability and acceptance of the role of technology. However, they portrayed a reflective and critical outlook, while their evident commitment was tempered by a cautious, critical and conservative approach, as well as by the influence of external constraints. The researchers explain these results by suggesting that the school curricula, assessment frameworks, and policies concerning ICT use seemed to simultaneously encourage and constrain teachers in using technology in the classroom. They also argue that the increasing investment in technology infrastructures has not been matched by investment of time and resources to develop new ways of learning and teaching. Finally, they propose that in order to invest in pedagogic change, the key contextual factors in how technology is perceived and used by teachers, need to be understood.

The results of a study in public schools of Quebec conducted by Wozney et al (2006) are also in line with the findings noted before. The researchers, who tried to investigate teachers' perceptions and practices with respect to computer technologies' implementation, found that teachers' use of computer technologies was predominantly for informative and expressive purposes, while their use in the classroom was extremely varied. It was indicated that teachers mostly incorporate technological resources like the Internet, educational cd-roms, and word processing, to facilitate informative and expressive purposes. Cuban (2001), as well as Becker and Ravitz (2001), also found that computers in schools are mainly used for these specific purposes. In this way, Wozney et al (2006), argue that their research's results support these researchers claims that computers "may simply maintain existing instructional practices that traditionally focus more on transmitting information than helping learners actively construct knowledge" (p:193). Nevertheless, they also suggest that a variety of personal and contextual factors affect teachers' use of technology and that staff developers should take them into consideration. They finally, accept the stance that as teachers gain experience with computer technology their use in the classroom evolves into using more computer applications, more often and more flexibly.

In the context of the European Union's (EU) Socrates Minerva programme, and the PRONETT (Professionals Networking Education and Teacher Training) project, a survey on the use of ICT was conducted in schools in the Netherlands, Spain, the United Kingdom, Greece, Portugal and Italy. The results of this survey are published in a report prepared by Koenraad et al (2002). The survey concluded that although the participant countries faced different realities and different resources, some problems with respect to ICT integration were consistent and common. A problem which was noted was the fact that ICT as an educational medium was predominantly used for information retrieval, and for presentational and illustrative purposes. Its potential for changing the pedagogy of teaching and learning had yet to be fully exploited and implemented within educational environments. A second problem was the fact that the successful utilisation of ICT was hindered by the conservative adherence of teachers to traditional curriculum and teaching approaches. The authors also note that even innovative teachers had a restricted view about the potential of ICT, which revealed that they were lacking both a vision and the personal experience of how teaching and learning should be.

A more comprehensive picture regarding the use of ICT in the EU countries is provided by Eurydice, the information network on education in Europe, and specifically by a report published in 2004 concerning key data on ICT in schools in Europe (Eurydice 2004). According to this report, the level of 'computerisation' of schools appeared to vary widely from one country to the next. Even within a given country, the number of pupils per computer varied considerably from one school to the next. Nevertheless, ICT was part of the compulsory minimum curriculum of pupils virtually everywhere in Europe, while the official recommendations regarding approaches to be adopted were similar in all countries. It was also reported that in primary education, ICT was mainly used as a tool for other subjects. In all countries, among the official aims of the curriculum, the most representative and common activities involved the use of software, information inquiries and communication networks for extending knowledge of various subjects. The report also includes data regarding primary school students (aged nine or ten) who indicated that the use of computers in their schools was not very often. Nearly half of them indicated that they never or almost never used a computer, with the exception of children from countries like the UK and Iceland who claimed that they used computers very regularly. In most countries, when pupils of this age group worked with ICT in school, this was mainly to write something or to search for information, something which as it is suggested corresponded fairly closely to the aims and recommendations set out in official curricula.

What is more, a survey commissioned by SOEID (Scottish Office Education and Industry Department) in Scottish schools, and conducted by Williams et al (1998), indicated that the use of ICT was relatively low and was focused on a fairly narrow range of ICT resources. Yet another research revealed that word processing was the predominant ICT application in schools, while other generic software like spreadsheets was also used but to a smaller degree. The results of this study showed that the use of the Internet and email was little even though the majority of schools had Internet access, and that ICT resources like video conferencing and computer networks were rarely used. The researchers noted that their study concluded that ICT was still seen as an extra or add-on rather than an integrated resource within teaching, despite the fact that teachers' overall perception of the value of ICT was positive and their recognition of a range of benefits for pupils and for themselves by the use of ICT. In another article (Williams, et al. 2000) which is based on the data collected from this survey, the authors suggest that teachers showed a great deal of interest and motivation to learn more about the potential use of ICT for teaching and learning, since they acknowledged that the future of education would definitely be affected by ICT. They also report that the majority of teachers considered themselves generally competent in the use of ICT, but that this does not mean that the vast majority of them use ICT often in the classroom, nor that they feel competent enough to use ICT as a core teaching resource.

A different study conducted in Scottish schools by Condie et al (2005), to evaluate the impact of a range of initiatives launched by the Scottish Executive, showed that the use of computers within the classroom to support learning was very 'patchy', with a small percentage of pupils experiencing this on a regular basis. The researchers suggest that the general picture was one of teachers coming to terms with the 'physical' impact of the government's initiatives and the presence of the new technologies, and beginning to work out how best to use them. Once again it was shown that word processing and graphics were the most used ICT resources. What is different in this research from the one discussed previously is that the use of the Internet was found to have increased. The fact that this research is much recent than the previous one, and taking into account the rapid expansion of the Internet, this result is rather justified and reasonable. However, the researchers highlighted that much of this activity (word processing, graphics, and Internet inquiry) was concerned with writing essays or reports and producing presentations (Condie et al. 2005).

Furthermore, the researchers suggest that their study showed that the focus in the classrooms had shifted somewhat from learning about ICT to learning with the support of, or through, ICT. Nonetheless, they point out it was unclear whether this meant a fundamental change in the pedagogical strategies employed, and that this was something which needed further research and investigation. Moreover, the researchers found excellent examples of good practice in schools, by a number of enthusiastic teachers, and they propose that these teachers could be used so as to share ideas and influence other colleagues, if an effective method of resources' dissemination could be devised. They note that teachers reported that ICT had influenced many aspects of classroom practice, and that they wanted to know how to best use the technology available for the benefit of their pupils. It must be finally mentioned that this study was the third and final part of a series of research programmes, something that gave the researchers the opportunity to make comparisons between the previous phases. In this way, they report that teachers in the last phase were found more confident in the use of ICT and there was evidence of a growing interest in and use of peripherals for computers. The number of teachers who were positive toward the introduction of ICT in the classroom and realised its potential benefits had increased, although some of them still remained to be convinced.

Based on the collected data for a report to the Department for Education and Skills (DfES), which intended to evaluate the 'Curriculum Online' programme, the authors, Kitchen and Finch (2003), report that the frequency of use of ICT resources in lessons was fairly low in schools. Specifically, around a fifth of primary teachers said computer packages such as word processor or spreadsheets, and subject-specific software applications were used in half or more of all lessons, and were the most commonly used ICT resources in the classroom. At the same time, more than two thirds of primary teachers said that they offered their students access to ICT facilities in some form outside lessons, like after school clubs, or at lunchtime. Moreover, 35% of primary teachers said that they rarely or never used internet resources for teaching, while they said that paper resources were used more extensively than digital resources when planning lessons. Nevertheless, the researchers highlight that teachers seemed to accept the perceived potential benefits of ICT and its motivational impact on students, since they showed a high level of agreement with related statements in their survey. They argued however, that the survey's findings suggested "that while ICT was being utilised as a tool for learning, it was not yet perceived as having a central role in the curriculum" (p:30).

Furthermore, the BECTA Review report (2006), through evidence from surveys and research studies at a national level in the UK, tried to establish a picture of technology provision, practice and impact in schools on learning. Among the conclusions included in the report, was that there had been an overall noticeable progress in engagement with technology in education, with rapid growth in the use of technology especially evident in primary and secondary schools. Also, it was noticed that the increased adoption had seen some improvements in teachers' understanding of pedagogy and practice associated with the use of ICT in the classroom. Particularly, these improvements were associated with the way in which teachers selected and organised ICT resources and the way they integrated and used them with other activities in the classroom and beyond. However, it was found that the use of technology to support an increasingly open and accessible system was in its early stages, and that if progress was to be achieved technical and professional practice issues needed to be addressed. Also, it was observed that digital content continued to be overwhelmingly delivered and used offline, although there was significant development in schools' Internet connectivity. Nevertheless, a substantial increase in the proportion of teachers who used digital resources and tools of all kinds was noticed. A difficulty by teachers to develop effective strategies for identifying appropriate software is also highlighted in the report. It is suggested that the time required to evaluate materials thoroughly and embed them into practice were constraining their overall use. Finally, the report includes the factors that are influencing teachers' knowledge and engagement with technology resources.

Condie et al (2007), prepared a report, which was commissioned by BECTA on behalf of the DfES, about the impact of ICT in schools. The authors consulted over 350 published literature resources to draw out conclusions about ICT use in British schools. In this way, they note that early use of ICT in schools, and particularly before the year 2000, was mainly to support drill or practice activities in previously taught skills or concepts, and as a treat or reward when work was satisfactory completed. By contrast, the authors suggest that more recent use "can be described as characterised by collaborative, investigative and problem-solving activities designed to develop increasingly independent learners who are confident users of ICT, exploring and finding out themselves, with greater peer interaction compared to non-ICT lessons" (Condie et al. 2007:21). In this context, the authors suggest that the learning experience may have changed, and that teachers' confidence and skill levels have improved significantly in recent years. They argue that this is partly an outcome of the provision of more relevant and appropriate staff development opportunities for teachers. Finally, they stress that teachers' improved ICT skills had an impact on the ways they are using ICT to support a range of planning and administrative activities at both class and school level.

The results of a number of studies conducted in Cyprus are quite similar with the results of the studies noted here. For instance, the findings of two independently conducted studies, which are reported in a joint article by Karagiorgi and Charalambous (2004), indicate that approximately 20% of the teachers were involved in ICT integration. The studies were based on both quantitative and qualitative data collected from teachers who were taking part in the initial programme for the introduction of ICT in Cyprus' primary schools. Both studies indicated two groups of teachers, who as noted, reacted differently to the call for introduction of ICT in schools: the first group included teachers who were willing to integrate ICT into their teaching, and the second group teachers who failed to get involved. The researchers note that the second group was the largest since the majority of the teachers reported limited or no use. In addition, the interview data revealed that a number of teachers, who reported in questionnaire some use, were actually expressing an intention to use ICT in teaching, while others understood ICT use, as computer use just for teaching preparation. Moreover, both studies revealed that the most used ICT resources were word-processing, CDs (for listening stories and music), electronic encyclopaedias, games, and drill-and-practice. These resources were most often used for the development of computing skills, the development of student interest, and as ‘conventional’ audiovisual aid. The researchers noted that the development, of active, cooperative, individualised, interdisciplinary learning and the support of special curriculum areas were less frequently reported by teachers as goals for ICT use.

Another study carried out by Karagiorgi (2003) showed that the majority of Cypriot teachers had not progressed into high levels of adoption of ICT in their work. The data for this study was collected using the Stages of Concerns Questionnaire (SoCQ), which according to Karagiorgi, could indicate the adoption levels of educational innovations in general and technologies in particular. The data was collected from 388 teachers in all pilot schools which were taking part in the experimental programme for the initial introduction of computers in Cyprus primary education. The research revealed that the profile of the average pilot teacher corresponded with the typical ‘nonuser’ profile, while teachers were found to be feeling uneasiness about the innovation and needed more training. At the same time, teachers were found to be more concerned with their personal ICT use adequacy than with the meaningful integration of ICT in the classroom. They were not focused on the management of the computer in the educational process nor were they concerned with the effects of using ICT in the classroom. Based on these, Karagiorgi notes that self concerns precluded the development of genuine impact level concerns about the innovation, which implied a rather low implementation level.

The research conducted by Eteokleous (2008) also showed that computers and ICTs in general were not extensively used in the classrooms of Cypriot primary schools. Although the results showed that teachers were using computers quite extensively for their own purposes, the classroom use was infrequent. ICT and its resources were being used in a sporadic fashion as supporting tools or – as the Eteokleous notes – as fancy, high-tech chalkboards. The teachers who were using ICTs as educational tools integrated in the teaching and learning processes, applying constructivist, transformational teaching approaches, were few. Based on these, she argues that the assumed traditional/progressive (constructivist) dichotomy in teachers' teaching practices is applied in the Cyprus primary context as well. Furthermore, the she notes that her study's overall results support Cuban's arguments about teachers' difficulty in incorporating computers as regular classroom feature. Finally, the research revealed that although teachers were using ICT for personal reasons, a number of attitudinal, professional, and organisational factors were inhibiting the integration of various ICT resources into their classrooms.

4.3 Factors affecting teachers' use of ICT

A common conclusion included in the studies and reports discussed in the previous section, as well as in other resources in the respective literature, is that teachers' use and application of ICT in the classroom is affected by a number of determining factors, which are often considered to be ICT use barriers as well. It is indicated that these factors prevent teachers from capitalising on the educational potentials offered by technology resources, and often their implementation efforts are blocked (Ertmer 1999; Ertmer et al. 1999; Earle 2002; Tearle 2004; Brinkerhoff 2006). Also, they affect not only the ways in which teachers infuse technology into their instructional practices, but also their decision to whether choose or not to incorporate ICT resources in their teaching. The combination of these factors, as well as the balance between them, could determine and also predict teachers' options and choices with respect to technological applications and pedagogical approaches employed in the classroom (Ertmer et al. 1999; Dawes, 2001; BECTA 2003; Vannatta and Fordham 2004; Plomp et al. 2007). In addition, these factors could determine whether technological resources have the potential to become valuable and well-functioning instructional tools (Becker 2000).

The literature indicates that not all teachers will face all these barriers or will be concerned with all these factors; however, anyone of them alone can significantly impede meaningful classroom use. It is noted that although it is not possible to predict the number, type, or order in which teachers will encounter these barriers, the fact that they will experience a wide range of barriers is almost guaranteed, even among exemplary users of technology in schools (Ertmer 1999; Hew and Brush 2007). In this way, in order to understand the rate and ways in which teachers adopt technological resources in their teaching, requires to investigate these barriers (Butler and Sellbom 2002), which simultaneously can help the development of the skills and strategies needed to overcome them (Ertmer 1999). Also, studying these aspects of teachers' use of technology can provide insights of how to achieve successful technology integration (Angers and Machtmes 2005).

The literature suggests various ways in which these factors or barriers can be categorised, even though the interrelationship between them is quite complex (BECTA 2003). These factors could be personal and demographic characteristics related to teachers (Wozney et al. 2006), as well as other technology-specific and contextual conditions which are out of the teachers' control (Hernandez-Ramos 2005). Therefore, they can be conveniently divided into two broad categories: (a) internal or teacher-level factor/barriers; and (b) external or school-level factor/barriers (Ertmer 1999; Ertmer et al. 1999; Rogers 2000; BECTA 2003). Internal or teacher-level factors are intrinsic to teachers and include beliefs about teaching, beliefs about computers, establish classroom practices, and unwillingness to change, while, external or school-level factors are extrinsic to teachers and include lack of access to computers and software, insufficient time to plan instruction, and inadequate technical and administrative support (Ertmer 1999).

Internal, teacher-level factors/barriers are less tangible than external, school-level factors/barriers, are more personal, are not readily observed, and are more deeply ingrained, which in turns cause more difficulties in addressing and dealing with them. It is suggested however, that the presence of these barriers is often evident in the reasons teachers give for being frustrated by external, school-based barriers (Ertmer 1999). Teachers often use these barriers as a handy excuse for not using technological resources, while in reality, the lack of use, is due for instance to their attitudes toward technology (Stallard and Cocker 2001). Therefore, it is important to examine the reasons why teachers are feeling frustrated with technology, and in this way to understand their goals with respect to technology, as well as their beliefs about its role in the classroom (Ertmer 1999).

4.3.1 Internal or teacher-level factors

4.3.1.1 Teachers' personal (demographic) characteristics

Teachers' personal or demographic characteristics are included among the various internal, teacher-level factors that are assumed to be affecting the adoption and use of technology in teaching. It is noted that these personal characteristics – which can relate to teachers' gender, age, teaching experience, as well as the grade level that they teach – may importantly influence the extent to which teachers take up an innovation, such as the implementation of ICT in their work (Scrimshaw 2004). In this way, it is worthwhile to explore how teachers' personal characteristics can affect their ICT use, since it can provide insights on how to differently approach ICT implementation for different teachers according to their personal characteristics. In addition, exploring the relationship between personal characteristics and ICT use can also improve the professional development strategies (Russell and Bradley 1997; Yuen and Ma 2002; Scrimshaw 2004; VanBraak et al. 2004).

The gender of the computer user, and more generally of the technology user, is supposed to be an important variable in human – computer (technology) interaction. The existence of a technological gender gap is hypothesised by researchers, since as suggested women are likely to hold more negative attitudes toward computers and to engage in fewer computer-related activities than men (Whitley 1997; VanBraak 2001; BECTA 2004; VanBraak et al. 2004). It is supported that this is due to the fact that technological applications like electronic games, as well as many types of software have been designed to serve the interests of male users rather than of female users. Also, computer use in schools is been linked to traditionally 'masculine' subjects like science and mathematics and not to traditionally 'feminine' subjects like art and literature (Whitley 1997).

In this context, a meta-analysis of 82 studies of gender differences in computer-related attitudes and behaviour was conducted by Whitley (1997) to examine the existence and size of these gender differences. The results of the analysis showed that boys and men, compared with girls and women, considered computers more appropriate to themselves, saw themselves as more competent on computer-related tasks, and reported more positive affect toward computer. Nevertheless, although the effect for gender differences in beliefs was statistically significant, it was quite small (0.232, $p>0.001$). The meta-analysis also showed that men and boys more readily accept the societal stereotype of computers as a male domain than women and girls.

Moreover, the study of population differences showed other, equally interesting results. The largest effect sizes were found for high school students (0.396, $p>0.001$) and the smallest for primary school students (0.161, $p>0.001$), while for university students (0.226, $p>0.001$), as well as other adults (0.180, $p>0.001$), the effect sizes were between these extremes. In this way, Whitley concludes that gender differences in attitudes toward computers result from socialisation processes, supporting simultaneously that the longer that children are in school, the greater the gender difference becomes. He also suggests that the difference in effect sizes found for the primary school and high school populations could also be attributed to the fact that changes in societal values and socialisation processes in the schools had resulted in smaller gender differences in attitudes among the younger children. With respect to the decrease in effect size from high school to college and adult populations, Whitley proposed that this was probably due to self-selection. In the light of these results, he notes that although the gender differences were statistically significant, the effect size was small, and therefore he assumes that any gender gap that exists in computer-related attitudes and behaviour was small.

A BECTA report (2004) about the barriers affecting teachers' use of ICT, indicates that there was some evidence to suggest that teacher gender had an effect on the degree to which teachers use ICT. Specifically, it is noted that male teachers make more use of ICT than female teachers, while the latter reported greater levels of computer anxiety than their male colleagues. In addition, Scrimshaw (2004) prepared a report to identify the factors which are most effective in overcoming the various barriers affecting teachers in their effort to uptake ICT for their work. The report was prepared for, and on behalf of, BECTA and published in conjunction with BECTA's report about the barriers to teachers' use of ICT. In this report, the author is in line with the BECTA's report conclusions, underscoring that teachers' gender differences could affect ICT implementation in schools. In this context, Scrimshaw noted that for primary schools, where the ratio of female to male teacher is much greater, the issue of gender differences as a barrier to the use of ICT may be much more significant.

Furthermore, Russell and Bradley (1997) examined the sources of computer anxiety for both primary and secondary school teachers. They surveyed 350 teachers in government schools in Queensland, Australia, and they found that male teachers had greater competence with computers in education that their female colleagues. In line with this finding, which is also consistent with what is noted in BECTA report (2004), they argue that since female teachers constitute the majority in schools (72% who participated in the research were female teachers), this could become a significant issue for the successful implementation of technology in education.

VanBraak et al (2004) conducted a research in 53 primary schools in Belgium to examine the effect of teachers' demographics and other variables on two different types of computer use: supportive computer use (for pro-active and administrative tasks) and class use (support and enhance the teaching and learning process). Data were collected from 468 primary school teachers (349 female and 119 male teachers). The research results showed that the strongest predictors of ICT's class use were teachers' technological innovativeness and their gender. Female teachers reported significantly lower levels of computer ability than male teachers. The researchers also note that the effect of gender on class use of computers stayed significant when controlled for attitudes and measures of computer experience. Finally, the research results revealed that teachers in primary education showed higher familiarity with supportive computer use than class use. In this way the researchers argued that this might partially explain why gender differences only exist in class use, since, differences between male and female teachers might gradually disappear when teachers become more acquainted with the educational potential of computers.

Furthermore, Yuen and Ma (2002) conducted a research that targeted pre-service teachers who were attainting the Postgraduate Certificate in Education at the University of Hong Kong. The researchers surveyed 186 pre-service teachers (male 24.9% and female 75.1%). Their research examined gender differences in teachers' computer acceptance, since as they note, they saw it as important factor to the successful use of computers in education. Perceived usefulness and perceived ease of use of computers in teaching were explored in relation to intention to use. The research's results showed that there were significant gender differences in computer acceptance. More specifically, it was found that perceived ease of use will influence only female teachers' intention to use computers. This factor was not significant at all towards intention to computer use for male teachers, although it was found to influence more their perceived usefulness of computers compared to female teachers. In addition, it was found that perceived usefulness influences intention to use computer more strongly for female than male teachers.

Similar results were also produced by studies conducted in Cyprus. Michaelidou-Evripidou (1995) carried out a study to investigate teachers' perspectives on the initial introduction of computers in Cyprus primary education in the early 1990s. She surveyed 473 teachers from all schools, not only from schools which were taking part in the pilot programme for the initial introduction of computers. Among other results, the research revealed that female teachers appeared to be more cautious regarding computer usefulness and role in the classroom than their male colleagues. At the same time, female teachers reported that they were less prepared and with less knowledge to effectively use computer in their teaching. Nevertheless, a more recent study carried out by Karagiorgi (2003), which concerned teachers that were taking part in the experimental programme for the initial introduction of computers in primary schools, showed that both male and female teacher had similar scores on all stages of the ‘Stages of Concern’ questionnaire. In this way, it was indicated that teachers’ concerns regarding the introduction of computers in schools were quite similar for all teachers, either male or female.

What is more, as already argued, teachers’ age and teaching experience could affect the successful implementation of technology in schools, and therefore, could be considered as factors that need to be explored.

Becker (1999), in the context of TLC survey in public and private schools in the U.S, surveyed approximately 2,500 teachers to explore various issues regarding the use of the Internet in schools. Among the predictors to the Internet use he explored, teachers’ teaching experience and age. According to his research results, the duration of teaching experience had a relatively small relationship to Internet use by teachers. Nevertheless, he found that the teachers who were in their first few years of teaching were slightly less likely than other teachers to use the Internet with students. He notes that even though the teachers with less than four years of teaching experience are younger and possibly more computer-savvy in general, they are less likely than more experienced teachers to use the Internet in teaching. However, as he argues, their younger age makes them more comfortable with the Internet in terms of their own use. In this way, the research results showed that teachers under 30 are the ones most likely to use the Internet professionally, and are those teachers who are also more likely than older teachers to consider the Internet to be essential in their classroom. Also, the research showed that the teachers who have four to seven years of teaching experience behind them are most likely to use project-based teaching and student web-publishing than other teachers of other age groups. In the context of these results the Becker argues that the greater comfort with technology that younger teachers display outweighs advantages of greater teaching experience.

Contrarily, a research conducted by Russell et al (2003) showed that although new teachers reported higher levels of comfort with technology and use it more for preparation, more experienced teachers reported using technology more often in the classroom when delivering instruction or having student engage in learning activities. The data for this study were collected from 2,894 teachers in 22 Massachusetts districts and examined the extent to which technology was used in and out of the classroom for instructional purposes. Similarly, BECTA's (2004) report, about the barriers that affect the implementation of technology in schools, indicates that younger teachers are no more likely to make use of ICT in their work than their more experienced colleagues. This statement was based on the fact that there was little evidence found in the literature to support the view that teachers' age affects levels of their use of ICT. Finally, the results of a qualitative study conducted by Granger et al (2002) in four Canadian schools showed that there was not a consistent overall relationship between teachers' teaching experience and their experience with ICT.

Cuban et al (2001), in their effort to explain why technology use in schools is low even in well-equipped schools where technology access is unhampered and easy, conducted a research in two high schools located in California's Silicon Valley. The research among others revealed that teachers' age, experience, as well as gender were not factors that affect teachers' use of technology in teaching. Specifically, it was found that there was little difference in computer use between veteran and novice teachers, between teachers with or without previous technological experience, or between male and female teachers.

The study carried out by Michaelidou-Evripidou (1995) showed that teachers' length of teaching experience was not associated with teachers' perspectives on the effects of computer use on student learning or on the relationships among students and teacher in the context of the classroom. However, the research indicated that teaching experience was associated with teachers' willingness to get involved with ICT, as well as their knowledge and skills regarding this issue. More specifically, it was found that novice teachers were more willing to take part in professional development programmes, while they indicated that they had more knowledge and skills to effectively use computers.

4.3.1.2 Teachers' philosophies and pedagogical beliefs

As discussed in Chapter 3, technology-using teachers employ ICT in their teaching in a variety of ways based on what is prescribed by the different theories of learning. A number of teachers implement technology as a vehicle of information and ready-made knowledge to be delivered to students, while others apply it in the classroom as tool to facilitate students construct their own knowledge and understanding (Dexter et al. 1999). At the same time, some teachers maintain tight control over students' actions and use technology only for presentation purposes, while others, with the same resources and access, feel more comfortable allowing students nearly full reign of technology decisions (Judson 2006). Based on these, it can be supported that technology-using teachers range along a continuum of instructional styles, from traditional transmission instruction to constructivist-compatible instruction (Dexter et al. 1999; Ravitz et al. 2000; Levin and Wadmany 2007). It is believed that these differences in instructional styles by teachers in technology integrated classrooms, may related to a set of fundamental beliefs about learning and good teaching that might underlie their pedagogical approaches (Becker and Ravitz 1999; Lumpe and Chambers 2001). Similarly, teachers may be using technology in a way that is aligned with their beliefs about learning (Judson 2006), while their decisions and attitudes regarding technology may be influenced by these pedagogical beliefs (Shaunessy 2005).

General speaking, pedagogical beliefs play a prominent role in the daily instructional decisions made by teachers. They are considered to be filters that guide teachers during instructional and curricular decision making (Albion and Ertmer 2002; Levin and Wadmany 2007), since they shape the content selection, delivery methods, interaction styles, and evaluation techniques that drive curricula and instruction on a daily basis (Shaunessy 2005). It is suggested that:

> to understand teachers' pedagogy, it is important to understand their beliefs about what constitutes good instructional practice. Presumably, their own instructional practices reflect, to a large extent, what they believe to be good teaching, and their beliefs about good teaching reflect their understanding about how students learn (Ravitz et al. 2000:10).

At the same time, teachers' pedagogical beliefs largely determine how and why they choose to adopt new teaching methods, or adapt to new classroom environments, processes, and goals. Namely, "teachers tend to adopt new classroom practices based on the assumptions underlying the new practices are consistent with their personal epistemological beliefs" (Levin and Wadmany 2007:159).

In addition, beliefs are considered to be a critical influence on the successful integration of technology, because changes to teaching style that are required when working with technology, may also necessitate significant changes in beliefs (Albion and Ertmer 2002). This denotes that it is worthwhile to investigate teachers' pedagogical beliefs when exploring teachers' technology use (Lumpe and Chambers 2001; Judson 2006), since without teachers' "skilled pedagogical application of educational technology, technology in and of itself cannot provide innovative school practice and educational change" (Levin and Wadmany 2007:158). Moreover, examining the link between technology integration practices with beliefs can provide insights and understanding why technology-using teachers employ ICT diversely (Judson 2006), and in this way, help the stakeholders, who are involved in school technology efforts, assess and address these beliefs as well as their actions (Lumpe and Chambers 2001).

It is noted that teachers' pedagogical beliefs are not static since they are formed, developed, and transformed through personal experience over many years, first as students, and later as teachers (Lumpe and Chambers 2001). They are also affected by professional peers, the expectations of learners in the classroom, the conditions and climate in which teachers work, and by other related pressures (Becker and Ravitz 1999; Albion and Ertmer 2002). Nevertheless, these beliefs may become firmly embedded in individuals, which means that they may be difficult to be altered (Shaunessy 2005), and therefore, are generally considered to be resistant to change (Albion and Ertmer 2002).

This state of affairs has implications in what teachers learn from professional development programmes and educational reform schemes with respect to technology. Teachers enter professional development programmes with certain beliefs that will ultimately affect how they will implement technology, their behaviour, and in turn, student learning (Lumpe and Chambers 2001; Levin and Wadmany 2007). However, typically professional development related to technology integration is disjointed from professional development related to pedagogy (Judson 2006). In this sense, it is suggested that it is not enough to train teachers in ICT-skills but it needs to be combined with pedagogical training (Totter et al. 2006:101). Based on what was discussed in Chapter 3, the emphasis of such professional development should be focused on constructivism and its connection with appropriate technological applications and practices, and not on the enforcement of specific hardware and software use (Shaunessy 2005; Judson 2006; Totter et al. 2006).

4.3.1.2.1 Research on teachers' philosophies and pedagogical beliefs

It is interesting to explore what the research says about the link between teachers' technology integration practices with their underlying pedagogical beliefs, and specifically the connection between educational technology and student-centred, constructivist approaches. There is a diversity of viewpoints regarding this issue. A number of researchers have found that there is a significant correlation between the two variables, while others suggest that the connection or link between ICT and constructivist beliefs is "often stated and even more often assumed" (Harris and Grandgenett 1999:327). It is also debatable "whether the relationship between teachers' beliefs and practices is a one-way relationship or a dynamic two-way relationship in which beliefs are also influenced by practical experience" (Levin and Wadmany 2007:161).

In this context, Becker and Ravitz (1999) conducted a survey research in 153 schools in the US, in order to find whether the use of computers and the Internet influences teachers' pedagogical practice and perceptions. The results showed that teachers' sustained use of computers and exploration of Internet resources was related to their increased use of constructivist teaching practices and might even change their pedagogical beliefs that underlie such practices. However, they argue that other conditions, which are relevant to teachers work context, as well as the technology infrastructure available, are also essential in order to facilitate changes in teaching in the direction of constructivist-oriented practices. Moreover, they found a consistent pattern between teachers' involvement in computer-based approaches and whether they reported having changed their teaching style toward constructivism. They report that "those teachers who have had students use computer software in substantial ways for several years or who have been among the pioneer teachers employing Internet-based activities for classes of students are the same teachers who are most apt to report that their teaching practice has changed substantially over the past three years in ways that educational theorists would regarded as indicating a constructivist-oriented model of teaching" (p:369). In order to explain this pattern, they propose three alternative theories which are included and described in Table 4.3:

Theory	Description
The theory of technology-induced belief change	It may be that technology-using teachers learn over time that they are more effective teachers when they allow students to work more independently, when they allow themselves to learn from students, and when they act more in the role of adviser and resource than as a direct source of instruction. The theory is that computers encourage and even demand such practices which in turn change the pedagogical beliefs of teachers who use them.
The theory of facilitating conditions	Technology-using teachers may already have had constructivist-oriented philosophies, but until computers and the Internet, they hadn't had the means of implementing this philosophy in their teaching. In this view, technology is catalyst that have enabled these teachers to implement practices more in line with their teaching philosophy than those they had been using before
The theory of spurious correlation	The teachers who tend to act on their awareness of constructivist ideas in teaching that have come to the fore during the recent years are also the ones who are most apt to experiment with the use of new technological resources in teaching. The fact that the teachers who report changes in pedagogical beliefs are often the same ones who have pioneered and experimented with new technologies could really just be a manifestation of the idea that teachers who are innovative with respect to pedagogy are also more innovative with respect to technology as compared to those who might approach their job in a routine way.

Table 4.3: Theories that explain why technology-using teachers have constructivist-oriented beliefs [From (Becker and Ravitz 1999:376)]

In this sense, the researchers conclude that their study left answered the question of whether the relationship between the technology use and the constructivist pedagogical beliefs "is limited to teachers who were already inclined to teach in a constructivist manner and simply needed the appropriate resources to do so, or whether the experience of using computers or the Internet in a substantial way with students itself leads otherwise 'noncostructivist' teachers to rethink their pedagogical priorities and philosophies in teaching" (p:381).

Similarly, in another case, the analysis of data collected from the TLC survey showed that the teachers who were using computers most productively in their teaching were not very comfortable with a transmission-oriented pedagogy. Becker and Ravitz (2001), argue that this study showed clear relationships between teaching philosophy and (a) whether a teacher used computers with students; (b) the particular objectives for computer use the teacher had; and (c) the types of software used frequently with students. They also note that teachers who used computers in a constructivist way reported making more general changes to their characteristic pedagogy than did teachers who used computers in a more limited way or not at all. However, the researchers underscore that to help teachers realise significant changes in their pedagogy and enabling them to put into practice a pedagogy that is more constructivist, other personal and contextual conditions and factors are also essential.

Moreover, Levin and Wadmany (2007), through a longitudinal study in Israel which lasted three years, found that spending three years in a technology-rich learning environment produces substantive change in teachers' educational beliefs and classroom practices, supporting in this way the first theory (Table 4.3) proposed by Becker and Ravitz (1999). The researchers also note that their study underpins the distinction of teachers' beliefs into two poles, traditional, transmissionist beliefs, and constructivist-compatible beliefs, which in turn leads to mechanistic-functional use of technology and the use of technology as enhancing a learning culture respectively. However, they argue that these categories can be refined and additional facets of beliefs can be included, since teachers' beliefs cannot always be classified simply and dichotomously. Therefore, they argue that most teachers do not consistently hold a particular pedagogical orientation. In this way, they stress that although the teachers in their study made changes in their beliefs, they demonstrated multiple views rather than pure beliefs, a result that made them conclude that teachers' beliefs form a mosaic of complementary visions, even conflicting ones. Finally, they underscore that "it is not just the technology, but the overall learning environment and its emphasis on non-structured tasks, rich sets of technology-based information resources, and exposing teachers to new visions, that ultimately change teachers' beliefs and practices" (p:173).

Furthermore, the results of a study conducted by Dexter et al (1999) in 20 K-12 US schools across three states, showed that the teachers who had adopted more progressive teaching practices over time felt that computers helped them changed, but they did not acknowledge computers as the catalyst for change. It was made clear by teachers that computers did not automatically cause more constructivist practices. Rather, teachers' changes in instructional approach were the result of thoughtful reasoning, their experiences, and the local circumstances and needs. In this way, the researchers conclude that for teachers to implement the use of educational technology in a constructivist manner, they must have opportunities to construct pedagogical knowledge in a supportive manner. They also stress that simplistically viewing computer introduction in schools as a cause of instructional change disregards the general knowledge about teacher development and the change process. It also underestimates the impact of teachers' beliefs on how they teach and choose instructional practices.

The research by Judson (2006), showed different results than the studies mentioned before. The study was conducted in US schools and intended to investigate the connection between the ways that teachers integrate technology and their beliefs about learning. It included surveys and observations of 32 classroom teachers which measured the degree to which technology integrated lessons were aligned with constructivist principles. The results of this study showed that there was not a significant relationship between practices and beliefs, and that teachers' beliefs about instruction do not necessarily resonate in their classroom practices when integrating technology. Judson suggests that "in some cases, computers did enable observed teachers to carry out constructivist convictions, but computers also enabled teachers to carry out traditional routine as well" (p:590). Nevertheless, Judson acknowledges that the results of his study were contradictory to the results of other larger scale research projects, but he argues that those studies were only based on self-reported data and did not include data collected from observations. Without disregarding teachers' honesty when answering questions about their beliefs and attitudes, he argues that teachers usually perceive their own instruction with great variability, something which can be explained by their varying level of expertise, which makes them identify different salient features of their teaching. Moreover, these salient features may be different from those identified by an expert observer.

Similarly, the study conducted by Etekleous (2008) in Cyprus primary schools also showed that there was no link between computer usage and the tendency of teachers to support progressive, constructivist, student-centred instructional practices in their work, although it was revealed that the traditional/constructivist dichotomy was applied in the context of Cyprus primary education. She characterises this finding as surprising and inconsistent with other studies included in the respective literature. Nevertheless, she explains this result by saying that the Cypriot teachers did not distinguish the idea of computer integration in learning form the idea of constructivist learning. At the same time, she argues that a second explanation could be teachers' level of professional knowledge and the lack of organisational support that are inadequate to allow computers to be used in constructivist ways. With respect to organisational support, she notes that the 'tyranny of the curriculum' as well as the national standardised tests for determining educational opportunity and attainment, operate as 'gravitational force' that discourages teachers from taking risks or loosening the reign over classroom processes.

4.3.1.3 Teachers' attitudes toward ICT

The successful and effective use of technology in the classroom seems to be depended on and influenced by teachers' attitudes and beliefs toward ICT (Yildirim 2000; Christensen 2002; Vannatta and Fordham 2004; Angers and Machtmes 2005; Brinkerhoff 2006). Teachers' personal feelings and attitudes to ICT, play a substantial role in determining what will and will not be considered when implementing technology into their teachings (Mumtaz 2000; Rogers 2000). On the one hand, if teachers have a high value for ICT, and their attitudes toward it are positive, the more likely will be to use it in their teaching (Cox et al. 1999). On the other hand, if teachers' attitudes toward technology are negative, they may become a major barrier to adopting technology in their practices (Rogers 2000; Brinkerhoff 2006). In this sense, teachers' negative attitudes toward ICT can affect the learning process (Yildirim 2000), since as suggested, these attitudes not only pose difficulties in the use of technology per se, but can also cancel the learning benefits expected to emerge from the instructional reform it entails (Demetriades et al. 2003).

It is easy to say one must have the right attitude toward technology; however, understanding teachers' attitudes to technology is characterised as a jigsaw puzzle with many pieces that are needed to be filled in (Kadel 2005). Therefore, it is suggested that technology planning should include strategies for changing and addressing teachers' attitudes toward ICT (Rogers 2000), since as believed, they are one of the main reasons why teachers are often resistant to change (Christensen 2002). Teachers are often resisting to the changes that technology brings about because they have concerns about its influence on issues regarding their work (Angers and Machtmes 2005). As discussed in Chapter 3, a way of dealing with this problem is to provide the teachers the chance to look at new developments and examples of technology used in educational practice and also to try them. In this way, they will become aware of the opportunities technology offers, they will realise the educational purpose of ICT, they will gain experience, and eventually, they might find the diverse technological resources fascinating, involving, and useful (Dawes, 2001). Teachers must be convinced that technology can more effectively achieve or maintain a higher-level goal than what has been used. They must be reassured that using technology will not cause disturbances to other higher-level goals that they evaluate as more important. Also, they must be convinced that they have the ability and resources to use technology (Zhao and Cziko 2001). It must be clarified to them that learning to use technology as an instructional tool requires willingness to make mistakes and to learn from them (Angers and Machtmes 2005). In this way, with familiarity, teachers' anxieties and fears will decrease, while their confidence will increase, which may greatly influence the effective implementation of technology in the classroom (Christensen 2002).

4.3.1.3.1 Research on teachers' attitudes toward ICT

The results of a qualitative study conducted in two US schools by McGrail (2005), showed that teachers' attitudes toward technology played a key role in shaping their use of technology in their classroom practices. Specifically, McGrail notes that teachers described their attitudes toward technology through considerations of gain, dilemmas, and concerns with regard to their own or their students' computer applications. The teachers showed ambivalence about technology, which according to McGrail was due to organisational problems, pedagogical concerns, and personal struggles in relationships with technology-literate students and school administration. Nevertheless, the teachers appeared to be willing to accept the technological change as long as they were convinced that it would allow them to see the gain for their students as well as for their own instructional practices. McGrail concludes that for the teachers in this study, ICT was more of a problem with multiple facets rather than a solution or ultimate goal for their practices. The participant teachers indicated that their main responsibility was to help student master the curriculum material, and that they viewed technology as a supplementary tool rather than a change agent. This attitude was shared not only by the teachers who resisted technology due to their low knowledge and comfort levels, but also by the teachers who welcomed technology.

A study regarding the introduction of ICT in Greek schools was conducted by Demetriades et al (2003), which indicated that the introduction of ICT schools, although long awaited and strongly supported, had encountered significant problems related to teachers' attitudes. The researchers note that even though teachers were seemed to have accepted the rationale for using ICT in school, and realised that technology slowly but steadily found its way into the classroom, they were worried about their ability to overcome possible technical problems and to handle the various technological resources, which in turn, made them feel insecure and reluctant to implement ICT to support their teaching. Additionally, teachers were found to be strongly oriented to fulfilling the already established school instructional targets, ignoring in a strong degree any innovative learning activity that would change their practices. The researchers suggest that this may be due to the fact that teachers were in doubt on how to proceed with the use of ICT tools and what exactly ICT had to offer to school.

Cox et al (1999) investigated how teachers perceive ICT's contribution to teaching and learning. Their investigation was focused on the teachers' perceived ease of use and perceived usefulness of ICT, since as they note, if teachers perceive ICT to be easy and useful to them, their teaching and their pupils learning, then they are more likely to have positive attitude to the use of ICT in the classroom. The study's results showed that teachers who were already regular users of ICT had confidence in using it, perceived it to be useful for their personal work and for their teaching. They were also planning to extend their use further in the future. The researchers also found that the factors that are related to the perceived usefulness of ICT are equally important with the acquisition of basic IT skills by teachers. In this way, they suggest that if teachers are to be convinced of the value of using ICT in their teaching, their professional development programmes should include training in pedagogical issues as well.

The aforementioned study in Scottish schools conducted by Williams et al (1998), showed that teachers' attitudes toward ICT were varied, and that teachers had mixed feelings about technology's introduction into the classroom. It was evident by the research's results that teachers were not questioning the potential value of ICT and that they were interested in developing their skills and knowledge; however, a number of them were caught up in a kind of 'technophobia' and a resistance to learning about computers because they perceived it to be too difficult. Also, many teachers who were not using ICT in their teaching were found to be overwhelmed by the pressures to integrate technology. They worried about the pace of developments, felt that they could not cope with the jargon associated with computers, and also quite worried about their own lack of skills and knowledge compared to that of their pupils. The researchers found that the negative attitudes among teachers were associated with awareness of the difficulties they had to overcome in order to be able to use ICT effectively. Based on these results, the researchers note that they found a significant correlation between levels of use of ICT and teachers' attitudes.

What is more, personal attitudes towards computer technology was reported as the most important and significant factor in terms of integrating computers in classroom practices, by the teachers who had taken part in the study carried out by Eteokleous (2008) in Cyprus primary schools. Further analysis of the research's data also showed that this factor was one of the most significant predictors for student classroom computer use. At the same time, the analysis of the qualitative data indicated that, teachers' beliefs that the computer was an extremely important tool for students to possess, was one of the factors that facilitate a teacher to adopt and apply computers in their teaching practices. Based on these results she notes that teachers' attitudinal factors may help explain why classroom computer usage remains limited even when technology is provided abundantly. Therefore, she suggests that it is important to give more attention on the human aspect and not to ignore teachers' beliefs when implementing instructional change since they can lead to disappointing results.

Also, Karagiorgi (2005) conducted a study to examined how the pilot schools, which were taking part in the experimental programme for the initial introduction of computers in primary education, responded and adapted to the programme. Both quantitative and qualitative data were collected from the stakeholders involved in the programme (teachers, ICT coordinators, Headteachers, students), from four pilot schools. The study's results revealed that there was a general agreement with ICT introduction in primary schools as well as a general support for the innovation. Nevertheless, Karagiorgi notes that this should be interpreted with caution since the absence of experiences with concrete, high quality usage of ICT could have led to superficial support and positive attitudes towards the innovation. Based on this, she notes that the study revealed that the ICT coordinators had positive attitudes towards technology on the personal level and seemed theoretically convinced of its educational value, although they had doubts about the institutionalisation of the innovation. The Headteachers, indicated their lack of experiences with respect to computer use, but in the context of their perceived role, they were doing their best for the innovation's successful integration. Students were found to be excited about computers' introduction in their classrooms, but expressed complaints that computer use was restricted and regulated by their teachers. Finally, but most importantly, the study showed that teachers were holding positive attitudes about ICT only in theory, since most of them hesitated to get involved. Karagiorgi attributes this situation to teachers' lack of faith in the educational value of ICT, but also to the inadequate infrastructure.

4.3.1.4 Teachers' technology self-efficacy beliefs

The concept of self-efficacy was discussed in Chapter 3, as a significant construct of social cognitive approach to learning. It was mentioned that self-efficacy refers to "beliefs in one's capabilities to organise and execute the course of action required to produce given attainments" (Bandura 1997:2). Namely, individuals who feel that they will be successful in a given task are more likely to be so, because, as suggested, "they adopt challenging goals, try harder to achieve them, persist despite setbacks, and develop copy mechanisms for managing their emotional states" (Ross et al. 2001:142). Additionally, efficacy beliefs can affect how much effort people put forth, how long they will persist, and how resilient they will be in dealing with failure or stress (Littrell et al. 2005). Contrarily, individuals who believe that they will fail avoid expending effort because failure after trying threatens self-esteem (Ross et al. 2001). Self-efficacy perceptions influence decisions about what behaviour to undertake, affect the emotional responses like stress and anxiety of the person who performs the behaviour, as well as the actual performance attainment of the person regarding of this behaviour (Torkzadeh and VanDyke 2002; Gong et al. 2004). In this way, the concept of self-efficacy is considered to be important since it provides understanding about how individuals quickly adopt new tools and easily develop considerable skill in the use of those tools (Compeau and Higgins 1995; Torkzadeh and VanDyke 2002).

Based on these, it can be assumed that a strong link exists between self-efficacy beliefs and an individual's reactions when adopting and using the various technological resources: an individual's beliefs about his/her capabilities to use technology successfully could be related to decisions about whether and how much to use technology (Compeau et al. 1999). In this context, it is noted that computer self-efficacy exerts influence on individuals' expectations of the outcomes of using computers, their emotional reactions to computers in terms of affect and anxiety, as well as their actual computer use (Gong et al. 2004). Successful or unsuccessful interactions with technology, positive or negative attitudes toward computers, as well as emotional responses to technology use like affect and anxiety, are respectively influences on an individuals' computer self-efficacy (Compeau et al. 1999; Torkzadeh and VanDyke 2002). An individual's self-efficacy can also be influenced by the encouragement of others in the workgroup, and by others' use of ICT (Compeau and Higgins 1995).

Consequently, self-efficacy beliefs also appear to influence technology integration in schools and teachers' adoption and use of ICT in their teaching. Teachers' beliefs in their capacity to work effectively with technology is believed to be a significant factor determining patterns of classroom computer use (Albion, 1999), and are therefore considered as another facet of the attitudinal barriers toward technology integration in the classroom (Brinkerhoff 2006). It is noted that even if a teacher believes in the value of integrating technology in the classroom, he/she may discouraged from attempting it if belief in the personal capacity to implement the various technological resources is not strong (Albion and Ertmer 2002). In this context, technology self-efficacy is a pivotal concept that can provide understanding about technology's acceptance, implementation, and use (Torkzadeh and VanDyke 2002), and can be perceived as a useful indicator and as an effective measurement of likely success in technology integration and technology planning in schools (Albion, 1999; Torkzadeh and VanDyke 2002). In this way, investigating the concept of teachers' technology self-efficacy can provide insights on how to approach teacher education and professional development with respect to ICT, so as to result in increasing self-efficacy for teaching with technology (Albion, 1999).

4.3.1.4.1 Research on technology self-efficacy beliefs

Gong et al (2004) carried out a study to identify some of the key determinants that affect teachers' acceptance of ICT. They surveyed 146 teachers in Hong Kong in order to evaluate a theoretical model for explaining teachers' acceptance of ICT. The analysis of the collected data showed that teachers' perceived usefulness of ICT had both a direct and indirect effect on intention to use. Also, it was shown that teachers' perceived ease of use had a significant effect on their attitudes toward ICT and their perceived usefulness. Furthermore, it was found that teachers' computer self-efficacy had a strong direct effect on perceived ease of use and intention to use ICT, and in this way, on teachers' technology acceptance. Based on these findings, the researchers proposed a number of implications for teachers' professional development. They note that in order to facilitate teachers' ICT acceptance, it is critical to increase their perceived usefulness and perceived ease of use simultaneously. They also suggest that the improvement in teachers' self-efficacy through professional development can enhance technology's acceptance, supporting at the same time that the primary goal of a training programme on ICT should be to increase teachers' computer self-efficacy.

Similarly, Littrell et al (2005) found that teachers' computer self-efficacy, along with other factors significantly predicted ICT utilisation in the classroom. The researchers surveyed 168 K-12 teachers in four rural schools in Tennessee, to assess instructional technology use for classroom management and instructional development. In the light of their study's results they note that their research highlights the importance that self-efficacy plays in the use of instructional technology for classroom management and instructional development purposes. They suggest that if teachers' access to technology resources is assumed to be unhindered, then the reason why teachers avoid using instructional technology would be their low levels of computer self-efficacy.

4.3.2 External or school-level factors

4.3.2.1 Resources

The results from a worldwide survey among national representative samples of schools from 26 countries showed that the most frequent mentioned problems when teachers were asked about obstacles to their use of ICT were related to technology resources (Pelgrum 2001). The literature indicates that the factors and barriers related to technology resources may be relevant to quantitative issues such as insufficient computers, peripherals and software, and lack of Internet access, or qualitative issues such as out-of-date hardware and software as well as slow or intermittent Internet connections (Brinkerhoff 2006). In this sense, the issue of teachers' access to ICT resources is quite complex since a teacher's inability to gain access to ICT resources may be the result of one of a number of factors and is not always simply because the hardware or software is not present within the school (BECTA 2004; Tearle 2004; Tearle 2004). Consequently, there are different kinds of access to resources problems which could be relevant to the lack of resources physically available at the school, the poor quality of the available resources, as well as the organisation of those resources (BECTA 2004; Tearle 2004).

Nevertheless, the actual lack of resources is identified as one of the most pervasive barriers impeding technology integration (Brinkerhoff 2006), and continues to receive by far the most attention by educational stakeholders over the years (Tearle 2004; Tearle 2004). This is due to the generally acknowledged fact that without adequate hardware and software, there is little opportunity for teachers to integrate technology into their practices (Granger et al. 2002; Tearle 2004; Hew and Brush 2007). In this way, the provision of proper amount of technology is a prerequisite for the successful and meaningful introduction and integration of ICT in schools (O'Mahony 2003). The lack of computers and software can seriously limit what teachers can do in the classroom with regard to the implementation of ICT, and consequently may have a detrimental effect on pupils' achievement, since it can prevent teachers from making good use of ICT in their teaching (Granger et al. 2002; BECTA 2004). Moreover, the lack of adequate technological resources in the classroom or in a classroom where the number of students is large and the number of computers is small, can also create classroom management problems which may prevent teachers from using technology in their teaching (Williams et al. 1998; Ertmer 1999; Ng and Gunstone 2003). This denotes that smaller class size and a better ratio of students to computers can lead to more effective computer use (Larner and Timberlake 1995).

Furthermore, even in cases where technology is abundant, there is no guarantee that teachers will have easy access to technological resources. Obsolete hardware and software, the unreliability of equipment, resources which are not robust and are not best supporting the purpose for which they are to be used (Larner and Timberlake 1995; BECTA 2003; O'Mahony 2003; Tearle 2004), are commonly found to be barriers to technology integration and use by teachers, and are related to technology resources. For instance, technical faults with ICT equipment could lead to lower levels of ICT use by teachers and specifically in the cases where the frequency of technical problems is quite high. Teachers' confidence in attempting to use the equipment can be directly affected, because of the fear of it breaking down during a lesson, or the fear to them breaking the equipment themselves. In this way, recurring faults, and the expectation of faults during teaching, are likely to reduce teacher confidence and cause teachers to avoid any future attempt to use technological resources (BECTA 2004; Tearle 2004).

In addition, teachers' effective integration of ICT in their instructional practices necessitates that they are able to access the resources they need, when they need them, without additional organisational requirements (Tearle 2004). Although nowadays there is great progress in bringing computers and networks to schools, there are cases in which teachers' access to this infrastructure is not easy at all. Low and problematic access to technology resources in a school, by both teachers and students, is not only a result of inadequate and unreliable equipment, but also because of inappropriate organisation of the available resources (BECTA 2003; Hew and Brush 2007). For example, in a school where computers are housed in labs or suits, teachers can be said to have access to computers, but they may not have easy access to them, if they have to schedule lab time far in advance and compete with other teachers (Zhao et al. 2002). In this sense, the deployment and organisation of computers exclusively in ICT suites rather than in classrooms is an important issue which may contribute to the emergence of access barriers (BECTA 2004).

4.3.2.2 Support

What is more, in order for teachers to use technology meaningfully and to begin exploring new ways of integrating ICT within their classrooms, multiple types of support are needed (Ertmer 1999). Zhao et al (2002) use the term 'human infrastructure' to describe the organisational arrangements needed to support teachers integration and use technology in their teaching. A human infrastructure should include technical support, administrative support, as well as support through collaboration with peers and senior staff for practical needs (Tearle 2004; Tearle 2004). In this context, support is defined as:

> the administrative leadership and technical assistance offered at the individual schools. It is how the administrators, exemplary computer knowledge teachers, and other support personnel at the school encourage the rest of the teachers to utilise the equipment they have at their disposal (Larner and Timberlake 1995:11).

The lack of any mode of support could become a significant barrier to technology infusion in the classroom (BECTA 2003; 2004).

It is suggested that "the lack of available technical support is likely to lead to teachers avoiding ICT, for fear of a fault occurring that cannot be rectified and lessons being unsuccessful as a result" (BECTA 2004:3-4). In this way, the lack of technical support is considered to be a considerable barrier to technology integration (Rogers 2000; BECTA 2003; Hew and Brush 2007). It is important for teachers to be able to ask for technical support in order to ensure that the needed equipment is in the right location at the right time and ready for use, to solve technical problems, to be available when things go wrong and to provide basic support for teachers trying to improve their own knowledge, understanding and practical skills (Tearle 2004). Therefore, it is suggested that "a healthy human infrastructure should include a flexible and responsive technical staff, a knowledgeable and communicative group of 'translators', or people who can help the teacher understand and use technologies for his or her own classroom needs" (Zhao et al. 2002:502). Appropriate, full-time, and ongoing technical support, which is as necessary as teachers' unhindered access to technological resources (Granger et al. 2002), ensures that teachers will not feel that they have to become technical experts themselves (Williams et al. 2000), since both hardware and software will be maintained or even replaced when breakdowns occur (BECTA 2004; Tearle 2004). Nevertheless, although the provision of strong support infrastructure is essential, it also needs to be effectively deployed, allowing teachers to be aware of what technical support is available and how they can access it (Tearle 2004; 2004).

Moreover, the lack of administrative support can become a major barrier to the infusion of new technologies in a school (Rogers 2000; Hew and Brush 2007). A supportive and positive school administration that adopts policies and procedures related to technology issues, such as hardware and software purchases, professional development for teachers, as well as student access to computers and the Internet (Zhao et al. 2002), encourages teachers to try new technologies and practices (Rogers 2000), and promotes teachers' professional growth in all areas including computer technology (Larner and Timberlake 1995). In this context, the role of school management and administration, and particularly the role of the Headteacher, is to create "the kind of organisational culture which is both forward looking and dynamic, but also sympathetic to the stage which teachers are at in their own ICT skills and knowledge development" (Williams et al. 2000:318). More specifically, the way a school's Headteacher demonstrates his/her beliefs about ICT, through specific actions and examples, significantly influences teachers' adoption of technology (Tearle 2004). Based on these, Headteachers need to be aware of the benefits of ICT across the school, in all contexts, and to set examples by being seen to be using ICT themselves where appropriate (Williams et al. 2000).

Finally, in order for teachers to successfully integrate and use technology in their teaching, a collaborative culture that provides support and promotes learning, needs to be developed in school

(Zhao et al. 2002; Tearle 2004). Schools with such cultures have informal ICT support structure in place, and a well-established recognition of the importance of continually learning and developing new practices (Tearle 2004). Generally, although the school culture is difficult to be described, since it comprises many relationships, beliefs, attitudes and ideologies of the staff, it is a very powerful force in determining the direction of the school. The school culture becomes evident through the norms and routines of the school-day, the behaviours of students, the activities taking place, and the ways in which the school relates with the wider community (Kennewell et al. 2000). In this context, the use of ICT and the informal support among the teachers with respect to ICT are embedded in the culture of the school (Tearle 2004). In this way, it becomes an important facet of the school environment which can produce changes on how the school operates and can help the school remain open and receptive to change opportunities (Kennewell et al. 2000; Tearle 2004). It is noted that the informal support provided within a school culture is quite distinct for the formal technical support since it is based on collaboration amongst teachers (Tearle 2004). Through ongoing conversation with colleagues and other experts, engagement in joint technology projects, and shared planning time with colleagues, teachers can gain access to a supportive network which can empower them, first to envision and then to achieve, meaningful technology use (Ertmer 1999).

4.3.2.3 Research on resources and support

Tearle (2004) conducted a research in three British schools to explore the factors that may contribute to facilitating or encouraging teachers to use ICT for teaching and learning. She collected data via questionnaires addressed to all staff in the three schools, from interviews to selected participants, and finally via contextual observations. Among other key findings, the research revealed that the participant teachers considered good access to computers for teaching as the most significant factor affecting their use of ICT in the classroom. The availability of subject-specific software or peripherals, as well as the good school-based access to computers for professional use outside lessons, were found to be the following more significant influential factors. Tearle notes that these access issues were regarded as more important than technical support, the support from colleagues, other matters related to whole school view of ICT, and the support from the senior management. However, she argues that although access to resources continued to dominate teachers' responses, the situation was shifting. The research revealed that teachers were not simply concerned about the shortage of resources, but also about the nature and flexibility of their access to the available resources. In this way, she underscores that the resources must be readily available, robust and well suited for their planned use, pinpointing simultaneously that frequent reliability problems of equipment can have a devastating effect on use and on teachers confidence.

Tearle (2004) conducted another research which intended to test a theoretical framework about the factors affecting the implementation of ICT in UK schools. She tested this framework, which derived from the respective literature, using a single case study in a specific school. The study showed that the issues regarding 'good resourcing' can become a significant barrier to technology. Further exploration of this conclusion revealed that issues like the carefully planned location of computer suite and access to them, the reliability of machines, and the up-to-date software are factors affecting teachers' access to technology resources. In this way, Tearle suggests that the teachers' requests for resources were at quite an advanced level, since they mostly regarded flexible access in terms of time and location, and not simply about the numbers of technology equipment available.

Similarly, the research in Scottish schools conducted by Williams et al (2000) showed that the lack of availability of some ICT resources was the main reason given by primary teachers for not using technology in their teaching. Nevertheless, the researchers note that this does not mean that there were not any other inhibiting factors affecting teachers' ICT use, but as they argue, access to the technology tends to override all other factors in determining use. For example, although the research revealed that the lack of support was not reported as a strong inhibiting factor, the interview data and additional comments by teachers showed that an ongoing support was an issue that concerned many teachers. In this way, they suggest that the importance of factors like support was masked by the fact that teachers were overwhelmed by the lack of access and the lack of availability of ICT resources, which were considered as the predominant inhibiting factors.

Furthermore, BECTA (2004) published a report about the barriers affecting teachers' ICT use. The report brought together evidence from a range of sources in the literature as well as from a small scale survey carried out by BECTA. The findings showed that teachers' confidence with respect to ICT use was directly affected by barriers like the amount of access to ICT that teachers had and the amount of the available technical support. The survey showed that despite the fact that the levels of ICT equipment was increased, a significant number of the respondents identified the lack of hardware as a possible ICT barrier. At the same time, many respondents in the survey noted that their schools' hardware was kept and used in ICT suits, a policy which was generally causing many access problems. Also, the survey confirmed that although the pupil/computer ratio was quite low, and the variety of software was satisfactory, the old and poorly maintained hardware in schools, in combination with the often inappropriate available software respectively, were considered to be significant barriers for effective and meaningful technology use. Finally, many respondents to the BECTA survey agreed that there was a need for increased technical support.

Franklin (2007) conducted a quantitative study to examine the ways elementary teachers used computer technology and the factors influence their use. The data were collected from 121 recently graduated teachers. The study showed that the participant teachers had a vision, an ideal, of how to integrate technology but as they noted they were not able to achieve this vision due to a number of factors and barriers. In this way, teachers' uses of computers were primarily for preparatory and communicative tasks. Leadership, access and availability, personnel support, and other external constraints were among the factors that influence teachers' technology integration into the classroom. Particularly, access and availability to technology resource, as well as leadership, were found to be significant predictors of teachers' use of technology.

Norris et al (2003) carried out a large scale survey covering large and small districts around the US and collected data from approximately 4,000 K-12 teachers. They found a significant and substantive correlation between technology access and use. They note that “almost without exception, the strongest predictors of teachers’ technology use were measures of technology access” (p:16). Moreover, it was evident from this research that other teachers’ personal characteristics and also demographic characteristics were of relatively little consequence in predicting technology use. In this context, the researchers suggest that these results refute the conventional wisdom that adoption and integration of technology into K-12 classrooms are somehow based on or related to individual teacher attitudes and attributes. Rather, the results showed that use of technology is almost exclusively a function of teachers’ access to technology resources. In this way, they argue that having a computer in the classroom is not access, nor will lead to significant student use or have an impact on student learning.

What is more, O’Dwyer et al (2004) conducted a research in 96 schools in 22 Massachusetts districts, and collected data via a survey addressed to 1,496 elementary teachers, in order to examine how technology was being used by teachers. The researchers examined use of technology in four different ways: teachers’ use of technology for delivering instruction; teacher-directed student use of technology during class-time; teacher-directed student use of technology to create products; and teachers’ use of technology for class preparation. Among other results, the research showed that increased availability of technology was likely to result in increased use of technology in all different ways explored, except of teacher-directed student use of technology to create products. Also, it was revealed that the quality of the available technology was not strongly associated with any of the four uses. However, the researchers note that the relationship was negative but weak and not statistically significant. Finally, the study showed that organisational characteristics such as districts’ and schools’ leadership practices and emphasis on technology, were found to be associated to all different ways of technology use in schools.

The results of a study in Australian schools and specifically in the state of Victoria, conducted by Ng and Gunstone (2003), revealed that a number of obstacles stood in the way of teachers using computer-based technologies in their teaching. The difficulty in getting access to computers and associated equipment, the lack of suitable software programmes, as well as management issues in terms of student behaviour, related to a lack of equipment and technical skill to use the hardware and software, where found to be significant barriers to technology use. The researchers note that these obstacles are interdependent like a ‘chain’ where a broken linkage at any point would produce negative effects in technology use in schools.

With respect to the Cypriot context, the study conducted by Eteokleous (2008) revealed that teachers’ use of ICT is influenced and hindered by a wide range of factors, which she summarises in three major categories: professional factors, organisational factors, and attitudinal factors. Among the organisational factors, she includes resources-related factors, like the lack of computers, the lack of other equipment, the lack of prepared materials from district and Ministry officials which could help teacher know when, where, and how to use ICT as well as the intended objectives and expectations, and finally, the lack of basic Greek language software. Eteokleous notes that through the interview sessions it became evident that the teachers primarily focused their attention on the last two factors. Also, in the organisational factors the low level of support and assistance by the local and district ICT coordinators, is included. She notes that lacking regular support, teachers would be more likely to place less priority on ICT-based instruction. In the same category of factors, teachers’ professional culture and school climate are also included, which according to teachers’ responses in the interviews, are unsuited for promoting any instructional changes. It should be noted that regression analysis showed that school climate was found to be the most significant predictor for students progressive/constructivist classroom computer use. Finally, the category of organisational factors includes the Headteachers’ role. Headteachers’ leadership was reported by teachers as a relatively low important factor for the promotion of classroom computer usage.

The study carried out by Karagiorgi (2005) in four pilot schools, which were taken part in the experimental programme for the initial introduction of computer in Cyprus primary schools, indicated that the newness of computers and the suddenness of their arrival in schools caught many

Headteachers unprepared. Specifically, it was found that three Headteachers in the four pilot schools examined had not had any prior experience with ICT, while their commitment to the specific innovation was different. Although all of them accepted that computers were necessary, and were actively involved in making their schools part of the experimental programme, they were found to be rather ‘passive’ observers of the process. Nevertheless, Karagiorgi notes that they were trying to maintain friendly interaction with the Curriculum Development Unit (CDU) and to consult with the coordinators regarding project issues. They recognised teachers’ efforts, were proud of those involved and understood those who were not, but felt pressurised by parents and their demands and complaints. Based on these, she highlights Headteachers’ support as a critical factor in the successful and meaningful implementation of the project. She notes that it is not necessary for Headteachers to be experienced in the use of ICT at the personal level, but they must be knowledgeable about the programmes’ goals and to be in the position to understand teachers’ needs.

4.4 Summary

This chapter was concerned with teachers’ actual use of ICT, as well as with the factors that affect and influence its meaningful and effective use and integration in teaching and learning processes. As discussed, although the interest in ICT is continually increasing, and although schools and teachers are increasingly pressurised to meaningfully integrate ICT, the literature and the related research indicate that the pace of ICT adoption is quite slow. In order to shed light on teachers’ use of ICT, they ways in which they develop their ICT use competence and integration progress, were examined. In this context, a number of researches on teachers’ use of ICT were discussed to empirically examine the issues raised in this chapter. A common conclusion of these studies was that teachers’ ICT use and integration is dependent on this wide array of factors which are complexly interrelated. These factors could be teachers’ personal and demographic characteristics as well as other factors which could be related to technology itself and contextual conditions.

The following chapter will be about teachers' professional development and training practices with respect to ICT. It is believed that teachers' training in ICT is considerable parameter for the successful and meaningful implementation of ICT in teaching and learning practices.

Chapter 5: Teachers' professional development and ICT

5.1 Introduction

In the previous chapter, teachers' use of ICT in their teaching practices as well as the factors that affect and influence their use and the successful and meaningful integration of ICT in schools, were discussed and explored. Many authors in the respective literature, and many researchers through their studies and proposed recommendations, are boldly highlighting the importance of teachers' technology training for the successful infusion of ICTs in schools. In this way, the aim of this chapter is to address and explore issues that are related to teachers' training on ICT in the context of the offered professional development opportunities.

The chapter is divided into two parts. The first part includes a discussion about teachers' professional development in general, since the specific field informs the undertaken endeavours for training teachers to include and exploit diverse technological resources in their work. The second part of the chapter is about professional development in educational technology. How this type of professional development is differentiated from general professional development because of technology, as well as how its lack affects the successful infusion of ICT in the classroom and teachers' adoption of ICT tools in their work, are examined.

5.2 Teachers' professional development

5.2.1 The importance of teachers' professional development for education

The need for high-quality professional development opportunities for teachers is being emphasised in every proposal for educational reform and in every plan for school improvement (Guskey & Huberman, 1995; Baines, 1999; Guskey 2000: 245; Mouza, 2005). This is also evident with the current ongoing reform of the Cypriot educational system; the need for teacher professional development is highlighted by the educational stakeholders as an essential prerequisite for the reform's successfulness and institutionalisation. The bold emphasis on professional development is based on the widely acknowledged fact that the improvement of schools is first and foremost associated with teachers. Teachers are and will remain at the centre of the educational system, and thus, their professional development remains the most important force in the quest for educational improvement (Adey et al. 2004; Siddiqui 2004). In addition to this, “most of the factors that correlate with effective school outcomes have direct implications for teachers and indirect ones for teacher learning and continuing professional development” (Bolam & McMahon, 2004:36). Any notable improvements in education almost never take place in the absence of teachers’ professional development, and that, at the core of each and every successful educational improvement effort is a thoughtfully conceived, well-designed, and well-supported professional development component (Guskey 2000). Therefore, and in the light of these views, teachers, and their experience and expertise, are considered to be not only schools’ greatest assets (Day 1999), but also their main resources, denoting in this way that their training and development ought to be seen as a significant investment (Earley and Bubb 2004).

In some cases however, the demand for increased professional development is seen as an indication of deficiencies in the knowledge and skills of the teachers, while the increased emphasis on their training is translated as a sign that they are doing an inadequate job. Nevertheless, these views, are restricting the breadth of professional development which is an extremely important endeavour, that is central to education’s advancement as a profession (Guskey 2000). It is noted that “long gone are the days when initial training and induction were seen as a total of final preparation for a career in teaching; nowadays they have to be seen as merely providing a platform on which further or continuing professional development will be built” (Earley and Bubb 2004:5). After all, one of the hallmarks of being identified as a professional is to continue to learn throughout a career. Therefore, “teachers will only be able to fulfil their educational purposes if they are both well prepared for the profession and able to maintain and improve their contributions to it through career-long learning” (Day 1999:2). Based on these, it is demanded from teachers to be well qualified, highly motivated, knowledgeable and skilful, not only when they enter the profession, but also throughout their career (Day & Sachs, 2004).

In addition, it is evident that "never before in the history of education has greater importance been attached to the professional development of educators" (Guskey 2000:3). There are continuing calls for raising standards of student learning and achievement which are mainly expressed through national policies upon the quality of teachers and their teaching in classroom. Also, many efforts are made to ensure that all teachers undertake regular training so that they remain up-to-date with curriculum content knowledge, continue to develop their classroom organisation, teaching and assessment strategies, as well as their leadership roles (Day 1999). Also, a common feature of the diverse educational reforms is that they are calling for teachers to teach in new ways that are substantially different from how they were taught and how they learn to teach (Darling-Hammond and McLaughlin 1995; Borko & Putnam, 1995).

It is interesting to identify the reasons why this is happening. One of the obvious reasons concerns the rapid growth of the knowledge base in education as well as the growth of the knowledge base in nearly every subject-area and academic discipline. This in turn, increases the demands for new types of expertise on behalf of teachers (Guskey 2000). Therefore, it is expected that teachers, like practitioners in other professional fields, must keep abreast of this emerging knowledge and must be prepared to use it to continually refine their conceptual and craft skills (Guskey and Huberman 1995; Guskey 2000). In addition, the social context, within learning is taking place, is constantly changing, and is characterised by intense compression of time and space, cultural diversity, economic flexibility, technological complexity, organisational fluidity, moral and scientific uncertainty (Hargreaves, 1995). Nonetheless, these changes, as well as other changes in occupational and organisational working conditions, have intensified teachers' work in schools by increasing their workloads. Consequently, there is a reduction in trust in the discretionary judgement of teachers, which in turn lowers their morale, self-confidence, and self-efficacy (Day 1999). Based on these, it is extremely important for teachers to keep pace and respond to change in society, while they must retain their energy, enthusiasm and commitment to high-quality teaching (Day & Sachs, 2004).

5.2.2 Defining teachers' professional development

Professional development is not a new concept for education; however, defining this field is not an easy task. This is due to the fact that teachers' professional development is a hugely complex intellectual and emotional endeavour which is at the heart of raising and maintaining standards of teaching, learning and achievement in education (Day & Sachs, 2004). The respective literature refers to the concept of professional development using a variety of terms (Downes et al. 2001). These terms often have overlapping meanings and are usually defined very differently by different authors. Some of these terms could be the following: teacher development, in-service education and training (INSET), staff development, career development, human resource development, continuing professional development (CPD), continuing education, lifelong learning, etc (Bolam & McMahon, Downes et al. 2001; 2004). Nevertheless, Day (1999) has provided a comprehensive definition which reflects to a great extent the complexity of the professional development process:

> Professional development consists of all natural learning experiences and those conscious and planned activities which are intended to be of direct or indirect benefit to the individual, group or school and which contribute, through these, to the quality of education in the classroom. It is the process by which, alone and with others, teachers review, renew and extend their commitment as change agents to the moral purposes of teaching; and by which they acquire and develop critically the knowledge, skill and emotional intelligence essential to good professional thinking, planning and practice with children, young people and colleagues through each phase of their teaching lives (p:4).

This definition reveals that teachers' professional development is not as narrow as knowledge and skill development in the context of in-service education and training (INSET) (Hargreaves, 1995). Nor can it be merely thought as fragmented 'one-shot' workshops and conferences at which teachers passively listen to 'experts' and learn about topics that are not always essential to teaching (Schoales, 1998; Earley and Bubb 2004; Siddiqui 2004). It should not be encountered as something that can be forced, because as noted, "it is the teacher who develops (actively), and not the teacher who is developed (passively)" (Day 1999:97). Viewing professional development in these narrow ways stems from the restricted view of good teaching as a matter of teachers mastering the skills of teaching and the knowledge of what to teach and how to teach it (Hargreaves, 1995). When teachers themselves perceive their professional development under this light, they tend to regard it as having little impact on their day-to-day responsibilities. Their participation in professional development activities is for the wrong reasons, since it is thought as an obligation, and they simply encounter it as something they must ‘get out of the way’ so they can get back to the important work of educating students (Guskey 2000; Mouza, 2005). This kind of professional development in the form of training courses, materials, workshops, and training programmes, is well known and widely practiced (Hargreaves, 1995). As indicated in Chapter 2, this kind of professional development was and still is the main way in which the Cypriot teachers are being developed. However, this kind of professional development should not be rejected altogether; it should be considered as one of a range of professional development opportunities available to teachers (Day 1999).

Day’s (1999) definition shows that teachers’ professional development is a quite complex process. It is not a process that just happens; “it has to be managed and led, and done so effectively ensuring it has a positive impact” (Earley and Bubb 2004:35). It is first and foremost an intentional and deliberate process that aims at enhancing teachers’ professional knowledge, skills, and attitudes, so that they might, in turn, improve the learning of their students. In its context, diverse programmes are planned and many activities are scheduled with specific planned goals that are derived from a clear idea and vision (Darling-Hammond and McLaughlin 1995; Guskey, 1995; Guskey 2000; Wiske et al. 2005). The vision that should guide teachers’ professional development must take account students’ outcomes enhancement, which is after all, the ultimate goal (Baines, 1999; Siddiqui 2004). This in turn denotes that any professional development efforts should help bring about changes in teachers’ practices, and simultaneously, to mobilise teachers to commit themselves to making these necessary changes (Guskey 2000; Earley and Bubb 2004). In addition, along with changes to teaching practices, teachers’ professional development should bring about changes to teachers' beliefs, values, attitudes and behaviours (Smylie, 1995; Earley and Bubb 2004).

Based on what was highlighted in previous chapters, and what it is indicated by the current literature, professional development should encourage and support teachers to adopt a more constructivist view of the learning process (Borko & Putnam, 1995; Herring 2004; Vrasidas and Zembylas 2004; Hartnell-Young 2006). Teachers through their professional development will need to think in new ways about students, subject matters, and the teaching-learning process. This denotes that they need to accept new roles for themselves and for their students, something that definitely represents a substantial departure for their established practices (Borko & Putnam, 1995; Hartnell-Young 2006). It is supported that in the framework of the constructivist approach to learning, professional development can further teachers' knowledge, only if it is compatible with their constructs and their existing knowledge base, as well as when it is related to their perceived tasks (Tillema & Imants, 1995; Kanaya et al. 2005). Teachers' must construct their own knowledge, since it is impossible to reform educational practice by simply telling teachers how to teach differently. Teachers themselves can make the desired changes by constructing a professional knowledge base that will enable them to teach students in more powerful and meaningful ways (Borko & Putnam, 1995). In addition to these, a programme's assumptions about how teachers learn should be compatible with its assumptions about how students learn. This is due to the fact that "change efforts based on an expectation that teachers will receive and practice information and skills presented by others are unlikely to succeed in fostering meaningful changes in the ways in which teachers interact with students" (Borko & Putnam, 1995:59).

The process of teacher change, which is a necessary outcome of effective professional development, is complex, unpredictable and dependent upon teachers' past life and career experiences, willingness, and abilities. At the same time, changing teachers' attitudes and practices takes time, as they are not all at same levels of readiness to learn (Day 1999). Based on these and since teachers are primarily responsible for implementing change, the professional development opportunities available to them, regardless of their form, must be relevant to them and must directly address their specific needs and concerns (Guskey, 1995; Schoales, 1998; Downes et al. 2001; Kanaya et al. 2005; Mouza, 2005). When the breadth of their learning needs is ignored, professional development is restricted and fragmentary (Day 1999). In this way, identifying teachers' agendas, and providing a range of learning opportunities appropriate to their needs, is considered to be crucial to learning and change (Day & Sachs, 2004). Consequently, it is vital that teachers are centrally involved in decisions concerning the direction and processes of their own learning (Day 1999). As indicated in Chapter 2, the provided professional development opportunities in Cyprus – at least before the current reform of the educational system – were to a great extent centrally determined. Although it was claimed that the range of training courses offered to the teachers aimed at addressing their needs, their personal involvement in the decision-making process regarding this issue was limited, their actual developmental needs were externally diagnosed and catered for. This could be one of the major reasons why teachers' participation in the training courses offered by the Pedagogical Institute was limited. Teachers' were not feeling that training was relevant to them, nor were they feeling that it served their actual developmental needs.

Nevertheless, it is contrarily supported that to focus exclusively on individuals in professional development efforts, while neglecting factors like the organisational features and system politics, severely limits the likelihood of success. Change as only an individual process can make professional development an arduous and uncomfortable personal endeavour (Guskey, 1995), while listening to teachers' needs and organising in-service courses and events on this basis only is too limiting (Day 1999). Although, teachers themselves ought to play key role in their personal professional development, the schools in which they work have a great responsibility as well (Earley and Bubb 2004). It is proposed that the teachers' development should be treated as reciprocal, collective, and joint responsibility of both individual teachers and their schools, while institutional and individual needs have to be regarded in a complementary and holistic way in order to be synchronised or at least reconciled (Day 1999; Downes et al. 2001; Earley and Bubb 2004).

Under this light, it is argued that the key is to find the 'optimal mix' of individual and organisational processes (Guskey, 1995), which will ensure that "training and development programmes meet the needs of both individual staff and their schools, minimising any tension that may exist between system needs and priorities (the school development plan) and those of individuals (the individual development plan)" (Earley and Bubb 2004:47). As discussed in Chapter 2, the updated professional development scheme proposed in the context of the ongoing reform of the Cypriot educational system, will attempt to incorporate an 'optimal mix' of processes, by taking into account not only the educational systems' needs, but also each school's contextual needs and also teachers' own personal developmental needs. Consequently, it is expected that the proposed optimal mix of processes will change the current situation in which training is offered without taking into account any of these parameters.

It is stressed that an efficient way to reconcile or synchronise individual and institutional needs in the context of teachers' professional development is to cultivate a collaborative organisational culture (Schoales, 1998; Siddiqui 2004). Culture is about people in the organisational setting and is characterised by the ways in which values, beliefs, prejudices and behaviour are played out within the micropolitical processes of school life (Day 1999). In this context, it is argued that "just as conditions in classrooms affect the ability of teachers to provide the best learning opportunities for students, so the school culture provides positive or negative support for its teachers' learning" (Day & Sachs, 2004:10). A culture of collaboration within schools can help teachers develop, clarify, review, reflect on, and redefine their purposes, missions and visions together, as well as to identify the problems and possibilities for themselves, their students and school (Hargreaves, 1995; Scrimshaw, 1997; Schoales, 1998).

Nevertheless, the organisational culture may be quite different from one school to another, which in turn affects teachers' professional development (Mouza, 2005). In many cases, teachers work in isolation from their colleagues (Downes et al. 2001; Wiske et al. 2005; Hartnell-Young 2006), which means that their opportunities for the development of practice based on observation and critique of that practice remain limited. In these instances, the collegial culture is restricted only at the level of planning or talking about teaching rather than at the level of examining practice itself (Day 1999). In other cases however, when teachers' isolation is replaced with a culture that encourages observation, sharing teaching strategies, trying out new ways of teaching, and getting feedback (Cook and Finlayson 1999; Earley and Bubb 2004; Wiske et al. 2005), collaborative professional communities are constructed which are considered to provide a vibrant form of teachers and school development (Hargreaves, 1995). Therefore, a school ought to be a learning community that its culture should provide time for critical reflection through forms of collaboration and critical discourse about teaching (Day 1999). It should also provide ongoing, group oriented activities with shared goals, responsibilities, and flexible agendas, as well as shared experiences and open exchanges of opinions and ideas. In this way, teachers would be encouraged to jointly identify and solve problems and develop new practices (Smylie, 1995; Downes et al. 2001).

It is advocated that the "responsibility for the professional learning culture of the school is at the centre of the cultural and educative leadership roles of Headteachers" (Day 1999:85). The school culture affects and is affected by its leaders, which means that the Headteachers' effectiveness, their behaviour, their managerial and interpersonal skills, as well as their learning orientations can shape the culture of their schools (Day 1999; Earley and Bubb 2004). The schools' leadership, by avoiding superficial and administratively controlled forms of 'imposed' collegiality, can facilitate the creation and sustention of those conditions in which teacher-led collaboration can flourish (Hargreaves, 1995). At the same time, the way that professional development is seen in a school is also dependent on the role that the Headteacher takes in supporting it (Mouza, 2005). In this way, professional development could be seen as an 'add-on' to the policy implementation roles of teachers or, it could be encountered as an integral part of the conception of school as a dynamic community of learning for both teachers and students (Day 1999).

As mentioned before, education is a dynamic field with an ever expanding knowledge base, not only in every subject area, but also in our understanding of how individuals learn and of the structures and processes that contribute to effective learning environments. It is therefore imperative for teachers to be continuous learners throughout the entire span of their careers so as to keep abreast of this new knowledge. In this way, professional development is not an event that is separate from teachers' day-to-day professional responsibilities; rather, it should be considered as an ongoing process, "woven into the fabric of every educator's professional life" (Guskey 2000:38). It is argued that teachers' professional development can be thought as a 'roller-coaster' with peaks and troughs, since, as one gets better at one aspect of his/her professional responsibilities, then he/she has to begin learning something new (Earley and Bubb 2004). Thus, "over the course of a career it would be reasonable to expect that teachers will have opportunities to participate in a range of informal and formal activities which will assist them in processes of review, renewal, enhancement of thinking and practice, and, importantly, commitment of the mind and heard" (Day 1999:1). The challenge is to take advantage of these opportunities, to make them available and purposeful, as well as to use them appropriately (Guskey 2000). The acknowledgement by the Ministry of education that the Cypriot teachers are not receiving training which would cover the span of their careers, led to preparation of the new scheme for professional development which intends to help teachers receive adequate training throughout their careers. As discussed in Chapter 2, the proposed scheme incorporates a range of training activities, which as expected will result in the systemic and ongoing professional development of teachers.

5.2.3 Effective professional development implementation

The discussion about the importance of teachers' professional development for education, as well as the pinpointing of many of its defining characteristics, leads to other equally significant issues which are related to the effectiveness of professional development. Those who are responsible for teachers' professional development programmes will face many incompatible dichotomies and many difficult questions about how to best design and implement effective professional development opportunities (Guskey & Huberman, 1995). This is due to the fact that teaching and learning process is a complex endeavour that is embedded in contexts that are highly diverse, which means that what works in one situation may not work in another. Therefore, it is noted that it is impossible to make precise statements about the elements of effective professional development programmes, because they are affected by specific contexts that are dynamically changing due to a variety of influences (Guskey, 1995).

One of these questions is associated with whether professional development should be district-wide or site-based (Guskey 2000; Mouza, 2005). On the one hand, when the objective is to implement a systemic reform beyond the school building and the classroom's walls, district-wide professional development opportunities are more appropriate. This is due to the fact that they provide a broader vision of improvement, and that they offer opportunities for collaboration across school levels, as well as for sharing ideas, resources, and expertise. In this way, teachers gain a better understanding of their roles in students' educational development (Guskey 2000). On the other hand, it is evident that in the recent years there has been a move towards site-based, school-focused, school-initiated, and school-provided professional development, because it appears to cost less and be a more efficient way of addressing practical school matters of immediate relevance (Siddiqui 2004). Furthermore, site-based professional development also appears to devolve responsibility for decision-making closer to the school and the classroom (Day 1999). In this way, it holds the promise of greater relevance, since its content and procedures are determined by the teachers themselves, and therefore is more likely to be contextualised. Also, the experience showed that district-wide professional development has relatively poor record of success, because is often consisted of one-shot presentations that have little relevance to the day-to-day problems of school teachers. Simultaneously, it seldom includes sufficient follow-up and support for the successful implementation of new practices (Guskey 2000).

Based on these views, which of the two options is the most effective professional development design? Although site-based professional development is often considered more contextualised and more relevant, if school-provided models of professional development focus primarily on teachers' responsibility for improving instruction and give little or no attention to organisational or social factors that influence their instruction and the curriculum, they may come to be seen as compensatory. If school site-based professional development remains the only route to professional development for most teachers, their opportunities to extend their professionalism will be constrained (Day 1999). In this context, it can be stressed that both learning in and out of the workplace are necessary and that the balanced combination of sites could be more effective (Day 1999; Mouza, 2005). It is obvious that the new scheme for teachers' professional development in Cyprus – as a result of the ongoing reform of the educational system – attempts to incorporate a balanced professional development design in which both district-wide and school-based training initiatives are promoted. According to the proposal prepared by the Ministry of education, teachers' professional development will be consisted of compulsory and optional training activities both in schools where teacher work but also outside the school premises.

A second extremely important question that needs to be answered is related to what professional development models are the most appropriate. It is nowadays acknowledged that many conventional forms of professional development are top-down and isolated from school and classroom realities, and therefore they do not have much impact on classroom practice (Guskey 2000). Also, more current views on teachers' professional development have departed from old norms and models like 'pre-service' and 'in-service' training (Darling-Hammond and McLaughlin 1995). These new views have led to new professional development models that present teachers with a wide range of options and opportunities to enhance their professional knowledge and skills (Guskey 2000). Also, as it will be discussed Section 5.3.3, the emergence of the worldwide web, the expansion of ICT, as well as the development of e-learning, have made possible professional development methods and approaches that were previously unthinkable (Bolam & McMahon, Downes et al. 2001; 2004; Siddiqui 2004). These new models of professional development could include the following: training, observation/assessment, involvement in a development/improvement process, study groups, inquiry/action research, individually guided activities, mentoring, collaborative/complementary partnerships, networks, professional communities, etc.

In this context, which model of teachers' professional development is the most appropriate and effective? The various models of professional development available to teachers differ in their assumptions, expectations, and beliefs about professional growth. At the same time, their appropriateness is dependent on the goals, the content, and the context for implementation. The implicit and explicit demands they make on the individuals involved also differ, as well as the orientations for change from which they derive. In this sense, and because of these differences, it is unlikely that any single model will prove effective for all individuals under all conditions. Therefore, a professional development plan based on a combination of models, can take advantage of the positive attributes of several models. In this way, combining models in thoughtful ways can provide a highly effective means to professional growth and improvement at both the individual and organisational levels (Guskey 2000).

Based on these, and since all professional development efforts are bounded by their particular context (Mouza, 2005), it is quite difficult to determine what constitutes the ideal in teachers' professional development. It is argued however, that rather than providing strict requirements, it is better to define and offer a framework for developing in which optimal mix of professional development processes will work best in a specific context at a particular point of time (Guskey, 1995). Therefore, and broadly speaking, the ideal professional development:

> sees educators at all levels constantly in search of new and better ways to address the diverse learning needs of their students. It sees schools as learning communities where teachers and students are continually engaged in inquiry and stimulating discourse. It sees practitioners in education respected for their professional knowledge and pedagogic skill (Guskey, 1995:126).

Nevertheless, and as mentioned before, there is no 'one right answer' or 'one best way' to achieve the vision presented in the quotation. The exact process for achieving the ideal professional development is blurred and confused, and there are multiple ways which should be adapted to the complex and dynamic characteristics of specific contexts. Finding the optimal mix of processes and professional development elements will ensure that their careful, sensible, and thoughtful application in a particular setting could result in success (Guskey, 1995).

It appears that the updated professional development scheme, proposed in the context of the reform of the Cypriot educational system, is to a large extent based on contemporary notions regarding teachers' training as they were presented and discussed in this section. It is obvious that efforts were made to produce a mixture of training approaches and processes which as believed will provide teachers with several options and opportunities for their effective professional development. As indicated in Chapter 2, the policy-makers who are responsible for the reorganisation and enhancement of teachers' training had taken into account several factors concerning the specific context of the Cypriot educational system, in order to produce an 'optimal mix' of professional development approaches. These approaches are linked with other innovations promoted for the reform of the educational system, like teachers' mentors and councillors. Although these plans constitute a great step towards the effective reorganisation of teachers' professional development, their sound implementation in schools and teachers' interest to participate in the various training activities, will be defining factors for their successfulness. Also, the actual implementation of the updated professional development scheme will reveal whether it will have a meaningful impact on teaching and learning processes as well as it will bring about the intended changes sought by the reform of the educational system.

5.3 Professional development of teachers in ICT

Teachers' general professional development traditionally encourages them to alter their practice and make changes to their instructional approaches within a relatively familiar zone of operation. Whether the professional development opportunities are challenging or not, they usually promote changes within a relatively safe, traditional classroom structure and a school context that are familiar to teachers (Staples et al. 2005). Nevertheless, the case with the ICT-related training the position is somewhat different, since general teacher professional development does not entirely address the issues of how to best conduct professional development in educational technology (King 2002). Even with a clear understanding of the professional development research and principles, teacher training about ICT requires another layer of consideration; ICT staff development has significant and unique qualities that makes it different from other types of staff development (Schrum 1999).

Generally speaking and as discussed in Chapter 4, this is due to the fact that technology has the ability to confuse, intimidate, and frustrate learners and users (Schrum 1999; King 2002). Learning to cope with entirely new technology knowledge bases and skills is a complex process for all. Taking also into consideration that teachers are urged to immediately and proficiently transfer these knowledge bases into the classroom and through them organise innovative educational applications, their professional development needs are definitely more increased (King 2002). In this way, as technology is introduced into schools, things become much more complex, and teachers need to 'juggle' multiple levels of professional development and expertise, moving back and forth between technology itself and the curriculum (Staples et al. 2005). Therefore, it can be argued that even though some of the identified principles of effective professional development have implications for learning to teach with technology (Mouza, 2005), technology-specific professional development has its own unique features. Consequently, finding effective ways to support teachers in their effort to integrate technology in their classrooms is becoming a perplexing professional development challenge (Maloy et al, 2005). Teacher development for instructional technology, which, as argued, lacks an empirical or theoretical basis (Margerum-Leys & Marx, 2003), needs to be based on what construed as 'best practices' for teacher professional development (Holland 2001).

Moreover, the need for quality professional development in the use of ICT is considered to be a necessity if teachers are going to build real capacities in teaching with technology and to acquire the skills necessary to make the most of the digital resources available in their classrooms (Mouza 2003). The developments in the application and dissemination of knowledge due to ICT, as well as technology's overall potential to bring about changes to the teaching profession, are altering the demands in education (Siddiqui 2004). It is widely acknowledged that these demands and issues could be met and addressed through effective training in technology. Professional development is the primary key for the successful introduction of technology into classrooms, while teachers' participation is crucial to the success of any effort a school community hopes to implement (Schoales, 1998; King 2002; Mouza 2003).

5.3.1 The lack of professional development as a factor affecting teachers' use of ICT

As discussed in Chapter 4, technology-driven instructional reforms often fail to institutionalise, while low-level technology use is almost evident in all schools. Many authors in the respective literature attribute this state of affairs to a number of personal, contextual, and technology-related factors. Among this wide range of factors the lack of opportunities for teachers to learn about and practice with the use of ICT, is also included (Siddiqui 2004; Willis and Cifuentes 2005). Consequently, planning for and implementing training and professional development for teachers are considered to be critical components for the successful implementation of an innovation like the introduction of ICT in the classroom (Hill et al, 2005). It is stressed that only when teachers are well trained does an innovation become part of their teaching repertoire (Schoales, 1998). Teachers' adequate professional development and preparedness to respond to the great diversity of technological resources are considered to have a profound importance for the effective and innovative use of technology in the classroom to support student learning and enhance teachers' instructional practices (Brand 1997; Mouza 2003; Staples et al. 2005).

In the context of Chapter 3 and Chapter 4, it was made clear that just abundantly having the technology in place does not immediately result in it being used to further educational attainment (King 2002). The challenge is not getting the technology and computers into schools, but meaningfully integrating ICT into the teaching and learning process to improve the learning outcomes (Siddiqui 2004). Nevertheless, a dichotomy is often invoked in discussing the implementation of technology in schools. In this dichotomy, the purchase and upkeep of hardware and software is pitted against investing in teachers' professional development (Staples et al. 2005). Traditionally, the primary concern was the acquisition of equipment, rather than the allocation of adequate funds to the professional development of teachers, based mainly on the belief that hardware, software and connectivity alone will improve the quality of education (Mouza, 2005). In this way, professional development in ICT has seldom kept pace with the purchase and installation of technical equipment (Herring 2004). The same pattern of actions was also followed in the case of the Cypriot educational system: the primary concern of the policy-makers and stakeholders responsible for the introduction of ICT in schools was to equip schools with computers and other ICT resources without adequately taking into account teachers' training to effectively use the available equipment. However, the emphasis on equipment without providing sufficient funding for the staff learning, which as suggested, is required to win a reasonable return on the huge investments being made, is like 'putting the cart before the horse' (McKenzie 2001). Consequently, just having the equipment in place and expecting teachers to figure it out for themselves, following the time-wasted approach of 'sink or swim', will definitely guarantee failure to integrate ICT in schools (Schoales, 1998).

Fortunately, it evident that nowadays financial resources are also being allocated for teacher professional development in educational technology (King 2002; Siddiqui 2004). It is now more widely accepted that it is not a case of privileging acquisition of equipment over professional development or teacher technology training over installation of technical equipment. Rather, professional development and ICT resources acquisition considerations need to take place simultaneously, in the context of an effective overall planning for technology integration in schools (Staples et al. 2005). After all, as discussed in Chapter 4, access to quality equipment is also a factor that contributes to teachers' use of technology in their teaching. Even when teachers are well-trained, unsatisfactory access to equipment and inadequate technical support, could limit their efforts for instructional change (Mouza, 2005). Therefore, thoughtful planning for technology integration takes a special understanding of the acquisition of hardware and software specifically as it related to the curriculum, while professional development anchors technology in the curriculum (Staples et al. 2005).

Moreover, although in many cases teachers participate in professional development programmes, their technology applications in classroom teaching remain limited or inefficient to bring about considerable instructional changes. This is often attributed to the fact that ICT training is best served through traditional models of professional development, and particularly one-shot INSET (Roblyer and Edwards 2000). As discussed in Section 5.2.2, traditional models of professional development have proved to be ineffective in inducing any significant difference in schools. It can therefore concluded that in the profoundly demanding area of technology, teachers' opportunities to learn during traditional professional development activities is lacking (Siddiqui 2004). In-service workshops, access to 'outside experts' as well as other forms of traditional staff training, rarely promote new attitudes and behaviours, since the demands of the teachers' daily work do not allow them to fully assimilate theoretical concepts about technology applications or recall specific 'how to' strategies for using the various ICT resources. In this way, and as time passes, teachers avoid using those technologies they do not fully understand (Maloy et al, 2005). Additionally, it is evident that learning to use ICT is not a single one-off experience; rather, it should be considered as a continual cycle of personal development (Cook and Finlayson 1999). The issue of sufficient time was pinpointed in Section 5.2.2, as an essential ingredient for effective professional development. Taking into consideration that teachers develop new ICT skills gradually over time, then 'one-shot', 'sit-and-get' training sessions, as well as 'one-size-fits-all' models should be considered inadequate and ineffective for helping teachers devise methods to use ICTs as instructional tools (Schoales, 1998; Roblyer and Edwards 2000; Mouza, 2005).

Based on these, it can be noted that although the lack of professional development is often reported in terms of quantity, quality is also considered to be an important issue (Mouza 2003). If ICT is going to be integrated successfully in schools, new quality models of professional development in ICT are needed, that will maximise the effectiveness of teachers' training. This denotes a huge undertaking which incorporates areas of school reform that extend far beyond the ability to use a computer. Therefore, a professional development programme that results in teachers successfully integrating ICT into their classroom practices requires changes in perspectives at every level of the education enterprise (Schoales, 1998).

5.3.2 Essential features of teacher professional development in ICT

In this framework, what are those essential features that make professional development in ICT effective? On a first consideration, it must be clarified that focusing teacher training on simple technology skills is not enough (Vrasidas & Glass, 2005). However, many ICT training programmes offered to teachers, concentrate on technical matters, such as how to operate particular software packages, leaving in this way the consideration of how to use these resources in teaching squeezed into whatever time is left at the end of each session (Somekh, 1997; McKenzie 2001). The structure of the training programmes included in the ICT training scheme offered by the Pedagogical Institute of Cyprus (Section 2.5.3), is based on this philosophy. Most of the teaching periods included in the available programmes are allocated for training on ICT basic skills and for training on the use of specific software packages. The teaching periods allocated for training on specific applications of ICT in teaching are considerably fewer. It is however pinpointed that just learning how to use computer hardware and software does not mean that teachers immediately know how to best use this technology for educational purposes in their specific teaching context, while their knowledge becomes too specific to be applied broadly, and is quickly becoming outdated (King 2002; Mishra & Koehler, 2003). Learning how to integrate technology into the classroom requires attention to multiple additional dimensions besides mere technical training (Wiske et al. 2005). It should not be confused with deep training to master complex technological skills; rather, it is concerned with understanding how ICT restructures and recontextualises the goals of learning, and knowing the implications of this for teaching (Gura and Percy 2005). Moreover, it is possible that teachers are technologically highly skilled, but unable to transfer those skills to their classroom (Demetriades et al, 2005; Willis and Cifuentes 2005). Therefore, technology professional development must find ways to give teachers a wide range of skills which will lead to technological know-how that can impact classroom teaching. Nevertheless, it must also address how to help teachers develop a deeper understanding of the concepts and skills that are not limited to specific instances of technology (Mishra & Koehler, 2003).

In addition to these, and as discussed in Chapter 3 and Chapter 4, ICT integration is a process of adopting an innovation (Marcinkiewicz, 1998). However, it was indicated that a number of teachers resist the pressures to adopt this innovation, and is partly due to the extensive technical knowledge required for using it in the context of their work (Riel et al, 2005). When ICT training is mainly focused on ICT technical skills has the disadvantage that it concentrates upon the area of teachers' weakness rather than building upon their existing professional knowledge (Somekh, 1997). Besides this, teachers are mainly concerned with what and how students learn. This means that they are more concerned with issues related to education rather than to technology, and are more interested in the nature of learning rather than in the nature of technology (Bruntlett, 2001). Therefore, unless teachers believe in this innovation and feel a sense of ownership, it is very unlikely that they will introduce it effectively (Somekh, 1997). If teachers are going to be convinced to change their practice by integrating technology, they must see the relevance of technology to what they do in the classroom (Brand 1997). If they cannot see any real benefit, and are not convinced about ICT's value, combined with the fact that many of them perceive themselves to be technologically incompetent and demoralised when they first begin to use it, they may introduce some elements at a minimal level, but will perceive them as impractical and educationally indefensible to make changes (Somekh, 1997). In this context, it is proposed that professional development should build on teachers' expertise and experiences, prepare them with the technological terminology, and facilitate their understanding and practice of technological applications in education (King 2002). In this way, they will realise that a direct connection exists between technology and their own curriculum (Mouza, 2005).

The introduction of computers in the Cypriot educational system in the early 1990s was not accompanied with sound actions and training activities that would help teachers develop a sense of ownership of this innovation. Computers were suddenly introduced into the classrooms while teachers were asked to immediately start finding effective ways to use them. Simultaneously, according to the official recommendations by the Ministry, at least at the beginning of this process, computers should have been dealt by the teachers as an additional teaching tool to facilitate the fulfilment of pre-existing objectives in the curriculum. In this context and as indicated in Chapter 2, this could be one of the reasons why computers did not manage to permeate the curriculum nor did they induce any worthwhile changes in teachers' teaching repertoire. Teachers did not enthusiastically welcome computers in their classrooms since they were not convinced about their educational value, and were concerned and unsure not only about technological matters but also for their ICT-use competence and skills.

Nevertheless, it must be noted that the importance of technical skills for technology's integration into schools should not be underestimated. In order for teachers to understand the potentials of technology for teaching and learning, they need to firstly acquire some basic skills on usage and troubleshooting (Collins, 1998; Mouza, 2005). Although this viewpoint is in contrast to what was supported in the previous paragraphs, it is self-evident that if teachers are to understand how to organise the classroom and to structure learning tasks to make ICT resources a necessary and integral part of their teaching approaches, they need to be competent and confident users of the hardware and software available to them (Somekh, 1997; Collins, 1998). They must realise that before they start considering implementation issues, they need to understand the affordances and constraints of various tools, acquire a comfort level with hardware and software, and develop confidence in their skills (Mouza, 2005). Mastery of these core skills could make technology less frightening and more useful (Collins, 1998). However, it must be clarified that in professional development these technical skills ought to be clearly connected to larger objectives, and not be considered ends in themselves (Wiske et al. 2005).

Consequently, it can be supported that professional development should help teachers develop skills at two levels: the technical-level skills of being able to use a machine and software effectively, and the higher-level skills of being able to use a computer as a tool to support innovative teaching approaches. Both levels of skills are vital, since without the former there is no possibility of acquiring the latter (Somekh & Davis, 1997). In this way, teachers' explorations of technology are tied up to their attempts to solve educational problems, and they go beyond thinking themselves as passive users of technological tools and begin thinking of applying the right tool for the job (Mishra & Koehler, 2003).

Nevertheless, once a common technology knowledge base is established, professional development needs to help teachers engage in activities that respond to their particular teaching circumstances, the resources they have available, their students and their constraints (Mouza, 2005). Even the best designed professional development activities will not accomplish their full potential unless teachers work in a context that helps them directly apply what they have learned (Wiske et al. 2005). Therefore, it is proposed that teacher professional development in ICT, which should be situated in authentic contexts that resemble the classroom, must provide teachers with realistic experiences that can be easily transferred to their working context (Willis and Cifuentes 2005). Teachers should have the opportunity to try the technology as well as the teaching approaches that it facilitates, to experiment with them and explore the ways in which they can open new avenues to student learning, and slowly make them part of their professional repertoire (Schrum 1999; Maloy et al, 2005). Also, they need to gain experience of how to use technology, explore its potential for their work, and then develop curriculum that will utilise it fully for solid pedagogical purposes (King 2002). In this way, it is suggested that issues that are related to the ways in which technology can be integrated into the curriculum should be at the heart of professional development (Mouza, 2005).

What is more, as discussed in Chapter 4, the way that teachers infuse ICTs in their instructional practices depends on their pedagogical beliefs as well as on their beliefs and attitudes toward technology. For many teachers, having access to technologies is not viewed as a benefit, since they consider ICT as another demand on their time, as a set of tools they did not ask for and do not know how to use. Simultaneously, some other teachers feel that they are already doing a good job in the classroom and wonder how technologies will contribute to any improvements (Siddiqui 2004). This is attributed to the fact that teachers feel uncomfortable using technology and are unaware of the instructional pedagogies that it is able to support (Mouza 2003). Nevertheless, effective technology integration in education requires teachers to modify their teaching approaches, which denotes making significant changes in their pedagogy, assessment methodologies, ways of understanding interactions in the classroom, and modes of collaboration both within and beyond the classroom (Wiske et al. 2005). Therefore, professional development in ICT should encourage teachers to examine their beliefs and assumptions about technology use (Brown-L'Bahy, 2005), and also guide, coach, and support them throughout their efforts to change aspects of their practice (Wiske et al. 2005). Additionally, teachers need to ‘unlearn’ many of their traditional teaching and learning beliefs, but also traditional practices that have dominated the teaching profession for many years (Schoales, 1998; Vrasidas and Glass 2005). It is supported that well-defined and carefully targeted professional development that combines instruction and technology can help teachers develop new learning conditions through new teaching practices which can facilitate their continuing growth (Herring 2004; Siddiqui 2004).

An equally important objective of professional development in ICT is to equip teachers with necessary knowledge, skills and understanding to make sound decisions about when, when not, and how to use ICT effectively in teaching (Teacher Training Agency, 1999). To make these informed decisions, but also to be clear about how and why they value and devalue particular forms of technology, teachers need to understand both the potential and the drawbacks of these technologies. Therefore, it is proposed that teachers should be given the autonomy to make decisions about technology use based on their goals, their students’ needs, and the realities of the classroom teaching. To achieve this, teachers must also study classroom technology use on a theoretical level, so as to learn how pedagogical and instructional approaches that have been found to be successful, should work in their specific classroom context (Brown-L'Bahy, 2005).

As mentioned before, technology integration skills cannot be learned sitting passively in a classroom, listening to an instructor, or watching demonstrations (Roblyer and Edwards 2000). It cannot be accomplished through information transmission in the context of traditional professional development (Wiske et al. 2005). These traditional approaches rely on a process in which teachers become consumers of knowledge about technological tools (Mishra & Koehler, 2003). Contrarily, teachers must be encouraged to undertake ambitious and adventurous teaching with new technologies (Wiske et al. 2005), which means that their professional development must address authentic problems that teachers face when integrating technology into their classroom (Siddiqui 2004). Therefore, it is supported that professional development should be focused on learner-centred activities, construction of knowledge, and critical thinking skills (King 2002). After all, and as discussed in Chapter 3, one of the forces that are driving the increased interest in educational technology and the integration of ICTs in schools is the promotion of a shift of pedagogical approaches toward constructivism. In this way, as teacher are learning educational technology, they should simultaneously gain a new perspective of teaching and learning (King 2002), and insights into how their students can use technology to improve their performance and attainment (Schoales, 1998). Based on these, professional development should model the approaches that teachers are expected to enact with their own students (Wiske et al. 2005), as well as to embody the forms of pedagogy that they can use in their classrooms (Siddiqui 2004).

Moreover, it is stressed that “anyone who has to struggle to learn about technology, or who has taught others to use it, is aware that brief exposure does not provide sufficient training or practice to incorporate technology into a classroom” (Schrum 1999:85). The issue of adequate time provided to teachers is considered to be a primary factor in determining whether professional development in ICT will be successful (Schoales, 1998; Cook and Finlayson 1999). Learning to use ICT in schools takes time, and if teachers are pressed for time, they cannot easily change what they are doing to incorporate new innovations, even if they sincerely want to try something new (Maloy et al, 2005). Consequently, teachers should be provided with as much time as possible to acquire and in turn transfer to the classroom the knowledge and skills necessary to effectively infuse technology in their teaching (Brand 1997). Simultaneously, they need time to explore ways of using technology, to develop strategies to effectively integrate the technology into the curriculum, to find resources, to use the technology themselves and experiment with the new tools, and to discuss about technology issues and initiatives with their colleagues (Hill et al, 2005; King 2002; Mouza, 2005). Also, professional development should provide time and also include strategies that prompt reflection, since this habit will enable teachers to make sense of their experiences when using technology (Mouza, 2005). It is noted that when teachers engage in reflection about what they learn regarding instructional use of technology, they are more likely to critically evaluate their own pedagogical practice and redesign their instruction (Brand 1997). This is due to the fact that through reflection they develop the instincts needed to reconceive pedagogical approaches that take advantage of the new technological resources (Gura and Percy 2005).

As indicated in Section 5.2.2, professional development should be tailored to meet the needs of the various participants. The same thing also applies to professional development in ICT: no single approach will meet the learning needs of all teachers seeking to develop skills and knowledge in the integration and application of technology (Siddiqui 2004). Teachers vary in skills and interest levels, so offering professional development experiences that are appropriate for all teachers can be challenging, but at the same time, can create an atmosphere that allows teachers to experiment, try new ideas, and take risks (Riel et al, 2005). Furthermore, teachers' varying levels of expertise will also demand a continuum of professional development opportunities, so that teachers' learning needs at all stages in the continuum will be met (Siddiqui 2004). Therefore, to be successful, professional development programmes must recognise the needs of teachers at the various stages of their careers (Schoales, 1998), but also acknowledge that those needs evolve as teachers work with new tools and teaching strategies, requiring in this way, different forms of support and assistance over time (Wiske et al. 2005). The ICT training scheme offered by the Pedagogical Institute of Cyprus is addressed to teachers of all levels and, according to the Ministry and the Pedagogical Institute, its various programmes (presented in Section 2.5.3) aim to cater the training needs of all teachers. To achieve this goal, teachers are categorised in four groups according to their ICT competence level. The available training programmes aim at addressing the training needs of the teachers in each group. However, it is obvious that the categorisation of all teachers in four groups is quite generic and broad. Teachers' personal and professional contexts are diverse and therefore their actual training needs cannot be possibly merged into four categories. In order to facilitate teachers' effective and meaningful training in ICT, thoughtful and inform consideration of their unique training needs should be taken into account.

5.3.3 Using ICT to facilitate teachers' professional development

ICT is not only considered to be an essential tool in teachers' daily work, but it can also offer opportunities for professional development (Kirschner & Selinger, 2005). Through applications of ICT and especially communications, professional development can be improved (Davis, 1997; BECTA 2004). ICT can offer significant advantages in overcoming many of the barriers and constraints associated with traditional modes of teachers' professional development, but more importantly, it can help teachers learn about how to teach with new technologies from working with these technologies as part of their professional development process (BECTA 2004; Wiske et al. 2005). ICT, in the context of professional development, can be used to encourage teachers to adopt new ways of thinking and working as part of professional learning communities, by linking and networking various educational establishments, and by bringing professionals together across a range of areas (Kirschner & Selinger, 2005). It can open up the classroom or a whole school to the world and become a means to enhance and extend professional development (Davis, 1997). Using technology, teachers can access productivity tools, information and colleagues, as well as collaborative professional development opportunities anytime and anywhere, overcoming in this way the conventional limitations of traditional professional development

(Siddiqui 2004). Due to these benefits, the attention being given to the role of ICT in the context of teachers' professional development is constantly being increased (Downes et al. 2001).

Moreover, ICT allows new forms of collaboration over time and place, bridging differences and breaking down spatial and temporal barriers. Consequently, the participation in professional development that is electronically delivered enables teachers to interact and collaborate with peers that bring with them a rich diversity in culture, perspective and experience (Siddiqui 2004). At the same time, online environments are rapidly expanding as a venue for teachers' professional development, since they provide rich interaction between tutors, learners, content and technological tools (Vrasidas and Zembylas 2004). Teachers can develop and share pedagogical practice by gaining insights from the experiences, expertise, and enthusiasm of other colleagues in the context of networked communities (Loveless et al, 2001).

Helping teachers learn from one another in collaborative reflective communities is a valuable component of their professional development (Wiske et al. 2005). Aligned with social constructivism's principles, which support the notion that knowledge is constructed through social interactions, communities of practice are generally described as:

> groups of individuals bound by what they do together – e.g. from engaging in informal discussions to solving problems – and by what they have learned through their mutual engagement in these activities. Rules of engagement within a community of practice are constantly renegotiated although there is a shared repertoire of communal activities, routines, discourses and so on that members have developed over time. Thus, communities of practice have been theorised as sites of mutual learning and as important contributors to the success of knowledge-depended organisations (Vrasidas and Zembylas 2004:328).

In the context of online environments, communities of practice can facilitate the growth and development of new ways of using ICT, while the interest in this type of teachers' professional development is being intensified day-by-day. Nevertheless, although ICT can support communication between teachers in the context of professional networks and online communities, this should be more than delivery and broadcast of resources and lesson plans. Approaches like the 'tips for teachers' and the 'this worked for me' kind are not considered to be appropriate to promote lasting changes in teachers' practices (Loveless et al, 2001).

5.4 Summary

In this chapter, issues that are related to teacher professional development and professional development in ICT were discussed. The chapter began with an exploration of the literature with respect to teachers' general professional development. The importance of professional development for teachers' continuing progress, and consequently, for education's improvement and advancement as a profession were underscored. Furthermore, issues that are more related to teacher professional development in ICT were discussed. It was noted that, even with a clear understanding of the professional development research and principles, ICT-related professional development has unique qualities and features that makes it different from other types of staff development. This is due to the fact that technology demands a new set of knowledge base that needs to be learned, while teachers must find effective ways to integrate the various ICT tools and resources into their instructional practices and improve their teaching. In this context, it was argued that the lack of professional development in ICT usually results in unsuccessful infusion of technology in schools and in the failure of technology-driven reforms.

Chapter 6: Methodology

6.1 Introduction

The theoretical context of this study, which was deployed in the previous literature review chapters, informed the interest to explore a diversity of issues regarding the endeavour of implementing ICTs in Cyprus primary schools. In this way, this chapter's purpose is to present the methodology employed to carry out the study, as well as to describe the procedures followed to answer the study's research questions.

The chapter begins with a presentation of the rationale that underpins the study's research questions and continues with the presentation of the study's research design. The study's research methods as well as the consequent data collection methods are discussed and the reasons for their selection are justified and explained. Furthermore, details regarding the data collection tools' design, piloting, and validation are provided. Also, the processes of selecting the research's sample as well as administering the data collection tools, and conducting the research, are described. Finally, the quantitative and qualitative data analysis methods used, to answer this study's research questions, are described.

6.2 The study's focus and research questions

As discussed in Chapters 3 and 4, implementing ICTs in an educational system constitutes a significant and, as often stated, imperative change. The diverse educational stakeholders assume that the infusion and addition of these tools into the general educational context could result in the emergence of innovative teaching approaches that would improve the offered education service and enhance the overall students' performance and learning. Nevertheless, even though researchers have concluded that teachers are at the heart of any change in educational practice and that their thinking influences the adoption of educational innovations, their beliefs about and perspectives on technology's introduction in the context of their work are in many cases ignored (Luthra, 1998).

Furthermore, as became evident from the study's literature review, teachers are considered to have the leading part regarding technology's successful infusion into education's core processes of teaching and learning. They are also considered to be the main actors when a profound change or reform is attempted by the educational community. Similarly, the successful adoption of innovations introduced in schools, is highly depended on teachers' overall stances and attitudes toward them. In this way, it seems useful to explore teachers' thinking with respect to the introduction of technology in schools and to examine their perspectives on this issue. Their beliefs, attitudes, and viewpoints could provide useful insights on how to approach, facilitate, and encourage the process of infusing ICTs in education, as well as how to effectively manage the expected changes that this process denotes. Furthermore, by listening to teachers' views and drawing conclusions upon them could help policy-makers and other educational stakeholders design and implement effective professional development opportunities for teachers with respect to technology.

Within this framework, the main purpose of this study was to collect data from Cypriot primary school teachers and analyse their viewpoints with respect to educational technology. The fact that the systematic and comprehensive endeavour of introducing ICT in Cypriot schools has been recently initiated provides an interesting context for investigating teachers' viewpoints regarding a variety of issues related to ICT. The exploration of teachers' experiences with these new and innovative teaching tools can provide useful insights which could be used to support and facilitate the whole process of infusing ICT in Cyprus primary schools. It must be mentioned that the Cypriot teachers' responses to the introduction of technology in their work were not thoroughly explored and investigated, which means that many decisions made and actions taken by those responsible for the process were mainly based on suggestions and implications found in the general literature. A comprehensive study on Cyprus could provide more specific and therefore more useful conclusions which could facilitate greatly the infusion of ICTs in schools.

Based on these, the study aims at addressing a diversity of issues which are related to the introduction of ICTs in Cyprus' primary education. More analytically it seeks to explore the following issues, which are grouped in three main research questions. Each research question is comprised of other sub-questions:

- What is the current situation with respect to ICT integration in Cyprus primary education?
  - ✓ To what extent do teachers use ICT resources and other audiovisual aids in their classroom?
  - ✓ How do teachers use ICT, and in which area of their professional responsibilities do they believe it has had the biggest impact?
  - ✓ How do teachers' rate their competence in using ICT both for personal and professional tasks?
  - ✓ What are teachers' attitudes toward ICT?
  - ✓ According to teachers, which factors are hindering and which are facilitating the use of ICT in their teaching?
- What is the current situation with respect to teachers' ICT professional development opportunities?
  - ✓ To what extent do teachers participate in the officially offered ICT professional development opportunities?
  - ✓ What are teachers ICT training needs?
  - ✓ What are teachers' attitudes toward ICT training?
- Which are the factors that affect teachers' use of ICT and which of these variables can predict teachers' use of ICT?
  - ✓ Are teachers' background characteristics (gender, age, length of teaching experience, grade responsibility, occupational status) affecting their use of ICT?
  - ✓ Are teachers' personal beliefs and attitudes (perceived ICT competence, pedagogical beliefs, ICT attitudes, beliefs about ICT use barriers and enablers) affecting their use of ICT?

- ✓ Has teachers' participation in the officially provided ICT training impacted and affected their ICT use?
- ✓ Which variables can predict teachers' use of ICT?

6.3 The study's research design

When a research problem and its derived research questions have been identified, and when an inclusive literature review with respect to this problem has also been conducted, a research design must be developed which aims at turning the research questions into a research project (Robson 1995). There is no single blueprint for designing a research, while the strategies that are included are mainly depended on the research's purpose and on the type of research questions that need to be answered (Robson 1995; Cohen et al. 2005). The role of research questions is central: they organise the project by providing direction and coherence; they delimit the project, showing its boundaries; they keep the researcher focused during the project; they provide a framework for writing up the project; and, they point to the data that will be needed (Punch 2004). Therefore, all the decisions that a researcher has to make to successfully conduct a research project ought to be aligned with and serve the project's research questions.

An immediate issue that needs to be tackled in the context of a research design is to choose the most suitable type of design for the research's purposes and objectives. There are four main types of research design – experimental, longitudinal, cross-sectional and case study (deVaus 2001). Each different research design functions somewhat like a research template (Gall et al. 2003), but for each type, decisions made by the researcher will produce variations within the type (deVaus 2001). For the specific study's purposes, the cross-sectional research design was considered to be the most appropriate. This is due to the fact that this research type produces a 'snap-shot' of a section in the research population (Robson 1995; Cohen et al. 2005), since it involves the collection of data at a point in time from a randomly selected sample representing a given population at that time (Jackson and Furnham 2000; Wiersma 2000). Moreover, when conducting a cross-sectional study, existing differences within the sample can be explored without the need for any intervention, and without any random allocation of people to groups (deVaus 2001). In this way, and as mentioned in the Section 6.2, the study intended to investigate Cyprus primary school teachers' viewpoints and opinions on issues that are related to the introduction of ICTs in their working context. Therefore, the objective was to explore the perspectives of a teachers' representative sample at a particular point of time, and to find differences between defined groups that take place in teachers' total population.

6.3.1 The study's research methods

In the context of social sciences there are two prevailing research methods: quantitative and qualitative research methods. Quantitative and qualitative research methods represent two distinctly different approaches of understanding the world and its phenomena that are being researched, and this is due to the different epistemologies underlying the two methods (Wiersma 2000). Beyond the philosophical issues that distinguish the two approaches, there are also other fundamental differences. In many cases, the differences between the two methods are issues for debate which makes the two methods a fundamental dichotomy in social sciences (Robson 1995). Table 6.1 presents some of these differences:

Quantitative approach	Qualitative approach
• the data collected are numerical • the data represent information about the world in the form of numbers that are used to express quantity • is based on hypotheses drawn from theory • it usually deals with a representative sample of the target population • the data analysis employed focuses on variables • its usual target is to produce generalisations • is best used to discover themes and relationships at the case level • plays a confirmatory role	• present findings in the form of a narrative that describes and discusses whatever phenomena the researcher has studied • is based on an open, interactive work plan • it emphasises a holistic interpretation of data • is less interested in generalisations and pays more attention on the specific features of social situations in which research is carried out • is best used to validate those themes and relationships • plays a discovery role

Table 6.1: Quantitative and qualitative differences [Compiled from (Crowl 1996; Wiersma 2000; Corbetta 2003; Gall et al. 2003; Punch 2004)]

Nevertheless, in spite of these differences, both approaches are considered to be valuable because both of them have helped researchers make important discoveries (Gall et al. 2003). Therefore, it is increasingly agreeable that both approaches are needed, and that, no one methodology can answer all questions and provide insights on all issues (Burns 2000). Based on these, it can be supported that quantitative and qualitative research methods also share many similarities which denotes that combining the approaches is possible (Punch 2004). Their epistemological differences do not necessarily make them incompatible, nor do they justify the notion that one type has a greater claim on truth than the other (Gall et al. 2003). The most important task is to understand the strengths and weaknesses of each method, to analyse any particular research situation in the light of those strengths and weaknesses, and to select the approach, or combination of approaches, on the basis of that analysis. In any case, the reason for combining the two approaches is to capitalise on the strengths of the two approaches, and to compensate for the weaknesses of each approach (Punch 2004). However, although the combination of aspects of both methods within a single study is possible, the orientation of most studies is either primarily quantitative or qualitative (Bryman 1988; Crowl 1996; Corbetta 2003).

In this framework, it was deemed that for the purposes of this study, the combination of the two research approaches was the most appropriate way of dealing with the research questions. Nonetheless, the quantitative approach was the main research method used, which has been complemented with qualitative research as well. This was due to the fact that the introduction of ICT in Cyprus primary schools is a relatively recent development in the educational system, while teachers' attitudes and stances about ICT infusion in their working context were not thoroughly explored and investigated. Therefore, qualitative research was used to investigate and discover immerging themes and relationships regarding this issue, while quantitative method was used to confirm these findings, and also to permit the exploration of a large representative sample which would ensure generalisations to the primary teachers' population.

In addition to these, the selection of the appropriate research methods to tackle a study's research questions is also depended on contextual and practical considerations such as time, money, sample, and data availability, as well as the researcher's familiarity with the situation being studied, the access to situations, and gaining the cooperation of others (Punch 2004; Cohen et al. 2005). The importance of these practicalities, which would enable the feasibility of this study, was also taken into consideration when it was decided to primarily use quantitative research to collect the required data, but with complementary use of qualitative approach. For instance, the fact that the research's context was Cyprus primary schools, which was a familiar situation to be studied and enabled easy access to sample and data, simultaneously raised issues that were relevant to the time needed to be spent in Cyprus for data collection.

Moreover, a research, regardless of the research method employed, can be classified in terms of its purpose. In this way, a research's purpose could be either the description of an accurate profile of persons, events or situations, or, the explanation of a situation or problem usually in the form of causal relationships. At the same time, a particular study may be concerned with both purposes (Robson 1995). Whether description or explanation is the appropriate purpose for a piece of research depends on the particular situation and context (Punch 2004). Generally speaking, descriptive research is not considered as powerful as explanatory research, but as noted, a "good description is fundamental to the research enterprise and it has added immeasurably to our knowledge of the shape and nature of our society" (deVaus 2001:1). Many important scientific discoveries have resulted from researchers making description (Gall et al. 2003), while it is considered to be the first step towards explanation, because if the objective is to know why something happens, it is important to have a good description of exactly what happens (Punch 2004). Also, description is important because the state of the thing being described and explored it is not always known (Anderson and Arsenault 1998).

In this framework, the particular study's purpose was to both describe and explain the current situation regarding the introduction of ICTs in Cyprus' primary education. As mentioned before, this area is not thoroughly explored in the context of Cyprus, therefore a detailed description of the state of affairs was considered to be essential. For example, it was not possible to explain why Cypriot primary teachers use technology in a particular way, without describing first the factors that affect their use of ICT, or if ICT resources were actually incorporated in the classroom.

6.3.2 Data collection methods

In the light of the selection of quantitative research as the primary method for conducting the study, with complementary use of qualitative research to underpin its objectives, two data collection methods were employed: questionnaire and semi-structured interview. It must be mentioned that the questionnaire, which was the main data collection tool, was used to collect quantitative data since its standardised, highly structured design is compatible with quantitative research method. On the other hand semi-structured interview was use to collect qualitative data, because as a data collection tool permits open-ended exploration of topics and elicits responses that are couched in the unique words of the respondents (Gall et al. 2003).

6.3.2.1 Questionnaire

The use of the questionnaire as a data collection tool is very common in the framework of social research. It is a widely used and useful instrument for collecting information, providing structured, often numerical data, being able to be administered without the presence of the researcher, and often being comparatively straightforward to analyse (Wilson and McClean 1994). A questionnaire is not a set of questions that have been casually jotted down without much thought (Oppenheim 1992). Rather, it is a process in which a general purpose or a set of purposes are turned in to concrete, researchable fields about which actual data can be gathered (Cohen et al. 2005). As discussed later, this process requires time-consuming planning, reading, design and exploratory pilot work before the questionnaire becomes operational, judged as satisfactory, and ready to be administered to the research's participants (Oppenheim 1992). This preparatory process is considered to be crucial since as suggested, when using questionnaire, it is difficult to go back to people and collect additional information which might be deemed as necessary. Therefore, thinking ahead and anticipating what information will be needed is very important to ensure that the most appropriate questions are asked (deVaus 1993).

In any case, a well constructed questionnaire permits the collection of reliable and reasonably valid data in a simple, cheap and timely manner (Anderson and Arsenault 1998). It constitutes a low cost way of data collection, which permits the collection of data from a large number of respondents who may be in one or several locations (Oppenheim 1992; Anderson and Arsenault 1998; Gall et al. 2003). Moreover, the fact that the questionnaire is a highly structured data collection tool, whereby each respondents is asked the same set of questions, provides a very efficient way of analysing the data collected from large samples (deVaus 1993). Additionally, the questionnaire can be administered in a variety of ways, and even though each way has advantages and disadvantages, the final choice will depend on each way's appropriateness to the research's purpose and to the means at the researcher's disposal (Oppenheim 1992).

Nevertheless, as any data collection tool, the questionnaire also has limitations. For instance, the data collected are necessarily superficial, since the respondents often have limited choices of answers, and they may not reveal their real views or attitudes if they don't match the 'forced choices' included. Moreover, unless the questionnaire is conducted face-to-face, the researcher cannot be sure of the honesty or seriousness of responses (Robson 1995; Walsh 2001; Gall et al. 2003). Also, the response rates can be generally low, while the respondents tend to be people who have stronger views of attitudes on the subject being studied, resulting in this way in biases (Oppenheim 1992; Walsh 2001). Additionally, if the questionnaire is not administered face-to-face, the researcher cannot be sure that the respondents have understood the questions and cannot use follow-up questions to explore unusual answers (Walsh 2001; Gall et al. 2003). Therefore, there is a need for clarity and simplicity of the questions and items included in the questionnaire (deVaus 1993).

6.3.2.1.1 Questionnaire design and adaptation

The questionnaire used for the specific study was designed and constructed using a compilation of selected items from other instruments developed by other researchers so as to investigate the integration of ICTs in schools. There are many reasons why a researcher chooses to employ existing research instruments instead of developing novice ones. Apart from the fact that the development work, time, and resources that are involved in generating a novice instrument are quite considerable, the complexity and multidimensionality of the under investigation variables are also a decisive factor. Additionally, using what already exists facilitates the comparisons with research results from different studies in which the same instruments were used. Finally, the use of existing instruments ensures and supports the validity of the study (Punch 2004). Therefore, in the light of these arguments, it was decided to employ various items which had already been used in other studies found in the literature. Nevertheless, several items were modified and tailored as a result of the study's piloting, and in the context of the questionnaire validity and reliability (Section 6.3.2.1.2). These changes were considered essential to serve the study's research questions and its specific context. At the same time, a number of items included in the questionnaire were not adopted from other studies, but were devised after considering the respective literature and the specific context in which the research had taken place.

In general, during the questionnaire design, particular attention was paid to ensure that all items used in the questionnaire, either having been adopted from other researches or newly devised, were well-worded, rightly-ordered, and with appropriate for the research objectives content. Simultaneously, great consideration was given to the questionnaire's overall layout. Questions wording and content are of fundamental importance, and therefore, devoted care and attention should be given to the choice of words, as well as to the clarity and unambiguousness of questions (Wilson and McClean 1994). This is due to the fact that small changes in wording can sometimes produce major changes in the distribution of responses (Foddy 1993). Equally careful attention was paid on the questionnaire's appearance which must look easy, attractive and interesting rather than complicated, unclear, forbidding, and boring (Cohen et al. 2005). The first page of the questionnaire included the covering letter, which is an essential mechanism for introducing individuals to the questionnaire and motivating them to respond (Wiersma 2000). In the questionnaire's coving letter, the purpose of the research was explained, while the participant teachers were asked to provide honest answers to the questions ensuring them simultaneously that the collected data would be only used for the study's purposes. Finally, an explanation of the acronym 'ICT', which was widely used throughout the questionnaire, was provided to reduce any misunderstandings.

In this context, the questionnaire used in this study was divided into six distinct parts in which teachers' thoughts about various aspects of ICT integration in schools were inquired using a number of questions. The questionnaire's parts are the following:

- Part A: Teachers' background characteristics

The first part of the questionnaire included five questions that intended to solicit factual information on teachers' gender, age, length of teaching experience, grade responsibility, and position in school. This information enabled the construction of independent variables.

- Part B: Issues on teachers' use of ICT

The second part of the questionnaire included five questions regarding issues related to teachers' use of ICT. In question B.1, the participant teachers were asked to indicate how they were using ICTs for their professional responsibilities, while in question B.2, they were asked to indicate the area of their professional responsibility in which ICT had had the greatest impact.

These questions were adapted from a questionnaire used in a research designed to evaluate aspects of 'Schools IT 2000', a programme launched in 1997 by the Irish Ministry for Education and Science, to foster, promote, and develop the use of ICT in primary and secondary-level education (NPADC 2001).

B.1 How do you use ICT for professional responsibilities as a teacher [use (√)]?

Teaching preparation (ie: preparing lesson plans, teaching tools)	
Teaching support (ie: presenting lesson plans, facilitating a project-based learning activity, or researching information)	
Classroom management activities (ie: tracking attendance or word processing worksheets)	
Professional Development (ie: skill training or reading articles about teaching with technology)	
Communications (ie: emails, newsletters, or class websites)	
Student assessment (ie: online testing or student portfolios)	

B.2 In which area of your professional responsibilities as a teacher has ICT had the biggest impact?
[using (√), indicate only one choice]

Teaching preparation (ie: preparing lesson plans, teaching tools)	
Teaching support (ie: presenting lesson plans, facilitating a project-based learning activity, or researching information)	
Classroom management activities (ie: tracking attendance or word processing worksheets)	
Professional Development (ie: skill training or reading articles about teaching with ICT)	
Communications (ie: emails, newsletters, or class websites)	
Student assessment (ie: online testing or student portfolios)	

Figure 6.1: Questions B.1 and B.2

In the next two questions B.3 and B.4, the participant teachers were asked to rate their level of competence when using ICT for personal purposes and for teaching purposes respectively. Both questions were also adapted from the research conducted in Irish schools and are included in the NPADC report.

B.3 Please rate your own level of competence in using ICT on the scale below, where 6 is very competent and 1 is not at all competent (circle the respective number):

Not at all competent	1	2	3	4	5	6	Very competent

B.4 Please rate your own level of competence in using ICT in teaching on the scale below, where 6 is very competent and 1 is not at all competent (circle the respective number):

Not at all competent	1	2	3	4	5	6	Very competent

Figure 6.2: Questions B.3 and B.4

The final question of this part, question B.5, requested from teachers to indicate how often they were using selected audiovisual aids and ICT resources during their teaching. The range of audiovisual aids and ICT resources included in the table presented to teachers are typical resources and equipment found in Cyprus primary school classrooms:

B.5 How often do you use the audiovisual aids which are included in the following table, <u>during your teachings</u>? Indicate the frequency using (√):

1:Never **2:Less than once in a month** **3:At least once in a month**
4:At least once in a fortnight **5:At least once a week** **6:Everyday**

Resource	1	2	3	4	5	6
Word Processor (Microsoft Word)	1	2	3	4	5	6
Spreadsheets (Microsoft Excel)	1	2	3	4	5	6
Real Objects	1	2	3	4	5	6
CD-Roms for Educational games	1	2	3	4	5	6
Overhead Projector	1	2	3	4	5	6
Data Projector	1	2	3	4	5	6
Video conferencing	1	2	3	4	5	6
Television (video or DVD)	1	2	3	4	5	6
Printer	1	2	3	4	5	6
E-mail	1	2	3	4	5	6
Digital Camera	1	2	3	4	5	6
Educational software	1	2	3	4	5	6
Internet	1	2	3	4	5	6
Graphic/Design Software (Paint)	1	2	3	4	5	6
Radio (Tape or CD player)	1	2	3	4	5	6
Maps	1	2	3	4	5	6
Scanner	1	2	3	4	5	6
Databases (Microsoft Access)]	1	2	3	4	5	6
CD-Roms Information Sources	1	2	3	4	5	6
Presentation Software (Microsoft PowerPoint)	1	2	3	4	5	6
Models	1	2	3	4	5	6

Figure 6.3: Question B.5

- Part C: Teachers' pedagogical beliefs and attitudes

The third part of the questionnaire included a question regarding teachers' pedagogical beliefs and attitudes. The participant teachers were asked to complete a table showing the extent of their agreement with a series of related items. This question was in the form of a six-point likert scale. The items included in this question were adapted from the 'Grasha's Teaching Styles Inventory', an assessment developed by A. Grasha (1996), that asks for a likert-type response to a series of forty items designed to objectively categorise teaching style. The original instrument is primarily used to categorise the teaching style of university teaching staff; however, it was deemed as appropriate to be used in this study, since it includes most of the under investigation variables. A number of the original items in Grasha's instrument were excluded because they were not applicable for primary education. Also, several modifications were made to the rest of the items to become more tailored for this study's purposes, objectives and target population.

C.1 Please indicate the strength of your agreement or disagreement with the following statements:

1:Strongly Disagree **2:Disagree** **3:Somewhat Disagree**

4:Somewhat Agree **5:Agree** **6:Strongly Agree**

Statements	1	2	3	4	5	6
Facts, concepts, and principles are the most important things that students should acquire.	1	2	3	4	5	6
I set high standards for my students.	1	2	3	4	5	6
What I say and do models appropriate ways of thinking for students with respect to issues in the content.	1	2	3	4	5	6
My teaching goals and methods address a variety of ways that the students learn (different learning styles of students).	1	2	3	4	5	6
Students typically work on course projects alone with little supervision from me.	1	2	3	4	5	6
Sharing my knowledge and expertise with students is very important to me.	1	2	3	4	5	6
I give students negative feedback when their performance is unsatisfactory.	1	2	3	4	5	6
Activities in my class encourage students to develop their own ideas about content issues.	1	2	3	4	5	6
I spend time consulting with students on how to improve their work on individual and/or group projects.	1	2	3	4	5	6
What I say are important for students in order to acquire a broader perspective on the under study issues.	1	2	3	4	5	6
Students would describe my standards and expectations as somewhat strict and rigid.	1	2	3	4	5	6
I typically show students how and what to do in order to master a lessons' content.	1	2	3	4	5	6
Small group discussions are employed to help students develop their ability to think	1	2	3	4	5	6
It is my responsibility to define what students must learn and how they should learn it.	1	2	3	4	5	6
Examples from my personal experiences often are used to illustrate points about the	1	2	3	4	5	6
I guide students' work on course projects by asking questions, exploring options, and suggesting alternative ways to do things.	1	2	3	4	5	6
Developing the ability of students to think and work independently is an important goal.	1	2	3	4	5	6
Lecturing takes part a significant part of my teachings.	1	2	3	4	5	6
I provide clear guidelines for how I want the tasks that I assign to be completed.	1	2	3	4	5	6
I often show students how they can apply the principles and pieces of information they	1	2	3	4	5	6
The activities that I organise encourage students to take initiative and responsibility for their learning.	1	2	3	4	5	6
My expertise is typically used to resolve disagreements about content issues.	1	2	3	4	5	6
My teachings have very specific goals and objectives that I want to accomplish.	1	2	3	4	5	6
Students receive frequent verbal and/or written comments on their performance.	1	2	3	4	5	6
I solicit student advice about how and what to teach in the context of a subject.	1	2	3	4	5	6
Students set their own pace for completing independent and/or group projects.	1	2	3	4	5	6
Students might describe me as a "storehouse of knowledge" who dispenses the fact, principles, and concepts they need.	1	2	3	4	5	6
My expectations for what I want students to do in the class are clearly defined in the	1	2	3	4	5	6
Eventually, many students begin to think like me about a teaching's content.	1	2	3	4	5	6
My students can make choices among many activities in the context of a teaching.	1	2	3	4	5	6
My approach to teaching is similar to a manager of a work group who delegates tasks and responsibilities to subordinates.	1	2	3	4	5	6
My standards and expectations help students develop the discipline the need to learn.	1	2	3	4	5	6
Students might describe me as a "coach" who works closely with someone to correct problems in how they think and behave.	1	2	3	4	5	6
I give students a lot of personal support and encouragement to do well in their assigned activities.	1	2	3	4	5	6
In the classroom, I assume the role of a resource person who is available to students whenever they need help.	1	2	3	4	5	6

Figure 6.4: Question C.1

- Part D: Teachers' attitudes toward ICT

In question D.1 teachers were asked to indicate the strength of their agreement with a number of items regarding their attitudes toward ICT use for their professional responsibilities. The items included in this question were developed by Williams et al (1998) in the context of a research in Scottish schools intended to explore teachers' perceptions on various issues with respect to ICT.

D.1 Please indicate the strength of your agreement or disagreement with the following statements:
1:Strongly Disagree **2:Disagree** **3:Somewhat Disagree**
4:Somewhat Agree **5:Agree** **6:Strongly Agree**

Statements	1	2	3	4	5	6
ICT makes my work easier.	1	2	3	4	5	6
Computer scares me.	1	2	3	4	5	6
ICT helps me find heaps of relevant information for my teaching	1	2	3	4	5	6
I use ICT resources effectively myself but I'm not sure how to include them in my work.	1	2	3	4	5	6
I don't know what would I do without ICT.	1	2	3	4	5	6
I manage information more effectively because of ICT.	1	2	3	4	5	6
I wish that computer had never been invented.	1	2	3	4	5	6
I find it helpful for non-work related tasks.	1	2	3	4	5	6
ICT encourages pupils to work together collaboratively.	1	2	3	4	5	6
Some pupils are as scared as me when using ICT and its resources.	1	2	3	4	5	6
I find using ICT during teaching time consuming.	1	2	3	4	5	6
I feel lost in the Information Age.	1	2	3	4	5	6
I prefer using computer on my own when no-one is around to see me make mistakes.	1	2	3	4	5	6
ICT helps pupils acquire new knowledge effectively.	1	2	3	4	5	6
It's all moving too fast for me.	1	2	3	4	5	6
I find it easy to select appropriate ICT resources for my teaching.	1	2	3	4	5	6
I can't cope with all the ICT jargon.	1	2	3	4	5	6
Pupils can get distracted by all the technology.	1	2	3	4	5	6
I can never find anything relevant for my pupils when surfing to the web.	1	2	3	4	5	6
ICT seems to motivate the pupils to learn.	1	2	3	4	5	6
The pupils are way ahead of me in their use of ICT.	1	2	3	4	5	6
I don't have time to prepare teachings using ICT.	1	2	3	4	5	6
Systems are slow, I'd be quicker using a book.	1	2	3	4	5	6
I tried to include ICT resources to my teachings but it was unsuccessful.	1	2	3	4	5	6
I know the basics but that is all.	1	2	3	4	5	6
ICT swamps pupils with information.	1	2	3	4	5	6
I don't want to use ICT resources because I consider my established practices adequate.	1	2	3	4	5	6
I don't have the appropriate skills to use it effectively.	1	2	3	4	5	6
When teaching with ICT resources the classroom is transformed into a chaos.	1	2	3	4	5	6

Figure 6.5: Question D.1

- Part E: Factors affecting teachers' use of ICT

The fifth part of the questionnaire included a question about the factors that affect teachers' use of ICT. In question E.1, the participant teachers were asked to indicate the strength of their agreement with a number of items about the diverse factors that affect their ICT use in the context of their work. The items included in the table presented to teachers were constructed based on two reports by BECTA (2003; 2004), about the barriers to the use of ICT in teaching, and a report conducted by Scrimshaw (2004), for and on behalf of BECTA about the factors that enable teachers to make successful use of ICT.

E.1 Please indicate the strength of your agreement or disagreement with the following statements:
1:Strongly Disagree **2:Disagree** **3:Somewhat Disagree**
4:Somewhat Agree **5:Agree** **6:Strongly Agree**

Statements	1	2	3	4	5	6
The school I work don't have adequate equipment so as to promote the use of ICT.	1	2	3	4	5	6
The dissemination of ICT resources in my school is well organised.	1	2	3	4	5	6
I'm willing to use ICT but the access to the equipment is difficult and time consuming.	1	2	3	4	5	6
The educational software available in my school is updated and current.	1	2	3	4	5	6
Although there is equipment in my school, it is obsolescent to be used efficiently.	1	2	3	4	5	6
Every time I use a piece of equipment, there are technical troubles.	1	2	3	4	5	6
The administration of my school is quite supportive with respect to ICT use.	1	2	3	4	5	6
There is nobody to turn to when I have a technical problem.	1	2	3	4	5	6
I can easily find advise when I use ICT during my teaching.	1	2	3	4	5	6
Nobody asks for my suggestions when a new ICT innovation is introduced to my school.	1	2	3	4	5	6
My classroom is suitable for the use of ICT resources.	1	2	3	4	5	6
There is not adequate number of software in Greek.	1	2	3	4	5	6
My effort to use ICT resources is prevented by pupils' inadequate technology skills.	1	2	3	4	5	6
There are enough resources that illustrate how to integrate ICT into the curriculum.	1	2	3	4	5	6
The proportion of pupils and the available equipment averts the use of ICT.	1	2	3	4	5	6
The availability and diversity of educational software is satisfactory.	1	2	3	4	5	6
The current curriculum is not suitable for ICT integration.	1	2	3	4	5	6
Devices with technical problems are immediately fixed.	1	2	3	4	5	6

Figure 6.6: Question E.1

- Part F: Issues on teachers' professional development in ICT

Various issues regarding teachers' professional development opportunities in ICT were explored through the five questions included in the final part of the questionnaire. In question F.1, teachers were requested to indicate if they had ever participated in the ICT seminars which are being organised by the Pedagogical Institute of Cyprus, while, in question F.2, they were asked to indicate if they had received any in-service training by the Ministry's ICT coordinators.

F.1 Have you attended the ICT seminars organised by the Pedagogical Institute of Cyprus?

Yes	No	If the answer is Yes, which programme? ___________

F.2 Have you ever received any in-service training by an ICT coordinator from the Ministry's ICT unit? (Please tick)

Yes	No	If the answer is Yes, how many times? ____________

Figure 6.7: Questions F.1 and F.2

Question F.3 asked teachers' opinion about the most appropriate form of ICT training. The first three options included in the table presented to teachers were adopted from Williams et al (1998) research in Scottish schools. The forth item was constructed to serve this study's objectives.

F.3 Regardless the training you received on ICT, which of the following do you believe is the best way to deliver ICT training?

ICT skills training	
ICT applied generally across the curriculum	
ICT applied specifically to a particular subject	
ICT training for pedagogical usage of ICT resources	

Figure 6.8: Question F.3

In order to obtain information about teachers' attitudes toward ICT training, question F.4 was included in this section. The participant teachers were asked to indicate the strength of their agreement with a number of items which were adapted from Williams et al (1998) research.

F.4 Please indicate the strength of your agreement or disagreement with the following statements:

1:Strongly Disagree **2:Disagree** **3:Somewhat Disagree**
4:Somewhat Agree **5:Agree** **6:Strongly Agree**

Statements	**1**	**2**	**3**	**4**	**5**	**6**
I am interested in learning more about using ICT.	1	2	3	4	5	6
I feel ICT training is not appropriate to my teaching.	1	2	3	4	5	6
I find training courses in ICT useful.	1	2	3	4	5	6
I need to develop my skills and knowledge for professional development.	1	2	3	4	5	6
I feel I should develop my skills to keep up to date with developments in teaching.	1	2	3	4	5	6
I don't think I need ICT skills to progress in the profession.	1	2	3	4	5	6
I'm not that interested but I suppose I should be.	1	2	3	4	5	6
I need to develop my skills and knowledge for the pupils' benefit.	1	2	3	4	5	6
I don't see the need to learn about ICT.	1	2	3	4	5	6
I'm interested but I don't have the time.	1	2	3	4	5	6
I'm interested but I don't have the access.	1	2	3	4	5	6
I don't need to use ICT in my teaching.	1	2	3	4	5	6
I really want to know more about developing my skills in ICT.	1	2	3	4	5	6
I'm interested personally but developing my skills/knowledge in ICT isn't appropriate to my teaching	1	2	3	4	5	6
I'm interested but training doesn't seem to be available.	1	2	3	4	5	6
I don't think it's necessary, no-one else in the school is bothering.	1	2	3	4	5	6
I would like to develop my skills and knowledge in ICT as everyone else is.	1	2	3	4	5	6
I feel my skills and knowledge in ICT are adequate.	1	2	3	4	5	6
ICT is not a priority for me.	1	2	3	4	5	6

Figure 6.9: Question F.4

The last question of the questionnaire, question F.5, was about teachers' training needs with respect to ICT. The participant teachers were asked to rate their needs for ICT training in specific areas, which were described by the items included in the question, using a given six-point scale. The construction of this question was based on an instrument created by Teacher Training Agency (2001), to help teachers identify and summarise their ICT training needs. All items included in the question are key factors drawn from the 'Expected Outcomes' report (Teacher Training Agency, 1999).

F.5 Please rate your need for ICT training in each area using the given scale:

No need	1	2	3	4	5	6	Great need

When I receive training on ICT, I expect that I will	**1**	**2**	**3**	**4**	**5**	**6**
understand and consider the advantages and disadvantages of using ICT for teaching and teaching preparation.	1	2	3	4	5	6
be capable to prepare lessons using ICT by selecting and preparing appropriate sources of information.	1	2	3	4	5	6
acquire the skills to select and use the most appropriate software and ICT resources for specific educational situations.	1	2	3	4	5	6
be capable to decide the most effective organisation of the classroom and pupils so as to fulfil my teaching goals.	1	2	3	4	5	6
learn how to extend pupils' learning in various subjects through the use of ICT.	1	2	3	4	5	6
be adequately competent so as to intervene and pose questions to stimulate, direct, monitor and assess the learning of pupils who are using ICT.	1	2	3	4	5	6
be skilled to employ the most appropriate technologies for whole class teaching.	1	2	3	4	5	6
be capable to combine the use of ICT with other resources and methods to achieve my teaching objectives.	1	2	3	4	5	6
acquire the competence to enable pupils to demonstrate their knowledge, understanding and skills in the different subjects while using ICT.	1	2	3	4	5	6
learn how to ensure that pupils' learning in the different subjects is not masked by the technology being used.	1	2	3	4	5	6
be capable to judge the effectiveness of using ICT in achieving teaching objectives.	1	2	3	4	5	6
obtain the competence to use generic and/or subject-specific hardware and software e.g. databases, internet, presentation tools, scanners, printers etc.	1	2	3	4	5	6
be skilled to use ICT to aid record-keeping, analysis of data, target-setting, reporting, transfer of information etc.	1	2	3	4	5	6
learn how to access and using resources, including resources from online communities, websites on education and from websites of the Ministry.	1	2	3	4	5	6
be capable to access research and inspection evidence.	1	2	3	4	5	6

Figure 6.10: Question E.5

6.3.2.1.2 Questionnaire validity, reliability, and piloting

The items included in a research's data collection instruments are only a sample of the possible tasks that a subject could carry out. A researcher infers from the subject's performance on this sample how well he/she would do on others or in other situations (Black 1999). Nevertheless, a great thread for a research project is that the data that a researcher collects can be a product of the instruments used in the research and not a true 'picture' or indicator of what they actually claim to be (Walsh 2001). In this framework, the issue of a study's validity emerges, that is the concern with the degree to which an instrument measures what it is supposed or intended to measure (Oppenheim 1992; Bell 1993; Jackson and Furnham 2000; Punch 2004). Whatever procedure for collecting data is selected, it should always be examined critically to assess to what extent it is likely to be valid (Bell 1993), which will eventually enable the researcher to draw unambiguous conclusions from the results (deVaus 2001).

A study's validity involves two concepts simultaneously, internal and external validity (Wiersma 2000). Internal validity refers to the internal logic and consistency of the research, and whether its design is a true reflection of the reality being studied (Punch 2004). It is also concerned with the extent to which results can be interpreted accurately. External validity on the other hand is concerned with the extent to which results can be generalised to populations, situations, and conditions (Bryman 1988; Wiersma 2000; Cohen et al. 2005). Internal validity is a prerequisite for external validity because if results cannot be interpreted it is not likely that they can be generalised (Wiersma 2000). However, a study with good internal validity may have limited value if its findings can only be applied to the people who have participated in the particular investigation (deVaus 2001).

Just like validity, the concept of reliability is also essential in ensuring the credibility of a research project. Both of them need to be addressed and considered in order to establish the appropriateness and usefulness of the data collection tools used in a research (Wiersma 2000). Reliability is essential to validity, since, unless a tool or a measure is reliable, it cannot be valid, nor its results can be interpreted with confidence or be generalised to other populations and conditions (Robson 1995; Gall et al. 2003). Nevertheless, it is possible to have a tool or a measure that is highly reliable yet of poor validity (Gall et al. 2003), since reliability refers to the purity and consistency of a measure or a data collection tool of obtaining the same results again if it was to be duplicated (Oppenheim 1992). It is concerned with the question of whether the results of a study are repeatable, and whether the measure or tool is consistent (Bryman 2001). The reliability of a study is also distinguished between internal and external: internal reliability refers to the extent that data collection, analysis, and interpretations are consistent given the same conditions, while external reliability deals with the issue of whether or not other researchers can replicate studies in the same or similar settings (Wiersma 2000).

Both validity and reliability are always a matter of degree, since it is practically impossible to attain 'perfect' validity and reliability of a study, especially in the context of social sciences (Oppenheim 1992; Wiersma 2000). Therefore, the threats to validity and reliability cannot be completely eliminated; however, with increased attention throughout the research project, the effects of these threads could be decreased (Cohen et al. 2005). Moreover, both validity and reliability are multi-faceted, have different types, and consequently, several ways can be used to address them (Bell 1993; Black 1999; Cohen et al. 2005).

For this study's purposes the issues of the questionnaire's validity and reliability were addressed in the context of the study's piloting which was carried out in three phases. The piloting process is very important for the construction of a solid and effective questionnaire. It is noted that "good questionnaires do not just happen; they involve careful thinking, numerous drafts, thorough evaluation and extensive testing" (deVaus 1993:105). Piloting is described as the process whereby a designed questionnaire is tested for its ability to do the job which it was designed to perform, while weaknesses in the questionnaire design are revealed (Wilson and McClean 1994). In this context, pilot-testing is of a paramount importance for the study's overall success, since it is considered to be an essential part of the research design process that prevents later problems. It is stressed that "once a fault has found its way into the main field-work, it will almost certainly prove irretrievable" (Oppenheim 1992:48).

Table 6.2 presents the diverse matters that need to be taken into account when piloting a questionnaire. These matters are not only related to the questions included in the questionnaire but also the items that comprise each question and also other procedural issues. It is obvious from the table that almost anything about the questionnaire can and should be piloted, while repeated pilots are needed when changes are made, and until the researcher is certain that the questionnaire can do the job for which it was designed for (Oppenheim 1992; Gall et al. 2003). In this framework, after the questionnaire used in this study was adapted and developed, the pilot-testing was initiated. The questionnaire was piloted three times to eliminate its apparent weaknesses, to address the issue of validity and reliability, and to increase as much as possible its appropriateness for this study's purposes.

Matters regarding questions	**Matters regarding the items included in questions**	**Procedural matters**
• how to phrase each question to lessen ambiguities • to clarify each question's wording • to evaluate how respondents interpret the questions' meaning • to identify misunderstandings in questions' instructions • to check whether the range of response alternatives in each question is sufficient	• to identify useless or inadequate items • to alert the researcher about any omissions or unanticipated answers by the respondents • to check for questions with low variation since they create serious problems at the data analysis stage • to check if the respondents understand the items' indented meaning • to ensure that each item measures a different thing • to exclude items that do not belong to the scale for which they were design • to evaluate the response rate to particular items since low response rate creates problem at the data analysis stage	• to evaluate the ordering of question sequences • to assess the questionnaire's overall layout • to calculate the time needed for completing the questionnaire • reduction of non-response rates • to assess the questionnaire's flow, namely how the questions fit together • to assess the smoothness of transitions from one section to another • to evaluate the respondents' interest and attention, with respect to questionnaire's length, and variety of question types

Table 6.2: Matters that are taken into account in the context of the questionnaire piloting [Compiled from (Oppenheim 1992; Bell 1993; deVaus 1993; Anderson and Arsenault 1998; Wiersma 2000; Gall et al. 2003)]

6.3.2.1.2.1 First piloting

The main purpose of the questionnaire's first piloting was to address the issue of validity. It is suggested that there is no foolproof procedure for establishing validity, and the validation methods used should depend on the situation and on the nature of the research questions (Black 1999; Punch 2004). For this study's purposes it was decided that content and face validity were the most appropriate to make the questionnaire more valid. On the one hand, content validity refers to the accuracy with which the questions adequately represent the qualities they are presumed to measure (Jackson and Furnham 2000). In other words, since questionnaire solicits respondents' opinions about particular topics and issues, and since the researcher wishes to claim that these are respondents' true opinions, he/she should collect evidence that the content of the included items represent these constructs (Gall et al. 2003). The evaluation of content validity is a matter of evaluation of consistency and discussion among subject experts of what constitutes reasonable knowledge and skills for a subject and how adequately the questionnaire and its included items sample this (Black 1999). Therefore, content validity of a questionnaire is ensured when it covers the domain of content areas of the subject in question, and this can be demonstrated by expert evaluation and critique (Jackson and Furnham 2000). On the other hand, face validity is concerned with whether the questionnaire appears to be measuring what it says it does (Burns 2000; Jackson and Furnham 2000). Simultaneously, it asks whether the respondents will perceive the questionnaire as being valid. If they do not, they may not respond, or may respond dishonestly, or not take it seriously and provide misleading responses (Black 1999). Face validity is addressed differently than content validity: while the evaluation of content validity is performed by experts in the subject, face validity is achieved through a systematic consideration of a trial group results compared to the original specifications (Black 1999; Jackson and Furnham 2000).

Within this context, and due to the fact that the questionnaire was design to collect data regarding ICT in education, and also to measure teachers' pedagogical beliefs, and attitudes toward ICT and ICT training, the following steps were undertaken to ensure that the included items were valid, relevant to the study's under investigation concepts, as well as clear and unambiguous for the respondents:

On a first consideration, the questionnaire was reviewed and thoroughly examined by the researcher and his supervisor to ensure that all the items were relevant to the under investigation topic, and also to ensure that all the items could be interpreted. After that, the questionnaire was handed to two PhD students to assess the questionnaire's structure and items. It was requested from them to review the included items and propose necessary changes that would improve the clarity of the questions and the overall questionnaire's layout. The researcher was given the chance to discuss with them the proposed changes. In addition, the questionnaire was shown to an ICT coordinator in Cyprus and to an ICT teacher who works as a technology trainer for teachers in the context of the training offered by the Cyprus Pedagogical Institute. It was asked from them to review the included items and make comments on their appropriateness to the Cypriot context. The questionnaire was initially written in English and it was then translated into Greek. The English and Greek versions were sent to an English teacher in Cyprus to review the accuracy of the translation, and to ensure that the terms and concepts included in the items of the Greek version of the questionnaire were producing the same meaning as in the original instrument.

As a final step in ensuring validity – and this was the main part of the first pilot study – the questionnaire was disseminated to twenty primary school teachers in three primary schools in Cyprus for completion and recommendations. The teachers who participated in this pilot phase were requested to jot down notes and discuss problematic items of the questionnaire, to highlight those items they found difficult to understand, and also to calculate the time they needed to complete the questionnaire. A free space was also left at the end of the questionnaire for further notes and commends. Finally, the researcher was given the opportunity to personally discuss various issues regarding the questionnaire with many of the respondents who participated in this pilot phase.

Going through these steps, enabled the researcher to make changes to the questionnaire and to the included items, which increased the confidence that the particular data collection tool was acceptably valid. The resulting changes were the following:

- The overall layout of part A was altered to become more convenient for the respondents and also to save some space.
- In the same part, the format of question A.2 and A.3 about teachers' age and length of teaching experience was changed. Initially, both questions were closed but it was deemed that the open format was more useful.
- In part B, questions B.1 and B.2 about the ways in which teachers use technology for their work and about ICT's impact respectively were added.
- Questions B.3 and B.4 were moved from part F to part B, because this was the logical order.
- In question B.5, the names of the applications used as examples of the various ICT resources were not translated in the Greek version of the questionnaire because they are widely used in Cyprus with their English names.
- In part C, two items included in the question C.1 were removed because their meaning was inappropriate for the study's purpose.
- Initially question E.1 was included in part D as question D.2. However, it was decided that part D should be split into two different parts because question E.1 was about the factors that affect teacher use of ICT, while question D.1 is about teachers' attitudes toward ICT.
- The last item in question E.1 was added since it was deemed as essential.
- The layout of part F was altered to become more convenient for the respondents and to save some space. Also, question F.5 was moved at the end of the part and of the questionnaire because this was the logical order.

- In the cover letter, a specific definition of ICT (ΤΠΕ in Greek) was added, since the particular acronym was widely used throughout the questionnaire. In this way, it was ensured that all the respondents would comprehend this term somewhat commonly.
- It was observed that the questionnaire was too lengthy and that the included items were too thickly written, which would be confusing and tiring for the respondents. This was due to the fact that a great part of the questionnaire's space was taken up by the options given in the likert-scale questions. Therefore, the questionnaire's layout was altered and the options in the likert-scale questions were moved from the tables to the questions' instructions. In this way, more space was gained for the items in the scales and questionnaire's length was reduced from eight to six pages.

6.3.2.1.2.2 Second piloting

After applying the necessary changes derived from the first pilot phase of the questionnaire, a second pilot study was conducted to test the new version of the questionnaire. The purpose of this pilot study was to address the validity of the new version, but its main purpose was to estimate the questionnaire's reliability. There are several procedures that can be used to estimate reliability (Burns 2000). Few of the approaches used could be the repeated administration of the data collection tool to the same sample within a short period of time (test-retest method); the internal consistency method, usually associated with Cronbach's Alpha coefficient and its variants; the split-half method; and the parallel-form method (Oppenheim 1992). All these methods are based on the principle that sets of scores can be correlated to determine the reliability of the test or the data collection tool (Burns 2000).

For this study's purposes, the internal consistency method was used to examine the questionnaire's reliability. This method was deemed as the most suitable since Cronbach's Alpha coefficient is a reasonable indication of the internal consistency of instruments that do not have right-wrong marking schemes, and therefore can be used for attitude questionnaires that make use of scales like rating and likert. At the same time, Cronbach's Alpha can be used to provide a reliability coefficient to indicate the level of internal consistency of the instrument or of a homogenous section of the instrument (Black 1999). Under this light, and because the questionnaire was mainly consisted of likert-scales, the particular method of examining reliability was used. Another reason for choosing this method was the fact that internal consistency reliability estimation requires only one administration of the instrument (Punch 2004). It is often very difficult to give the same research tool to the same sample twice, while people may remember their answers of the first occasion and answer the same way the second time to be consistent, which can artificially inflate the apparent reliability of the tool (deVaus 1993).

Based on these, in the context of this pilot study, the questionnaire was disseminated to 80 primary school teachers from whom 77 questionnaires were returned and considered adequate to be included in the pilot study. Once again, the questionnaire was personally administered to teachers by the researcher in 10 primary schools. The descriptive analysis of the data collected from the second pilot study is presented further down, along with the changes that were resulted from this pilot phase:

- Part A: Teachers' background characteristics

The teachers who participated in the second pilot study answered the questions included in this section without any significant problems and the results were deemed as satisfactory. Nevertheless, in question A.2, the percentages of teachers who belonged in 41-50 age group and 51-60 age group, were quite low (Table 6.3). The same thing was observed in question B.3 (Table 6.4). This did not raise any concerns since both questions were open which permits different recoding for the data analysis process. Therefore, no change was made to any question in part A. The descriptive analysis of the data collected from the questions included in this part is presented in the following tables:

Gender	Frequency	Percent
Male	12	15.6
Female	65	84.4
Total	77	100

Table 6.3: Teacher gender (Question A.1)

Age group	Frequency	Percent
21-30 group	35	45.5
31-40 group	35	45.5
41-50 group	4	5.2
51-60 group	3	3.9
Total	77	100

Table 6.4: Teacher age groups (Question A.2)

Group	Frequency	Percent
1-10 group	45	58.4
11-20 group	27	35.1
21-30 group	4	5.2
31-40 group	1	1.3
Total	77	100

Table 6.5: Teacher years in service categorised (Question A.3)

Grade	Frequency	Percent
Grade A	11	14.3
Grade B	12	15.6
Grade C	7	9.1
Grade D	12	15.6
Grade E	7	9.1
Grade F	6	7.8
Not specific	22	28.6
Total	77	100

Table 6.6: Teacher grade responsibility (Question A.4)

Position	Frequency	Percent
Temporary	25	32.5
Permanent	52	67.5
Total	77	100

Table 6.7: Teacher position in school (Question A.5)

- Part B: Issues on teachers' use of ICT

The second part of the questionnaire included five questions regarding teachers' ICT use. The participant teachers did not encounter any difficulty in answering these questions and their responses were adequate. No changes were made to the questions' items or the layout of this part. Nevertheless, the instructions of question B.2 caused confusion to teachers, and therefore, they were reworded, while the indication that they should only choose one option from those available was written with larger font and it was underlined to become more apparent. Question B.5 was a scale about teachers' use of ICT and other audiovisual resources. Internal reliability of this 21-item scale was assessed using the Cronbach's Alpha method. The scale in the second pilot study produced an Alpha of 0.856 (No. of cases=74). This value was considered acceptable, and therefore the scale was deemed as reliable. The following tables present the descriptive analysis of the data collected by the questions in this part:

Use of ICT for	Percent
Teaching preparation (ie: preparing lesson plans, teaching tools)	84.4
Teaching support (ie: presenting lesson plans, facilitating a project-based learning activity, or researching information)	81.8
Classroom management activities (ie: tracking attendance or word processing worksheets)	68.8
Professional Development (ie: skill training or reading articles about teaching with technology)	57.1
Communications (ie: emails, newsletters, or class websites)	70.1
Student assessment (ie: online testing or student portfolios)	33.8

Table 6.8: Use of ICT for professional responsibilities (Question B.1)

Impact of ICT in	Percent
Teaching preparation (ie: preparing lesson plans, teaching tools)	45.5
Teaching support (ie: presenting lesson plans, facilitating a project-based learning activity, or researching information)	32.5
Classroom management activities (ie: tracking attendance or word processing worksheets)	7.8
Professional Development (ie: skill training or reading articles about teaching with technology)	6.5
Communications (ie: emails, newsletters, or class websites)	2.6
Student assessment (ie: online testing or student portfolios)	2.6
No impact	2.6
Total	100

Table 6.9: The impact of ICT use in each area of professional responsibility (Question B.2)

ICT competence rating	Frequency	Percent
1	0	0.0
2	4	5.3
3	11	14.5
4	24	31.6
5	28	36.8
6	9	11.8
Total	76 (one missing)	100

Table 6.10: Teacher general ICT competence (Question B.3)

ICT competence in teaching rating	Frequency	Percent
1	1	1.3
2	8	10.4
3	19	24.7
4	21	27.3
5	20	26
6	8	10.4
Total	77	100

Table 6.11: Teacher ICT competence in teaching (Question B.4)

Resource	**1**	**2**	**3**	**4**	**5**	**6**
Word Processor (Microsoft Word)	12.7	9.9	11.3	12.7	29.6	23.3
Spreadsheets (Microsoft Excel)	40.8	32.4	15.5	5.6	5.6	0.0
Real Objects	4.3	1.4	7.1	12.9	18.6	55.7
CD-Roms for Educational games	17.1	18.6	15.7	18.6	22.9	7.1
Overhead Projector	19.7	26.8	23.9	14.1	9.9	5.6
Data Projector	31.4	22.9	14.3	14.3	12.9	4.3
Video conferencing	88.6	4.3	4.3	2.9	0.0	0.0
Television (video or DVD)	10.0	28.6	20.0	15.7	20.0	5.7
Printer	11.3	4.2	7.0	15.5	32.4	29.6
E-mail	35.7	12.9	10.0	4.3	12.9	24.3
Digital Camera	22.9	24.3	15.7	15.7	12.9	8.6
Educational software	20.9	19.4	13.4	14.9	22.4	9.0
Internet	11.3	19.7	8.5	11.3	16.9	32.4
Graphic/Design Software (Paint)	30.9	25.0	13.2	19.1	5.9	5.9
Radio (Tape or CD player)	2.8	8.5	14.1	19.7	29.6	25.4
Maps	8.6	14.3	8.6	20.0	24.3	24.3
Scanner	35.7	22.9	14.3	18.6	2.9	5.7
Databases (Microsoft Access)	54.3	20.0	21.4	2.9	1.4	0.0
CD-Roms Information Sources	19.7	31.0	18.3	14.1	14.1	2.8
Presentation Software (Microsoft PowerPoint)	16.9	26.8	15.5	14.1	21.1	5.6
Models	25.7	15.7	10.0	22.9	21.4	4.3

Table 6.12: Teacher use of ICT and audiovisual resources [(1=Never, 2=Less than once in a month, 3=At least once in a month, 4=At least once in a fortnight, 5=At least once a week, 6=Everyday) (Question B.5)]

- Part C: Teachers' pedagogical beliefs

The third part of the questionnaire included a 35-item likert scale (question C.1) about teachers' pedagogical beliefs. In general, all items presented in the scale were clear and teachers did not find any difficulty in answering them. Based on this, it was decided to keep all the items, while no changes were made to any of them. For the second pilot study, the Cronbach's Coefficient Alpha was 0.808 (No. of cases=75), and therefore, the scale was considered statistically reliable. Table 6.13 presents the descriptive analysis of the data which were collected from question C.1:

Statements	1	2	3	4	5	6
Facts, concepts, and principles are the most important things that students should acquire.	1.4	9.5	23	39.2	14.9	12.2
I set high standards for my students.	0.0	3.9	6.6	21.1	55.3	13.2
What I say and do models appropriate ways of thinking for students with respect to issues in the content.	2.7	5.4	9.5	41.9	39.2	1.4
My teaching goals and methods address a variety of ways that the students learn (different learning styles of students).	0.0	0.0	2.6	21.1	61.8	14.5
Students typically work on course projects alone with little supervision from me.	2.6	6.6	26.3	40.8	21.1	2.6
Sharing my knowledge and expertise with students is very important to me.	1.3	2.6	1.3	11.7	58.4	24.7
I give students negative feedback when their performance is unsatisfactory.	21.9	32.9	20.5	19.2	2.7	2.7
Activities in my class encourage students to develop their own ideas about content issues.	0.0	0.0	7.9	35.5	43.4	13.2
I spend time consulting with students on how to improve their work on individual and/or group projects.	0.0	1.3	2.6	25.0	48.7	22.5
What I say are important for students in order to acquire a broader perspective on the under study issues.	0.0	0.0	2.7	42.7	45.3	9.3
Students would describe my standards and expectations as somewhat strict and rigid.	13.3	26.7	21.3	32.0	6.7	0.0
I typically show students how and what to do in order to master a lessons' content.	2.6	6.6	18.4	35.5	28.9	7.9
Small group discussions are employed to help students develop their ability to think critically.	0.0	1.3	5.2	31.1	45.5	16.9
It is my responsibility to define what students must learn and how they should learn it.	4.0	10.7	8.0	29.3	34.7	13.3
Examples from my personal experiences often are used to illustrate points about the material.	0.0	3.9	7.9	34.2	39.5	14.5
I guide students' work on course projects by asking questions, exploring options, and suggesting alternative ways to do things.	0.0	0.0	1.3	25.0	55.3	18.4
Developing the ability of students to think and work independently is an important goal.	0.0	0.0	0.0	10.5	48.7	40.8
Lecturing takes part a significant part of my teachings.	2.7	20.3	36.5	24.3	14.9	1.4
I provide clear guidelines for how I want the tasks that I assign to be completed.	0.0	0.0	2.7	12.2	62.2	23.0
I often show students how they can apply the principles and pieces of information they learn.	1.3	1.3	2.6	31.6	55.3	7.9
The activities that I organise encourage students to take initiative and responsibility for their learning.	0.0	0.0	1.3	30.3	55.3	13.2
My expertise is typically used to resolve disagreements about content issues.	5.3	14.7	21.3	36.0	17.3	5.3
My teachings have very specific goals and objectives that I want to accomplish.	0.0	0.0	0.0	14.7	56.0	29.3
Students receive frequent verbal and/or written comments on their performance.	0.0	0.0	4.0	22.7	42.7	30.7
I solicit student advice about how and what to teach in the context of a subject.	8.1	5.4	33.8	35.1	14.9	2.7
Students set their own pace for completing independent and/or group projects.	3.9	10.5	17.1	36.8	26.3	5.3
Students might describe me as a "storehouse of knowledge" who dispenses the fact, principles, and concepts they need.	7.9	18.4	34.2	27.6	10.5	1.3
My expectations for what I want students to do in the class are clearly defined in the curriculum.	2.6	13.0	29.9	33.8	19.5	1.3
Eventually, many students begin to think like me about a teaching's content.	4.1	5.4	17.6	52.7	17.6	2.7
My students can make choices among many activities in the context of a teaching.	1.3	6.6	25.0	36.8	26.3	3.9
My approach to teaching is similar to a manager of a work group who delegates tasks and responsibilities to subordinates.	3.9	10.5	28.9	44.7	10.5	1.3
My standards and expectations help students develop the discipline the need to learn.	0.0	0.0	5.3	44.7	40.8	9.2
Students might describe me as a "coach" who works closely with someone to correct problems in how they think and behave.	0.0	0.0	10.5	31.6	51.3	6.6
I give students a lot of personal support and encouragement to do well in their assigned activities.	0.0	0.0	1.3	21.3	49.3	28.0
In the classroom, I assume the role of a resource person who is available to students whenever they need help.	0.0	0.0	10.7	32.0	49.3	8.0

Table 6.13: Teachers' pedagogical beliefs [(1=Strongly disagree, 2=Disagree, 3=Slightly disagree, 4=Slightly agree, 5=Agree, 6=Strongly Agree) (Question C.1)]

- Part D: Teachers' attitudes toward ICT

The fourth part of the questionnaire included a question about teachers' attitudes toward ICT. Question D.1 was a 29-item likert scale regarding teachers' attitudes toward ICT. The participant teachers did not find any difficulty in answering the question, and their responses were considered to be satisfactory. In this context, it was decided to keep all items while no changes were made to their original wording. Also, the internal reliability for this scale was assessed using the Cronbach's Alpha. The scale in the second pilot study produced an Alpha of 0.668 (No. of cases=76) which was considered adequate. The descriptive analysis of the collected data is presented in table 6.14:

Statements	1	2	3	4	5	6
ICT makes my work easier.	0.0	2.6	5.3	25.0	40.8	26.3
Computer scares me.	46.7	24.0	14.7	9.3	4.0	1.3
ICT helps me find heaps of relevant information for my teaching	0.0	0.0	2.7	8.0	48.0	41.3
I use ICT resources effectively myself but I'm not sure how to include them in my work.	6.6	17.1	15.8	30.3	23.7	6.6
I don't know what I would do without ICT.	7.9	22.4	21.1	22.4	13.2	13.2
I manage information more effectively because of ICT.	0.0	0.0	10.5	30.3	40.8	18.4
I wish that computer had never been invented.	74.7	18.7	4.0	0.0	1.3	1.3
I find it helpful for non-work related tasks.	17.3	17.3	32.0	14.7	16.0	2.6
ICT encourages pupils to work together collaboratively.	2.6	3.9	14.5	38.2	28.9	11.8
Some pupils are as scared as me when using ICT and its resources.	22.7	28.0	14.7	20.0	13.3	1.3
I find using ICT during teaching time consuming.	7.9	9.2	25.0	34.2	15.8	7.9
I feel lost in the Information Age.	41.3	26.7	9.3	16.0	5.3	1.3
I prefer using computer on my own when no-one is around to see me make mistakes.	46.1	26.3	15.8	6.6	1.3	3.9
ICT helps pupils acquire new knowledge effectively.	1.3	8.0	12.0	40.0	24.0	17.7
It's all moving too fast for me.	1.3	1.3	0.0	18.4	36.8	42.1
I find it easy to select appropriate ICT resources for my teaching.	0.0	9.5	25.7	33.8	21.6	9.5
I can't cope with all the ICT jargon.	28.0	26.7	16.0	25.3	4.0	0.0
Pupils can get distracted by all the technology.	12.2	21.6	28.4	27.0	9.5	1.4
I can never find anything relevant for my pupils when surfing to the web.	42.7	37.3	12.0	5.3	1.3	1.3
ICT seems to motivate the pupils to learn.	0.0	2.7	12.2	27.0	36.5	21.6
The pupils are way ahead of me in their use of ICT.	22.4	30.3	21.1	14.5	7.9	3.9
I don't have time to prepare teachings using ICT.	9.2	14.5	27.6	31.6	11.8	5.3
Systems are slow, I'd be quicker using a book.	16.7	26.4	25.0	19.4	8.3	4.2
I tried to include ICT resources to my teachings but it was unsuccessful.	19.7	36.8	22.4	13.2	5.3	2.6
I know the basics but that is all.	31.6	23.7	18.4	11.8	13.2	1.3
ICT swamps pupils with information.	13.9	26.4	27.8	23.6	8.3	0.0
I don't want to use ICT resources because I consider my established practices adequate.	27.0	39.2	24.3	5.4	2.7	1.4
I don't have the appropriate skills to use it effectively.	24.0	33.3	13.3	22.7	5.3	1.3
When teaching with ICT resources the classroom is transformed into a chaos.	29.7	37.8	24.3	8.1	0.0	0.0

Table 6.14: Teachers' attitudes toward ICT [(1=Strongly disagree, 2=Disagree, 3=Slightly disagree, 4=Slightly agree, 5=Agree, 6=Strongly Agree) (Question C.1)]

- Part E: Factors affecting teachers' use of ICT

The fifth part of the questionnaire was about the factors that affect teachers' use of ICT and the successful implementation of ICTs in the classroom and school. Question E.1 (Table 6.15), included in this part, was a six-point likert scale with 18 items which represented factors that positively affect the use of ICT by teachers, but also factors that hinder teachers' use of ICT. The internal reliability was assessed using the Cronbach's Alpha method. The scale in the second pilot study produced an Alpha of 0.279 (No. of cases=74). This value was quite low suggesting that the scale was unreliable. Therefore, it was decided to change the wording of a number of items in the Greek version of the questionnaire to improve their clarity. Also, it was decided not to remove any of the items, since all of them represented significant factors that were found to affect teachers' use of ICT.

Statements	**1**	**2**	**3**	**4**	**5**	**6**
The school I work don't have adequate equipment so as to promote the use of ICT.	10.8	21.6	12.2	21.6	24.3	9.5
The dissemination of ICT resources in my school is well organised.	6.8	18.9	21.6	14.9	29.7	8.1
I'm willing to use ICT but the access to the equipment is difficult and time consuming.	6.8	17.8	20.5	27.4	19.2	8.2
The educational software available in my school is updated and current.	8.1	2.7	17.6	39.2	25.7	6.8
Although there is equipment in my school, it is obsolescent to be used efficiently.	9.5	32.4	23.0	17.6	12.2	5.4
Every time I use a piece of equipment, there are technical troubles.	12.3	17.8	24.7	32.9	11.0	1.4
The administration of my school is quite supportive with respect to ICT use.	2.7	2.7	4.1	24.3	50.0	16.2
There is nobody to turn to when I have a technical problem.	12.2	23.0	21.6	25.7	9.5	8.1
I can easily find advise when I use ICT during my teaching.	6.8	16.4	19.2	38.4	12.3	6.8
Nobody asks for my suggestions when a new ICT innovation is introduced to my school.	7.1	11.4	38.6	17.1	15.7	10.0
My classroom is suitable for the use of ICT resources.	11.3	22.5	15.5	29.6	15.5	5.6
There is not adequate number of software in Greek.	5.6	14.1	29.6	21.1	19.7	9.9
My effort to use ICT resources is prevented by pupils' inadequate technology skills.	11.3	11.3	26.8	32.4	16.9	1.4
There are enough resources that illustrate how to integrate ICT into the curriculum.	5.6	14.1	31.0	32.4	9.9	7.0
The proportion of pupils and the available equipment averts the use of ICT.	1.4	5.6	9.7	23.6	36.1	23.6
The availability and diversity of educational software is satisfactory.	8.3	15.3	26.4	33.3	15.3	1.4
The current curriculum is not suitable for ICT integration.	5.6	12.7	28.2	31.0	14.1	8.5
Devices with technical problems are immediately fixed.	23.3	35.6	13.7	20.5	5.5	1.4

Table 6.15: Factors affecting teachers' use of ICT [(1=Strongly disagree, 2=Disagree, 3=Slightly disagree, 4=Slightly agree, 5=Agree, 6=Strongly Agree) (Question E.1)]

- Part F: Issues on teachers' professional development in ICT

The sixth part of the questionnaire included five questions which intended to collect data regarding issues related to teachers training on ICT. Questions F.1 and F.2 (Table 6.16) were clear to teachers and no revisions were made. Question F.3 (Table 6.17) was also clear to teachers; however, a number of them made more than one choice to the provided options. Therefore, it was decided to make the question's instructions more detailed by adding a sentence probing teachers to only choose a single option. The added sentence was written with larger font and it was underlined to become more apparent.

Question F.4 (Table 6.18) was an 18-item scale about teachers' attitudes toward ICT training and professional development. The items were clear to the participant teachers and no confusion was caused. Nevertheless, small changes in some of the items' wording were made in the Greek version of the questionnaire to increase the scale's reliability, which was found to be acceptable but somewhat low. The scale for the second pilot study, produced an Alpha of 0.612 (No. of cases=73). Additionally, question F.5 (Table 6.19), a likert scale, was about teachers' training needs with respect to ICT. The scale included 15 items representing different training needs with respect to ICT. The teachers were asked to indicate importance of each need. The items were clear for the teachers and their responses were adequate. Reliability of this scale was also assessed using the Cronbach's Alpha method. For the second pilot study an Alpha of 0.936 (No. of cases=71) was produced. This value was considered acceptable suggesting that the scale was reliable. The descriptive analysis of the data collected from questions F.4 and F.5 is presented in Table 6.18 and in Table 6.19.

PD opportunity	Yes	No
Participation in ICT seminars	60.5	39.5
Training from ICT coordinator	69.9	30.3

Table 6.16: Previous participation in ICT training (Questions F.1 and F.2)

Preferable type of ICT training	Percent
ICT skills training	10.5
ICT applied generally across the curriculum	31.6
ICT applied specifically to a particular subject	35.5
ICT training for pedagogical usage of ICT resources	22.4
Total	100.0

Table 6.17: Teachers' preferable type of ICT training (Question F.3)

Statements	1	2	3	4	5	6
I am interested in learning more about using ICT.	1.4	0.0	1.4	23.6	31.9	41.7
I feel ICT training is not appropriate to my teaching.	19.4	22.2	30.6	11.1	12.5	4.2
I find training courses in ICT useful.	0.0	0.0	2.8	18.1	33.3	45.8
I need to develop my skills and knowledge for professional development.	0.0	5.6	8.3	27.8	34.7	23.6
I feel I should develop my skills to keep up to date with developments in teaching.	0.0	4.2	11.1	26.4	31.9	26.4
I don't think I need ICT skills to progress in the profession.	33.8	23.9	26.8	11.3	4.2	0.0
I'm not that interested but I suppose I should be.	33.8	29.6	18.3	15.5	1.4	1.4
I need to develop my skills and knowledge for the pupils' benefit.	1.5	2.9	5.9	26.5	23.8	26.5
I don't see the need to learn about ICT.	45.1	26.8	22.5	2.8	1.4	1.4
I'm interested but I don't have the time.	7.0	25.4	12.7	29.6	16.9	8.5
I'm interested but I don't have the access.	14.1	28.2	18.3	25.4	9.9	4.2
I don't need to use ICT in my teaching.	42.3	31.0	16.9	5.6	2.8	1.4
I really want to know more about developing my skills in ICT.	0.0	0.0	2.8	19.7	46.5	31.0
I'm interested personally but developing my skills/knowledge in ICT isn’t appropriate to my teaching	25.7	28.6	22.9	11.4	5.7	5.7
I'm interested but training doesn't seem to be available.	8.5	25.4	18.3	21.1	16.9	9.9
I don't think it's necessary, no-one else in the school is bothering.	36.1	43.1	16.7	2.8	0.0	1.4
I feel my skills and knowledge in ICT are adequate.	4.2	15.3	20.8	36.1	18.1	5.6
ICT is not a priority for me.	26.4	34.7	19.4	16.7	2.8	0.0

Table 6.18: Teachers’ attitudes towards ICT training [(1=Strongly disagree, 2=Disagree, 3=Slightly disagree, 4=Slightly agree, 5=Agree, 6=Strongly Agree) (Question E.4)]

When I receive training on ICT, I expect that I will	1	2	3	4	5	6
understand and consider the advantages and disadvantages of using ICT for teaching and teaching preparation.	7.1	5.7	14.3	27.1	31.4	14.3
be capable to prepare lessons using ICT by selecting and preparing appropriate sources of information.	0.0	1.4	4.3	21.4	28.6	44.3
acquire the skills to select and use the most appropriate software and ICT resources for specific educational situations.	0.0	1.4	5.7	18.6	40.0	34.3
be capable to decide the most effective organisation of the classroom and pupils so as to fulfil my teaching goals.	1.4	2.9	8.6	28.6	32.9	25.7
learn how to extend pupils' learning in various subjects through the use of ICT.	1.4	1.4	8.6	18.6	28.6	41.4
be adequately competent so as to intervene and pose questions to stimulate, direct, monitor and assess the learning of pupils who are using ICT.	1.4	2.9	8.6	34.3	28.6	24.3
be skilled to employ the most appropriate technologies for whole class teaching.	0.0	2.9	8.6	22.9	30.0	35.7
be capable to combine the use of ICT with other resources and methods to achieve my teaching objectives.	0.0	2.9	7.1	15.7	41.4	32.9
acquire the competence to enable pupils to demonstrate their knowledge, understanding and skills in the different subjects while using ICT.	1.4	2.9	7.1	27.1	30.0	31.4
learn how to ensure that pupils' learning in the different subjects is not masked by the technology being used.	1.4	2.9	17.4	23.2	31.9	23.2
be capable to judge the effectiveness of using ICT in achieving teaching objectives.	1.4	1.4	14.3	24.3	34.3	24.3
obtain the competence to use generic and/or subject-specific hardware and software e.g. databases, internet, presentation tools, scanners, printers etc.	1.4	1.4	8.6	22.9	41.4	24.3
be skilled to use ICT to aid record-keeping, analysis of data, target-setting, reporting, transfer of information etc.	1.4	2.9	18.8	20.3	33.3	23.2
learn how to access and using resources, including resources from online communities, websites on education and from websites of the Ministry.	1.4	4.3	10.1	20.3	33.3	30.4
be capable to access research and inspection evidence.	1.4	4.3	24.3	20.0	30.0	20.0

Table 6.19: Teachers’ ICT training needs [(1=No need ←→ 6=Great need) (Question E.2)]

6.3.2.1.2.3 Third piloting

In order to ascertain that the questionnaire could do the job it was designed for, and also to test whether the additional changes that were made after the second pilot study would have improved its overall ability to collect the necessary for the study data, a third pilot study was conducted. In the third pilot phase, the questionnaire was once again self-administered to 60 primary school teachers. 56 questionnaires were collected back and considered adequate to be included in the pilot study. The collected data were descriptively analysed while the reliability of each scale included in the questionnaire was estimated. The produced Alpha for each scale is presented in Table 6.20 along with the Alpha produced from the data collected during the second pilot study. The researcher was satisfied with the results and the participant teachers noted that everything was clear and unambiguous. Based on these, it was deemed that the questionnaire was ready to be used in the main research (the final version of the questionnaire is placed in Appendix 1).

Scale	**2nd pilot Alpha**	**3rd pilot Alpha**
Teachers' use of ICT and other audiovisual resources	0.856	0.865
Teachers' pedagogical beliefs	0.808	0.897
Teachers' attitudes toward ICT	0.668	0.677
Factors hindering or facilitating teachers' use of ICT	0.279	0.675
Mechanisms supporting teachers' use of ICT	0.863	0.860
Teachers' attitudes toward ICT training and professional development in ICT	0.612	0.703
Teachers' training needs with respect to ICT	0.936	0.939

Table 6.20: Scales' reliability during piloting

6.3.2.1.3 Questionnaire sample

It is self-evident that rarely a researcher is capable of studying all individuals who would be appropriate subjects for a given project, and therefore, the usual procedure is to select a sample from the under investigation population and carry out the research on that sample (Borg 1981; deVaus 1993; Robson 1995; Wiersma 2000; Gall et al. 2003). Population is defined as "the total target group who would, in the ideal world, be the subject of the research, and about whom one is trying to say something" (Punch 2004:105), while sample is described as the segment or a subset of this population (Bryman 2001). In this way, the purpose is to draw conclusions about the under investigation issues by studying a sample of subjects who represent the population (Borg 1981). Nevertheless, samples can reflect the populations from which they are drawn with varying degrees of accuracy, while a sample which accurately reflect its population is called a representative sample (deVaus 1993). In this context, the degree of confidence with which the researcher can apply the research findings to the population is determined by the procedure used in selecting the sample, as well as by its size (Borg 1981).

There are eight major kinds of samples, from which four of them (simple random, system random, stratified random, and cluster samples) are probability samples, while the other four (quota, purposive/judgement, convenience/haphazard, and snowball samples) are non-probability samples (Bernard 2000). Probability sample is the one that has been selected using random selection so that each unit/person in the population has a known chance of being selected (Bryman 2001). In this type of sample or method of sampling, each individual in the population has exactly the same chance as every other individual of being selected (Bernard 2000). In this way, it is generally assumed that a representative sample is more likely to be the outcome when this method of selection from the population is employed (Bryman 2001). This is due to the fact that non-probability sample is the one that has not been selected using a random selection method, which implies that some units/individuals in the population are more likely to be selected than others (Bryman 2001). Therefore, if the objective of the research project is to generalise the research's results to the total population from which the sample is drawn, then a probability sampling method should be employed (deVaus 1993; Bernard 2000; Wiersma 2000; Punch 2004).

This study's main purpose was to explore the infusion of ICTs in the Cyprus primary schools, while its results would be generalised to the study's target population which is the total number of the Cypriot primary school teachers. Therefore, it was decided that probability sampling method should be employed and more specifically simple random sampling approach. Simple random sampling is usually considered the best approach, since all the individuals in the defined population have an equal and independent chance of being selected as member of the sample (independent means that the selection of one individual does not affect in any way the selection of any other individual) (Borg 1981; Gall et al. 2003). Simple random sampling involves selection at random of the required number of persons for the sample from a list of the population under study, known as the sampling frame (Robson 1995). A sampling frame is defined as "a list of units of analysis from which you can take a sample and to which you generalise" (Bernard 2000:147). The usual way to select a simple random sample is to assign a number to each person in the sampling frame and use a table of random numbers, or a lottery method, or a computer to select the sample (Borg 1981; Robson 1995). However, one of the problems of simple random sampling is that it requires a good and precise sampling frame which in many cases is not available or easily accessible, making in this way the specific sampling procedure not always feasible (Borg 1981; deVaus 1993).

Nevertheless, in the case of this particular study, a precise and comprehensive sampling frame was acquired by the Cypriot primary school teachers' union, and therefore, simple random sampling could be employed. The sampling frame included all the teachers who work in Cypriot public primary schools. The total population was 4009 teachers, from which 853 were headteachers and deputy headteachers.

Type of post	**Male**	**Female**	**Total**
Headteachers/Deputies	293	560	853
Teachers	533	2623	3156
Total	826	3183	4009

Table 6.21: Teacher population

However, headteachers and deputy headteachers were excluded from the sampling frame and the research's target population since it was deemed that these teachers' administrative duties as well as the fact that their presence in the classrooms for teaching is much less than the other teachers, would have made them perceive things differently and see the under investigation issues from a different perspective. In this way, the final sampling frame included 3156 teachers. The aim was to research 15% of the teachers' total population. Therefore, each teacher in the sampling frame was given a number and using a lottery system, 475 teachers were randomly selected to be included in the research sample.

6.3.2.1.4 The administration of the questionnaire

A serious problem when administering a questionnaire for data collection is related to the low response rate by the research's participants. It is characteristically noted that "if you get everything else right (perfect random sampling from perfect sampling frame), anything other than a very high response rate casts serious doubts on the representativeness of the sample you actually achieve" (Robson 1995:143). A very low response rate, not only causes disappointment and troubles, but also carries the possibility of biased research's results (deVaus 1993; Punch 2004). This is due to the fact that those who do not participate in the research may differ, or have different views, form those who decide to complete the questionnaire (Robson 1995). Therefore, the method of administration of the questionnaire affects the response rate which ultimately affects the sample quality (deVaus 1993).

Therefore, in order to tackle the problem of the low response rate and also to ensure the quality of the collected data, it was decided to self-administer the questionnaire to the teachers who were chosen for the study's sample. Cyprus is a small country, and the distances between the different districts and urban areas are minimal. In this way, a researcher has the opportunity to use this method of administering the questionnaire easily without any major problems. It is noted that this method of disseminating the questionnaire to the research participants ensures a high response rate and accurate sampling (Oppenheim 1992), while it allows data gathering from a large, representative sample at a relatively low cost (Bernard 2000). Also, it allows the researcher to easily distribute the questionnaire, to provide explanations about the purpose of the research, to correct any misunderstandings, to maintain control and order over the questionnaire completion, and finally, to achieve a high response rate (Opie, 2004; Punch 2004).

In this way, the precise procedure that was followed to administer the questionnaire is the following: after identifying the schools where the teachers who were randomly selected to participate in the research had been working, the researcher visited each school and met the respective Headteachers. After providing the necessary explanations about the research and its objectives, the Headteachers were asked to disseminate the questionnaires to the participant teachers. In many cases the researcher was given the chance to personally meet the participant teachers and provide further explanations and comments. Headteachers were then asked to collect the completed questionnaire and let the researcher know when to return back to collect them. In a number of cases, where a school was in a remote area and where the number of the participant teachers was small, the researcher asked from Headteacher to mail the completed questionnaires back to the researcher. In these cases, prepaid envelops were provided to Headteachers.

6.3.2.1.5 Analysis methods for the questionnaire data

Statistics can be divided into two broad categories: descriptive and inferential. Descriptive statistics describe samples of subjects in terms of variables or combinations of variables (Tabachnick and Fidell 2007). They allow a researcher to summarise large quantities of data using measures that are easily understood by an observer (Burns 2000). Their uses include the description of the characteristics of a sample, the addressing of specific research questions, and the examination of variables for any violation of the assumptions underlying other statistical techniques that are needed for answering other research questions (Pallant 2005). Nevertheless, in many research situations, a sample is studied with the intention of generalising to some larger group, and therefore, the analysis is an attempt to infer something about the large group by using the data collected from the sample (Wiersma 2000). In this way, the term inferential statistics refers to the procedures for making generalisations about characteristics of a population based on information obtained from a sample taken from that population (Black 1999; Burns 2000; Hinton et al. 2004). This type of statistics is also used to examine relationships, through hypotheses testing, between different variables of the data being studied (Opie 2004). The use of both descriptive and inferential statistics is also a common practice in research projects. Usually the data are described, reliable differences or relationships are found, and population values for the reliable findings are estimated (Tabachnick and Fidell 2007).

Within this framework, descriptive as well as inferential statistics were used in this study to answer the research questions. More analytically, descriptive statistics like frequencies, means and standard deviation were used to organise, examine, and describe the collected data but also to answer specific research questions. Inferential statistics like independent-samples t-test, one way analysis of variance (ANOVA), correlation, regression analysis, and structural equation modelling

(SEM) were used to answer other research questions. The statistical analysis was carried out using the statistical software package SPSS (version 15), and also the software SPSS AMOS (version 16.0.1) for SEM. The probability level for all tests used was set at ≤ 0.05. This means that if a statistical test says that the probability of an event occurring by chance alone is less that 5% then it probably did not occur as a random event (Black 1999).

More analytically, independent-sample t-test is used for comparing the mean scores of two different groups of people or conditions, or for comparing the mean score on some continuous variable, for different groups of subjects (Pallant 2005). The t statistic is calculated by dividing the difference between the sample means by an estimate of the standard deviation of the distribution of differences, which is known as the standard error of the difference (Kinnear and Gray 2004). T-test was used in this study to test if the differences between the mean of two groups in the sample were statistically significant. For example, it was used to test whether male and female teachers were using ICT differently.

Moreover, ANOVA, like t-test, is concerned with the testing of hypotheses about means (Kinnear and Gray 2004). However, ANOVA is used to compare two or more means to see if there are any statistically significant differences among them (Tabachnick and Fidell 2007). ANOVA has the advantage that it can be used to analyse situations in which there are several independent variables. In these situations, ANOVA shows how these independent variables interact with each other and what effects these interactions have on the dependent variable (Field 2005). It is also called analysis of variance because it compares the variance between the different groups (believed to be due to the independent variables) with the variability within each of the groups (Pallant 2005). In this way, an F-statistic or F-ratio is produced which is the ratio of the mean between-group variance and the mean within-group variance (Bernard 2000). If these two estimates of variance do not differ appreciably, it can be concluded that all of the group means come from the same sampling distribution of means, and that the slight differences among them are due to random error. If, on the other hand, the group means differ more than expected, it is concluded that they were drawn from different sampling distributions of means, and therefore, the means are not the same (Tabachnick and Fidell 2007). In this study, ANOVA was used to determine if there are statistically significant differences in teachers' use of ICT because of other independent variables like teachers' age, length of teaching experience, and previous participation in any form of in-service training.

Factor analysis was also used in the study. Factor analysis is a technique for identifying groups or clusters of variables and its main uses are the following: (1) to understand the structure of a set of variables; (2) to construct a questionnaire to measure an underlying variable; (3) to reduce a data set to a more manageable size while retaining as much of the original information as possible (Field 2005). Specifically, for the purposes of this study the method of principal component analysis was used with varimax rotation. The reduction of the number of the related variables to a more manageable number enabled the researcher to decide which variables to include in other analyses such as multiple regression, ANOVA, and SEM.

Regression analysis was used to explore (predict) the relationship between a dependent variable (i.e teachers' ICT use) and a number of independent variables or predictors (i.e teachers' pedagogical beliefs, attitudes towards ICTs, etc). Regression analysis is a set of statistical techniques that can be applied to a data set in which independent variables are correlated with one another and with the dependent variable to varying degrees. The result of regression is an equation that represents the best prediction of a dependent variable from several continuous (or dichotomous) independent variables (Tabachnick and Fidell 2007). Regression is a method for figuring out how much variance in a dependent variable is accounted for from a series of independent variables after taking account of all the overlap in variances accounted for across the independent variables (Bernard 2000).

Finally, SEM was used to examine, assess and graphically depict the regression equations produced by multiple regression analysis. SEM is also a family of statistical techniques (Garson 1998; University of Texas, 2002) that allows 'a set of relationships between one or more independent variables, either continuous or discrete, and one or more dependent variables, either continuous or discrete, to be examined' (Ullman, 2007:676). SEM is a combination of multiple regression analysis and factor analysis (Garson 1998; Hox and Bechger 1998; Wuensch 2008), which allows questions to be answered that involve multiple regression analyses of factors (Tabachnick and Fidell 2007).

6.3.2.2 Interview

As mentioned before, the combination of quantitative and qualitative methods was deemed as the most appropriate approach to deal with this study's research questions. In this way, even though a quantitative approach was the main research method used, qualitative data were also collected using the interview, which is considered to be the most widely employed data collection method in qualitative research (Bryman 2001). The interview data were used to complement the data collected by the questionnaire, since as argued, it "can yield rich material and can often put flesh on the bones of questionnaire responses" (Bell 1993:91). Additionally, these data were used to validate the quantitative data (Cohen et al. 2005). It is noted that using a single method of collecting data and finding clear-cut results, may delude the researcher in believing that the right answer was found (Robson 1995; Burns 2000). In this context, employing two methods of collecting data permits triangulation (see Section 6.4), which means that the findings from one method can be checked against the findings deriving from the other, enhancing in this way the overall validity of the study's findings (Punch 2004).

In this framework, the interview is defined as a specialised form of communication between people for a specific purpose associated with some agreed subject matter. Therefore, the interview is considered to be a highly purposeful task, a special kind of knowledge-producing or meaning-making interaction/partnership that occurs between two parties, which goes beyond mere conversation (Robson 1995; Anderson and Arsenault 1998; Hesse-Biber and Leavy 2006). As a data collection method it is considered to be particularly useful for accessing individuals attitudes and values, namely, things that cannot be observed or accommodated in a questionnaire, while the open-ended and flexible questions are likely to permit better access to the research participants' views, interpretations of events, understandings, experiences and opinions (Byrne, 2004). It is suggested that often the interview is more efficient than the questionnaire in enabling a researcher to gather rich, detailed answers and more complete information (Anderson and Arsenault 1998; Bryman 2001). In this way, and when done well, interviewing is able to achieve a level of depth and complexity that is not available to other approaches (Byrne, 2004), while, it can greatly broaden and deepen the original plan of the research, throw up new dimensions to be studied, and suggest many new ideas (Oppenheim 1992).

Nevertheless, the interview also has a diversity of disadvantages that need to be taken into account when deciding to employ it as a data collection tool in a research project. For instance, preparing the interview, interviewing, the transcription of interviews, as well as the analysis of transcripts are all very time-consuming (Oppenheim 1992; Bell 1993; Bryman 2001; Walsh 2001), and in this way, only a limited number of respondents may be interviewed (Burns 2000). By reducing the number of persons willing to participate, may in turn leads to biases in the sample that is being achieved (Robson 1995). Also, biases can be caused by the fact that the researcher is physically present during the data-gathering process (Borg 1981; Walsh 2001; Cohen et al. 2005). In this sense, the interview is a highly subjective technique, with reduced standardisation which except of the danger of bias, can create validity and reliability concerns with respect to the collected data (Borg 1981; Bell 1993; Burns 2000; Walsh 2001).

6.3.2.2.1 Interview format and questions

There are several types of interview which differ in the openness of their purpose, their degree of structure, the extent to which they are exploratory or hypothesis-testing, and whether they seek description or interpretation (Kvale 1996). Nevertheless, a commonly made distinction is based on the degree of structure or formality of the interview (Merriam 1988; Robson 1995; Bogdan and Biklen 2003), which in turn reflects the purposes of the interview in relation to the research project (Cohen et al. 2005). According to this way of discriminating the interview, three types are derived: structured, unstructured and semi-structured interview. Table 6.22 presents a compilation of the major characteristics of each interview type:

Structured interview	Unstructured interview	Semi-structured interview
• questions are planned and standardised in advance • pre-coded categories are used for responses • the interview itself does not attempt to go to any great depth • it aims to keep the focus of the talk tight • the data collection is focused and efficient • the compilation of data is straightforward • the respondents' answers are not followed up to obtain greater depth • the responses are similar to those obtained from a questionnaire • the interviewer can interact with individuals to reduce the number of unusable responses	• there is no predetermined set of questions • the researcher has a general area of interest and concern • the 'conversation' in the context of this type of interview develops within the researchers' area of concern and interest • can help the acquisition of insights and understanding • it is preferred for understanding the complex behaviour of people without imposing any predetermined categorisation which might limit the field of inquiry • the researcher needs to be quite skilled to handle the great flexibility demanded in this type of interview • it is highly subjective and time-consuming • it can make the researcher feel lost in a sea of divergent viewpoints and seemingly unconnected pieces of information	• the aim is to have something of the best of both the structured and unstructured interview • the researcher establishes a core of issues to be covered • a set of questions is worked in advance • the predetermined set of questions is often referred to the interview guide • the interview guide provides a direction to the researcher to keep the content of the interview focused on the crucial issues of the study • during the interview, the researcher can make changes in the questions' order based upon his/her perception of what seems most appropriate • changes can also be made in the way the questions are worded • the researcher can leave out particular questions which seem inappropriate with a particular interviewee or include additional ones • the researcher can provide explanations • the sequence and the relevances of the interviewee are left free to vary, around and out from the core of issues

Table 6.22: The interview types' characteristics [Compiled from (Merriam 1988; Robson 1995; Bernard 2000; Burns 2000; Bryman 2001; Freebody 2003; Gall et al. 2003; Punch 2004)]

The selection of a particular type of interview for a research project is dependent on its goals and objectives (Bogdan and Biklen 2003). For this study's purposes the semi-structured interview was chosen as the secondary data collection tool. This decision was based on the fact that semi-structured interview permits greater flexibility than the structured type, and also because it permits a more valid response from the participants' perception of reality (Burns 2000). Also, with semi-structured interview, the researcher is confident of getting comparable data across subjects (Bogdan and Biklen 2003). The fact that the researcher follows particular lines of talk and in accordance to the interview guide, permits the analysis of patterns and themes that emerge from the interviews' transcripts (Freebody 2003).

The interview guide (Appendix 1) that was prepared for this study was quite simple. It included four main sections, namely a list of headings of the under investigation topic and issues. Under each heading a number of key questions to be asked were included, as well as a number of associated prompts to direct the discussion and to probe additional and more detailed information. The interview guide was in line with the main topics covered by the questionnaire, since, the intension was to complement the data collected by the questionnaire with the qualitative data collected by the interview. More analytically, the interview guide included the following sections and questions:

- Section A: Teachers' background characteristics

The first section included questions on teachers' gender, age, length of teaching experience, and grade responsibility.

- Section B: Teachers' thoughts on pedagogy

The second section of the interview guide included questions that intended to solicit teachers' thoughts on pedagogical issues. Teachers were asked to describe the most common and frequent teaching approaches they were employing during their teaching, to indicate their perceptions on their roles and on their students' roles during teaching, as well as about the way they organise their classroom setting. Also, they were asked to comment whether students should participate in the process of decision making with respect to teaching, educational objectives, teaching content and procedures, as well as their assessment.

- Section C: Teachers attitude toward ICT, and the factors affecting their ICT use during teaching

This section included questions that were related to teachers' attitudes toward ICT. Teachers were asked to discuss ICT's role in education, and its advantages and disadvantages as a teaching tool according to their experiences. In addition, they were asked to discuss the factors that encourage them to use ICT resources in their teaching as well as the challenges or obstacles they face in their attempts to integrate technology in their classroom.

- Section D: Teachers' training needs on ICT and attitudes toward ICT training

The final section of the interview guide aimed to explore teachers' view regarding ICT training. Teachers were asked to describe the ideal way of receiving ICT training as well as to discuss the appropriate focus of this training. Finally, teachers were asked to discuss the needs that should be satisfied when receiving ICT training.

6.3.2.2.2 Interview validity

Just like the questionnaire, the interview, as the secondary data collection tool for this study, needed validation. Therefore, after the development of the interview guide, a discussion between the researcher and his supervisor was followed. The different sections of the interview guide, as well as the included questions were explored, reviewed and discussed to ensure that they were relevant to the study's main topics and issues. After this, the interview guide was presented to two PhD students for revision and assessment. They were asked to propose changes for the questions' wording and sequencing to improve their clarity and the consistency of the interview discussion. Also, due to the fact that interview guide was written in English, a translation was made which was thoroughly corrected by an English teacher in Cyprus. She was asked to check the accuracy of the translation and also to ensure that the terms and concepts included in the questions were producing the same meaning as in the English interview guide. Finally, the interview was piloted with two teachers in Cyprus. During the pilot interviews the researcher had the chance to measure the time needed for the interview session and also to test the digital voice recorder's efficiency. After the two pilot interviews, the researcher was given the opportunity to discuss with the interviewees problematic issues of the interview session. They were also asked to provide feedback and make comments about the interview questions and their experience as interviewees. These steps helped the researcher make changes to the interview guide, change the wording of the unclear questions, and also alter the sequence of some question to improve the interview's overall flow.

6.3.2.2.3 Interview sample

Qualitative sampling strategies have a different underlying logic than the strategies used in quantitative research. This is due to the fact that in many cases the intention in qualitative research is not to ensure the generalisability of findings to the populations from which the sample was drawn. Rather, qualitative researchers indentify particular attributes they want participants in the study to have and then actively seek persons who have them. In this way, sampling in qualitative research seeks in respondents only the criteria and social characteristics specified by the research questions (Merriam 1988; Crowl 1996; Darlington and Scott 2002; Warren and Karner 2005). Nevertheless, when the research objectives of a study demand it, sometimes a probability sampling approach may be employed. In these cases a sample of interviewees may be taken from a much larger sample generated in the context of a survey (Bryman 2001).

In this context, and as mentioned before, the qualitative data from the interview in this study were used to complement the data collected by the questionnaire. Therefore, it was deemed that a probability sampling approach would be more appropriate for the study's objectives. Specifically, using simple random sampling, 20 teachers from the 475 teachers that were randomly selected to be included in the questionnaire sample were identified and selected to be included in the interview sample as well. It was decided that these teachers would firstly be interviewed and then complete the questionnaire. Also, the participant teachers' were free to decide whether or not to participate in the interviews. Only one teacher in the sample refused to participate and therefore she was replaced by another randomly selected teacher.

6.3.2.2.4 The conduction of the interviews

A researcher needs to manage diverse issues before and during the interview session. On a first consideration, he/she should prepare a ‘cover story’, an initial presentation of him/herself to those who will be involved in the research, which should not only include details on the researcher’s identity and on the research’s general nature and purposes, but also, to prepare the participants to take part more effectively (Burns 2000). Assurances of anonymity and confidentiality should be provided, which will ensure that the participant interviewees will feel safe, comfortable and secure to talk freely (Bernard 2000; Cohen et al. 2005; Hesse-Biber and Leavy 2006). Other initial interviewing activities should include details about the use of the study’s results, the data recording method, the duration of the interview session, the place where the interview will take place, and at what time (Burns 2000).

Moreover, the issue of establishing rapport with the interview participants is boldly highlighted. Engaging the participants in a small talk before beginning the interview and by using an everyday conversational style, rapport can be achieved (Gall et al. 2003). During this conversation, but also throughout the interview session, the interviewees need to feel that what they are saying is valued (Hesse-Biber and Leavy 2006), while the researcher ought to provide reassurances that there are no right answers and that his role is not judgemental or evaluative (Burns 2000; Wiersma 2000). In order to achieve this, the researcher should explain that the interest is only focused on their viewpoints and perspectives according to their observations and experiences (Bernard 2000). This means that the researcher should remain neutral and non-judgemental no matter what a respondent is saying (Merriam 1988). The establishment of an appropriate atmosphere (Cohen et al. 2005), in which the researcher is taking the role of an active listener while the interviewee is speaking, and by showing a genuine interest in what he/she is saying, are very important elements for maintaining the rapport and the unhindered flow of the interview (Wiersma 2000; Hesse-Biber and Leavy 2006). Another key issue to successful interviewing is the effective probes (Bernard 2000). A probe is described as a device to get the interviewee to expand on a response when there is the impression that he/she has more to give (Robson 1995).

These guidelines were generally employed during the conduction of the interviews in the context of this study. After randomly selecting the participant teachers, the researcher met with the interviewees in each school, explained how they were selected to participate in the research, and assured them that the collected data would only be used for the study's purposes and that their viewpoints would be greatly appreciated. He also informed them about procedural matters concerning the interview like the expected duration of the session and the way of data recording. The participant teachers were asked to propose a convenient place for them, as well as their preferred time for the interview. The majority of them preferred their classroom while others chose the staff meeting room. Also, most of them chose to be interviewed during planning periods and only a couple of them preferred to spare time after school.

All interview sessions were quite straightforward without any significant problems. The participant teachers provided answers to all questions without frustration or hesitation. All interviews initiated with a short discussion about the research's overall rational and purposes. After establishing the necessary rapport, the interview continued according to the predetermined interview guide. Probes and prompts were employed in the cases when the researcher felt that an answer was inadequate or incomplete. However, the researcher tried to stay neutral and restrict his facial expressions and body movements in an effort not to influence the interviewees' responses and reaction to the questions. In two cases, the interview session was interrupted by students who wanted to talk with their teachers, but afterwards, the interviews continued without any problems and as planned.

In all cases a digital voice recorded was used to record the interviews. The researcher informed the participant teachers about his intension to use the recorder prior to each interview and asked for their consensus. All teachers agreed to the use of the recorder. The use of a voice recorder is the usual method for preserving the information collected in an interview (Merriam 1988; Gall et al. 2003). Nevertheless, some researchers take written notes in addition to recording the session to highlight non-verbal activities and reactions by the respondents (Merriam 1988). The final step of each interview session was the transfer of the media file produced by the digital voice recorder to a computer where it was transcribed and translated into English.

6.3.2.2.5 Analysis methods for the interview data

The qualitative data deriving from interviews typically take the form of a large database of unstructured textual materials, and therefore, they are not straightforward to be analysed (Bryman 2001). Generally speaking, qualitative data analysis does not proceed in a 'cookbook fashion' while there is no one right way to go about it (Hesse-Biber and Leavy 2006). This is due to the overall richness and complexity of qualitative research which entail that there are different ways of looking at and analysing the various social phenomena, while there are multiple perspectives and practices in the analysis of qualitative data (Gall et al. 2003; Punch 2004). In contrast to quantitative data analysis, there are no clear-cut rules about how qualitative data analysis should be carried out (Bryman 2001). Nevertheless, broad guidelines and steps can be provided in order to help a researcher conduct the analysis of qualitative data. Figure 6.11 presents a visual model of the steps that can be followed when conducting qualitative data analysis and interpretation:

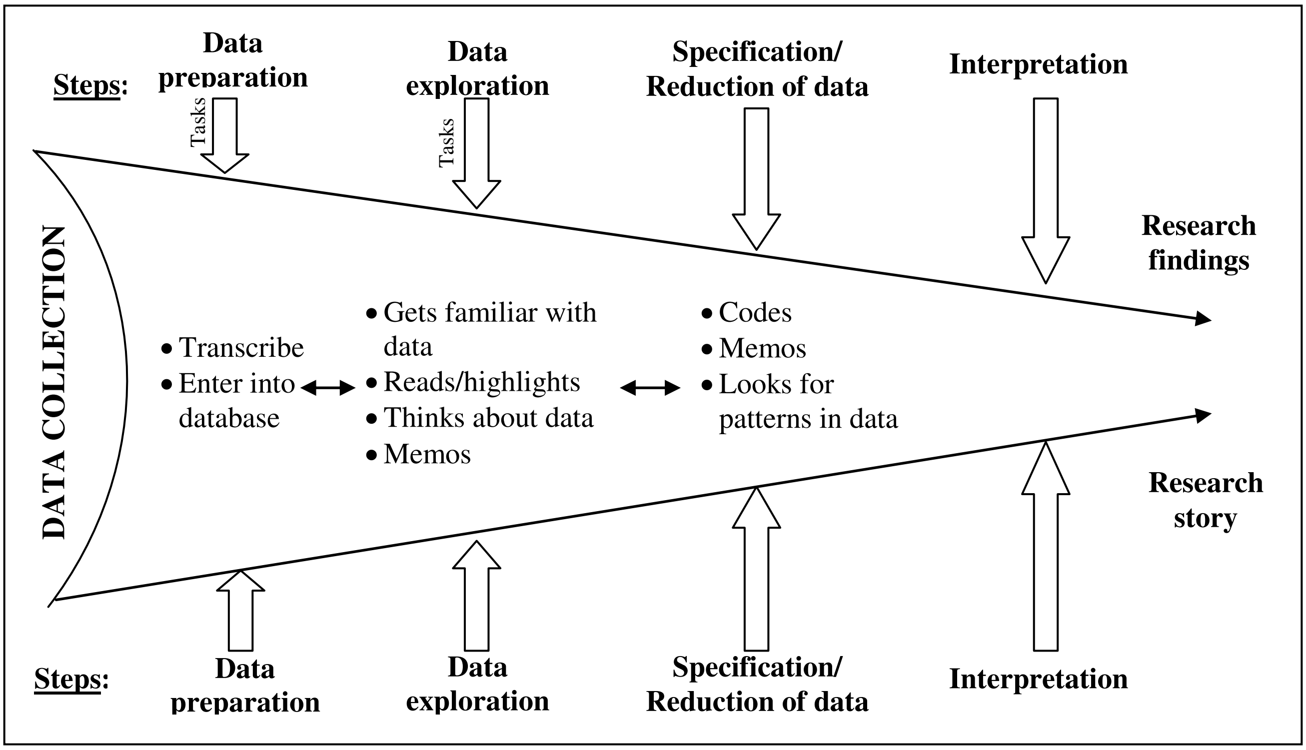

Figure 6.11: Steps in qualitative data analysis and interpretation: A visual model [From (Hesse-Biber and Leavy 2006:358)]

The steps and the general framework depicted in Figure 6.11 were generally followed to guide the analysis of the data collected through the interviews conducted in the context of this study. On a first consideration, the researcher prepared the collected data by organising the media files produced by the digital voice recorder on his computer. Each file was labelled with the name of the respective interviewee. Additional notes that were taken during the interview sessions and the data collection phase were typewritten and attached to the respective respondent's interview. In this way, sixteen folders were created containing the audio files of each interview, as well as the documents of the complementary notes. After that, the folders were updated with the interview transcripts which were carefully produced by the researcher soon after the data collection phase.

In order to become familiar with the data, the researcher printed out the interview transcripts and while listening to the actual interviews, read them twice to ensure that the transcription was accurate. This step also help the researcher to get 'a sense of the whole', which provides a context for the emergence of specific units of meaning and themes later on (Cohen et al. 2005). During this initial reading, few general notes were jotted down to highlight interesting viewpoints raised by the interviewees. Then, the transcripts were read once more, but this time, basic marginal notes were taken regarding keywords used by the interviewees, while, what was felt as important was highlighted and marked up. Reading and rereading the collected data, helps the researcher notice similarities and consistencies throughout (Warren and Karner 2005), which are considered to be preliminary ideas for developing a coding system (Wiersma 2000).

Coding the data is a necessary analysis task of practically any qualitative research study, since through this strategy a researcher can locate key themes, patterns, ideas, and concepts that may exist within the data (Hesse-Biber and Leavy 2006). Coding denotes reviewing transcripts and giving labels (names) to component parts that seem to be of potential theoretical significance (Bryman 2001; Punch 2004). These component parts could be certain words, phrases, patterns of behaviour, subjects' way of thinking that are repeatedly standing out or appearing with regularity in the data, or for some reason are appearing to be noteworthy (Bogdan and Biklen 2003). Therefore, coding is a process of organising data and obtaining data reduction which in turns will enable the researcher to categorise, describe, synthesise, and finally to interpret the phenomenon under study (Wiersma 2000). However, coding should not be equated with analysis, since it is part of the overall analysis process (Bryman 2001).

ATLAS/ti software package was used by the researcher to facilitate the coding and all the subsequent analysis of the qualitative data collected through the interviews. After the initial examination of the interview transcripts and the basic coding of the collected data, the interview transcripts were translated into English. Sixteen new documents were created, which were then compiled into a single document containing all the interview transcripts. In this way, the researcher had the chance to review the produced codes in relation to the accumulated transcripts. The collected data and the initial codes were then organised in relation to the interviews' main questions which typically reflected the study's overall research questions. Therefore, new documents were created that included the accumulated data and codes concerning the main issues negotiated in each interview question. These files were then imported in to ATLAS/ti to proceed to more advanced coding.

The researcher carefully reread the organised transcripts and created additional codes developing in this way an index of terms, which as noted, would ultimately facilitate the interpretation and theorisation in relation to the collected data (Bryman 2001). At the same time, he started writing memos to record his ideas and thoughts with respect to the emerging codes and to the study's research questions. A memo is described as "the theorising write-up of ideas about codes and their relationships as they strike the analyst while coding... it can be a sentence, a paragraph or a few pages... it exhausts the analyst's momentary ideation based on data with perhaps a little conceptual elaboration" (Glaser 1978:83-84). Writing memos can raise a code to the level of concept and category (Hesse-Biber and Leavy 2006). Concepts are produced through coding and are labels given to discrete issues, while categories are concepts that are elaborated to represent themes and phenomena (Bryman 2001).

The researcher tried to establish connections and relationships between the created codes, developing in this way diverse concepts and categories which were relevant to the major issues and themes in each interview question. Devising categories is an intuitive process, but it is also systematic and informed by the study's purpose, and the researcher's orientation and knowledge (Merriam 1988). As the various categories emerged, the researcher examined the included codes and data in each category in relation to more theoretical ideas found in the respective literature. When a set of categories, which in general reflected the purpose of the study and were in line with its research goals and questions, were developed, the researcher went through the data once more to complement and saturate each category with additional data and pieces of information found in the interview transcripts. It should be noted that the overall process of category construction is a form of content analysis (Merriam 1988).

When the diverse categories were developed, the relationships between them were explored. The ways in which the categories were being linked together were thoroughly considered to find emerging connections. The consideration of the relations and linkages between the constructed categories led to the development of basic theoretical themes. Each theme included the interrelated categories, and the intention was to employ them during the presentation of the qualitative data analysis results. It should be noted that with the help of ATLAS/ti, the teachers' responses were organised under the respective themes as quotations which would be used as exemplars at the presentation of the results. Figure 6.12 presents a concept map of the major themes and coding categories as derived by the qualitative data analysis. The constructed themes were the following: teachers' ICT use, teachers' pedagogical beliefs, teachers' attitudes toward ICT, factors affecting teachers' use of ICT, and teachers' ICT training.

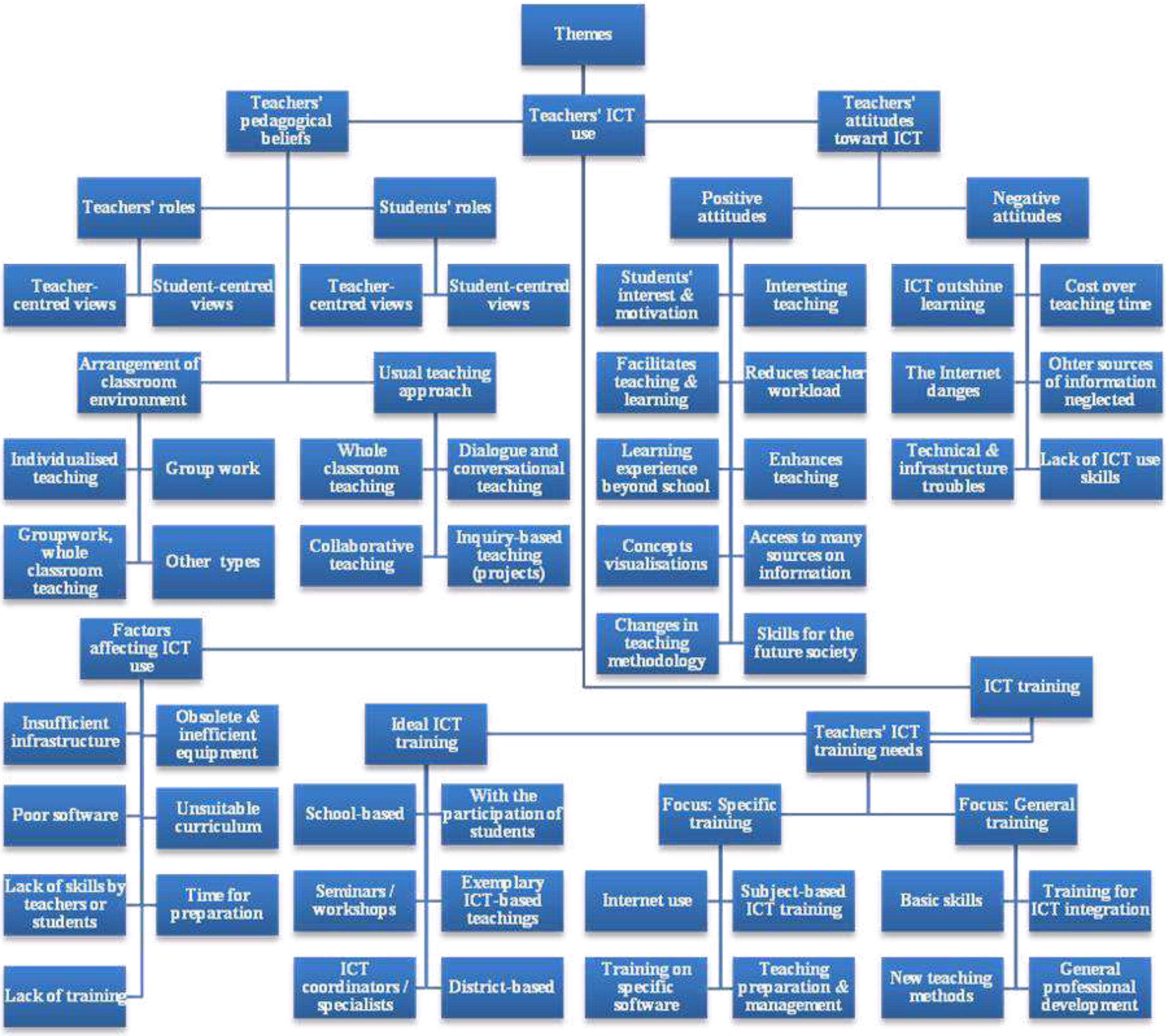

Figure 6.12: The qualitative analysis' main themes and coding categories

6.4 Triangulation

As noted before, the exclusive reliance on one data collection method may bias or distort the researcher's picture of the particular issues under study (Burns 2000; Cohen et al. 2005). Also as discussed, concepts of validity, reliability, and generalisability are of paramount importance in the context of a research project. A commonly used technique to tackle these issues, which will ultimately can enhance the study's credibility, is triangulation (Burns 2000). General speaking, triangulation can be described as the:

> comparison of information to determine whether or not there is corroboration. It is a search for convergence of the information on a common finding or concept. To a large extent, the triangulation process assesses the sufficiency of the data. If the data are inconsistent or do not converge, they are insufficient (Wiersma 2000:251).

Triangulation can take many forms, like the use of evidence from multiple data sources or theories or of different investigators (Merriam 1988; Robson 1995; Anderson and Arsenault 1998; Gall et al. 2003), but its basic form is the combination of two or more different research strategies of collecting data in order to study the same phenomenon or issue (Denzin 1978; Bryman 2001). In this way, triangulation provides a means of testing one method of collecting data against other methods: if two methods give the same messages and yield substantially the same results then, to some extent, they cross-validate each other (Robson 1995).

Moreover, the validity of a study is much improved through the use of multiple sources of data for each research question in the context of triangulation (Anderson and Arsenault 1998). If the outcomes of a data collection tool correspond to those of a different one for the same study, then the researcher will be more confident about the study's findings (Burns 2000). Additionally, triangulation can help eliminate biases that might result from relying exclusively on one data collection method (Gall et al. 2003). Therefore, it is underscored that "with proper triangulation, it will be difficult to refute conclusions which follow logically from multiple data sources" (Anderson and Arsenault 1998:150).

In the context of this study, the combination of quantitative and qualitative research with the use of questionnaires to gather quantitative data, and the use of interviews to collect complementary qualitative data, enabled the effective use of triangulation. It should be noted that to a large extent, the questionnaires' results were confirmed by those produced by the interviews. In this way, it became evident that the data collected for this study were considerably valid, reliable, and not significantly biased, which increased the researcher's confidence that the research's results would be accurate and a fair depiction of the reality under study.

6.5 Ethical issues

The fact that social research, and therefore educational research, involves data collection from people and about people, is inevitably concerned with ethical issues and considerations (Wiersma 2000; Punch 2004). Ethical issues may stem from both the kinds of problems investigated by the researchers and the methods that are employed to obtain valid and reliable data (Cohen et al. 2005). In this way, the responsibility for ethical research ultimately lies with the individual researcher (Anderson and Arsenault 1998), who ought to maintain strict ethical standards at all stages of the research process (Bell 1993; Punch 2004; Cohen et al. 2005).

Protecting the rights of research participants and conducting research in an ethical manner are to a large extent, matters of common sense (Wiersma 2000). The most fundamental ethical principle is informed consent (Burns 2000), that is, "the involved participants must be informed of the nature and purpose of the research, its risks and benefits, and must consent to participate without coercion" (Anderson and Arsenault 1998:18). Consent and cooperation do not only concern the individual participants but also others in the institutions or organisations who provide the access and permission needed of the conduction of the research (Cohen et al. 2005). Participation of human beings as subjects in research must be voluntary, while the individual's freedom to decline participation must be respected (Wiersma 2000). At the same time, the participants should have the freedom to withdraw from the study at any stage (Anderson and Arsenault 1998).

Moreover, confidentiality and anonymity are also methods of protecting the research participants (Cohen et al. 2005). Confidentiality involves a clear understanding between the researcher and participant concerning how the provided data will be used (Burns 2000). In this sense, confidential information implies that the identity of the individual will remain anonymous, since information may be quoted and reported, but the identity of the individual should be protected (Anderson and Arsenault 1998). Overall, whatever the specific nature of the research, the researcher must take into account the effects on the participants, and act in such a way to preserve their dignity as human beings (Cohen et al. 2005).

Following these guidelines and recommendations, the researcher tried throughout the research project to be honest about the purpose of the study and about the terms and conditions of the research. After discussing with his supervisor the project's outline, permission for conducting the research was requested and granted from the IFL Ethics Committee. It should be noted that due to the fact that the research intended to collect data from Cypriot primary school teachers (and not from pupils or their parents), no special permission was necessary by the Ministry of Education of Cyprus. In this way, during the main research implementation, the researcher requested permission to conduct the research from the Headteachers of the schools where the participant teachers were working. The researcher thoroughly explained to the respective Headteachers the study's nature and purpose, as well as the data collection methods, and asked for their cooperation.

Moreover, the cover letter attached to the questionnaire, provided to the participant teachers everything they needed to know about the research. The research objectives were outlined, while it was made clear that the participation was not compulsory, and that they retained the right to withdraw from the process at any time. It was also assured that the collected data would be confidentially and anonymously treated, and only for the purposes of the particular study. The researcher's e-mail address was included in the letter, prompting the participant teachers to contact the researcher in the case of any queries. Where possible, the researcher personally provided explanations and further information to the respondents.

With respect to the interview sessions, the researcher personally explained and clarified to the participant teachers the reasons for conducting the interview and requested their consent to be recorded using the digital voice recorder. It was explained to them that this was a necessary process to save and store the collected data for further analysis. They were assured by the researcher that their personal details would remain confidential and that their identity would be kept covert. He let them know that quotations from the dialogue could and would be used in the final product, but it was made clear to them that their anonymity was ensured. The researcher also boldly highlighted the fact that their participation was voluntary and that they had the right to withdraw from the interview session at any time. Finally he offered to provide them with further explanations and details regarding the whole procedure.

6.6 Summary

This chapter's purpose was to present the methodological approaches employed in this study to carried out the research and provide answers to the research questions.

The chapter began with a presentation of the study's research questions and the rationale which underpins them. The description of the study's research design was then discussed. The selection of cross-sectional research design and the complementary use of quantitative and qualitative research methods were discussed and defended.

Various issues regarding the selection of the questionnaire as the main tool for collecting quantitative data were discussed. The way in which the questionnaire in this study was designed and adapted was described, while its various parts and included items were presented. Furthermore, details regarding the process of validating the questionnaire were discussed. The questionnaire piloting phases were then described. Moreover, the procedure followed to select the questionnaire sample was presented and explained. Finally, the process of administering the questionnaire to the participant teachers was described, while the data analysis methods of the quantitative data were discussed.

After that, the discussion was directed on the semi-structured interview, which was the second data collection tool for this study in the context of qualitative research methodology. The format used in the interview guide was discussed, while the included questions were presented. The process of validating the interview, as well as the process of selecting the participant interviewees was also explored. Moreover, the procedures followed to conduct the interviews were presented, while details were provided regarding the ways of analysing the qualitative data collected through the interviews. What is more, the use of triangulation to establish validity and reliability for the study was discussed. Finally, the ways that were used to tackle with the ethical issues concerning this study were described. In the following chapter, the first part of the data analysis will be presented.

Chapter 7: Data analysis (Part I)

7.1 Introduction

This study's purpose is to examine a diversity of issues that are related to the integration of ICT in Cyprus primary education. The general objective is to depict and describe the current situation regarding the integration of ICT in the island's primary schools, to shed light on the factors that affect teachers' use of ICT and its related resources, and to explore issues relevant to teachers' professional development opportunities in technology. As discussed Chapter 6, the study aims to provide answers to three main research questions, which, to a large extent, cover all these issues. This chapter constitutes the first part of the data analysis and aims at addressing the first two research questions.

7.2 Sample and response rate

The aim of the study was to research 15% of the teacher population, except Headteachers and Deputy Headteachers who were excluded from the sampling frame. In this way, using simple random sampling method, 475 teachers were selected to be included in the research sample. Adequately completed questionnaires were returned from 427 teachers, which means that the response rate was 89.9%. This figure is generally considered very good, and was probably due to the fact that the researcher personally distributed the questionnaires to the participants.

7.3 Teachers' demographic characteristics

In this section, the participant teachers' background characteristics are presented according to the data collected from the questions included in the first part of the questionnaire. These questions intended to collect factual information about teachers' gender, age, length of teaching experience, grade responsibility, and position in school. As discussed in Chapter 4, various personal characteristics of teachers may significantly influence the ways in which they approach the integration and adoption of ICT in their work.

7.3.1 Teacher gender

Table 7.1 shows that from the 418 participants who answered the particular question 66 (15.5%) were males and 352 (82.4%) were females. These percentages reflect to a great extent the way in which males and females are distributed in the total population of primary teachers in Cyprus, and are fairly consistent with the data reported by Eurydice (2005), 18.1% male, 81.9% female.

Gender	**N**	**%**
Male	66	15.5
Female	352	82.4
Not stated	9	2.1
Total	427	100

Table 7.1: Distribution of teachers by gender

7.3.2 Teacher age

The second question of the questionnaire requested from teachers to indicate their date of birth. Table 7.2 shows that the majority of the participant teachers (57.8%) belong to age groups 26-30 and 31-35. 13.6% of them were younger than 26 years old, and 10.8% were older than 41 years old. These results reflect to a great extent how Cypriot primary teachers are distributed according to their age. Eurydice (2005) notes that the primary teachers in Cyprus and Latvia are the youngest in Europe, since those aged under 30 and 30-39-year-olds represent approximately 60% of total population.

Age	**N**	**%**
21-25 group	58	13.6
26-30 group	159	37.2
31-35 group	88	20.6
36-40 group	68	15.9
41+ group	46	10.8
Not stated	8	1.9
Total	427	100

Table 7.2: Distribution of teachers by age

7.3.3 Teacher length of teaching experience

Table 7.3 shows that the length of teaching experience for the majority of teachers (60.1%) was equal or less than 10 years, while only 6.1% of them had teaching experience that exceeded 21 years. Most of the primary teachers in Cyprus are eligible for promotion to deputy Headteacher and Headteacher posts after working as classroom teachers for at least thirteen years, five of which must be spent in public primary schools (Eurydice 2007).

Years in service	**N**	**%**
1-5 group	162	37.9
6-10 group	95	22.2
11-15 group	83	19.4
16-20 group	53	12.4
21+	26	6.1
Not stated	8	1.9
Total	427	100

Table 7.3: Distribution of teachers by length of teaching experience

7.3.4 Teacher grade responsibility

Table 7.4 shows the distribution of teachers in relation to the grade they were responsible at the time the data for this study were collected. It is indicated that almost a quarter of the teachers (24.8%) were not teaching in a specific grade, which means that they were assigned to teach various subjects or a specific subject in different grades and classes.

Grades	**N**	**%**
Grade A	59	13.8
Grade B	61	14.3
Grade C	50	11.7
Grade D	60	14.1
Grade E	48	11.2
Grade F	40	9.4
Not specific	106	24.8
Not stated	3	0.7
Total	427	100

Table 7.4: Distribution of teachers by grade responsibility

7.3.5 Teacher occupational status

Table 7.5 shows that the great majority of teachers held a permanent position in schools. Specifically, 275 (64.4%) teachers indicated that they were permanent employees, while 148 (34.7%) of them were still working on a temporary base. This is due to the fact that teachers in the Cyprus public sector become permanent public employees after the completion of a probationary period, while a number of them are employed on an annual contract basis to cover immediate needs (Eurydice 2007).

Position	**N**	**%**
Temporary	148	34.7
Permanent	275	64.4
Not stated	4	0.9
Total	427	100

Table 7.5: Distribution of teachers by their position in school

7.4 Teachers' pedagogical beliefs and philosophies

The data for teachers' pedagogical beliefs and philosophies were collected by question C.1 of the questionnaire. As shown in Table A2.1 (Appendix 2) the scale's Cronbach's Alpha coefficient is 0.815. Item 7 was excluded from the subsequent analysis, since its item-total correlation was low. Table A3.1 (Appendix 3) presents the frequencies of teachers' responses to the statements included in the scale.

In Table 7.6 teachers' responses were re-coded into two new categories: 'disagree' and 'agree'. Also, the statements included in the table were reorder according to teachers' responses mean scores (a mean score above 3.5 indicates agreement with the specific statement, while a mean score below 3.5 indicates disagreement). For the majority of the statements, teachers' responses means scores were above 3.5, indicating that teachers were adopting several different roles behaviours and instructional approaches during their teachings, in their effort to fulfil their teaching goals.

Statements	Disagree (%)	Agree (%)	Mean	St. Dev
Developing the ability of students to think and work independently is an important goal.	2.6	97.4	5.23	0.79
My teachings have very specific goals and objectives that I want to accomplish.	3.3	96.7	5.07	0.79
Sharing my knowledge and expertise with students is very important to me.	4.1	95.9	5.04	0.86
I give students a lot of personal support and encouragement to do well in their assigned activities.	3.6	96.4	5.01	0.80
I provide clear guidelines for how I want the tasks that I assign to be completed.	3.6	96.4	5.00	0.78
Students receive frequent verbal and/or written comments on their performance.	6.7	93.3	4.90	0.89
I guide students' work on course projects by asking questions, exploring options, and suggesting alternative ways to do things.	3.1	96.9	4.90	0.78
I spend time consulting with students on how to improve their work on individual and/or group projects.	5.7	94.3	4.89	0.90
The activities that I organise encourage students to take initiative and responsibility for their learning.	4.1	95.9	4.83	0.80
I set high standards for my students.	7.6	92.4	4.81	0.88
I often show students how they can apply the principles and pieces of information they learn.	4.8	95.2	4.78	0.80
My teaching goals and methods address a variety of ways that the students learn (different learning styles of students).	6.4	93.6	4.76	0.82
In the classroom, I assume the role of a resource person who is available to students whenever they need help.	9.3	90.7	4.74	0.91
Activities in my class encourage students to develop their own ideas about content issues.	8.1	91.9	4.69	0.87
Small group discussions are employed to help students develop their ability to think critically.	9.0	91.0	4.67	0.91
What I say are important for students in order to acquire a broader perspective on the under study issues.	6.7	93.3	4.64	0.81
Examples from my personal experiences often are used to illustrate points about the material.	11.2	88.8	4.59	0.98
Students might describe me as a "coach" who works closely with them to correct problems in how they think and behave.	9.5	90.5	4.57	0.87
My standards and expectations help students develop the discipline the need to learn.	7.9	92.1	4.54	0.81
It is my responsibility to define what students must learn and how they should learn it.	28.6	71.4	4.24	1.26
What I say and do models appropriate ways of thinking for students with respect to issues in the content.	20.0	80.0	4.15	0.99
Facts, concepts, and principles are the most important things that students should acquire.	28.9	70.8	4.10	2.29
I typically show students how and what to do in order to master a lessons' content.	28.3	71.7	4.05	1.22
Eventually, many students begin to think like me about a teaching's content.	23.4	76.6	4.00	0.97
My students can make choices among many activities in the context of a teaching.	31.7	68.3	3.94	1.00
Students set their own pace for completing independent and/or group projects.	35.5	64.5	3.84	1.19
My expertise is typically used to resolve disagreements about content issues.	38.0	62.0	3.72	1.22
My expectations for what I want students to do in the class are clearly defined in the curriculum.	38.9	61.1	3.66	1.15
Students typically work on course projects alone with little supervision from me.	43.9	56.1	3.58	1.11
My approach to teaching is similar to a manager of a work group who delegates tasks and responsibilities to subordinates.	49.9	50.1	3.43	1.15
Students might describe me as a "storehouse of knowledge" who dispenses the fact, principles, and concepts they need.	52.7	47.3	3.38	1.17
I solicit student advice about how and what to teach in the context of a subject.	55.1	44.9	3.29	1.22
Lecturing takes a significant part of my teachings.	61.2	38.8	3.23	1.13
Students would describe my standards and expectations as somewhat strict and rigid.	69.3	30.7	2.87	1.21

Table 7.6: Descriptive analysis for teachers' pedagogical beliefs (scale C.1)

Furthermore, factor analysis was carried out to examine the internal structure of teachers' pedagogical beliefs scale. As discussed in Chapter 6, factor analysis is a statistical technique for analysing the correlations between a number of variables (items) in order to reduce them to a smaller number of factors, and to determine the correlation of each of the original variables with each factor (Colman and Pulford 2006). In this way, it is useful in reducing numerous variables (items) down to a few factors, which informs the researchers about patterns within data sets. The produced factors (subscales) will be used in the subsequent analysis as separate variables. In addition, factor scores coefficients for each subject and for each factor will be estimated. Factor scores coefficients tell us an individual's score on each of the subset of measures (factor or subscale). In this way, factor coefficients are the scores that the individual would have received on each of the factors if they had been measured directly. Therefore, factor scores can be used in further analyses, like t-test, ANOVA, or multiple regression, instead of the original data. The regression approach to estimating factor scores will be used, since this method results in the highest correlations between factors and factor scores, and it ensures that that the resulting scores have a mean of 0 and a standard deviation of 1 (Field 2005; Tabachnick and Fidell 2007).

Prior to performing the analysis the suitability of the data was assessed. The correlation matrix revealed the presence of many coefficients of 0.3 and above. The Kaiser-Meyer-Oklin measure of sampling adequacy value was 0.858, exceeding the recommended value of 0.6. Also, the Bartlett's Test of Sphericity was significant ($p>0.05$), which supported the factorability of the correlation matrix. Table 7.7 shows that the factor analysis revealed the existence of eight factors with initial eigenvalues larger than 1. The factors explained 20.8%, 9.5%, 5.5%, 4.5%, 4%, 3.9%, 3.3%, and 3% of the variance respectively. Inspection of the scree plot (Figure 7.1), led to the retention of the five first factors for further analysis.

Factors	Total	% of variance	Cumulative
1	7.063	20.774	20.774
2	3.237	9.519	30.294
3	1.871	5.503	35.797
4	1.535	4.516	40.313
5	1.360	4.000	44.313
6	1.324	3.894	48.207
7	1.116	3.282	51.489
8	1.026	3.018	54.507

Table 7.7: Total variance explained (Initial eigenvalue) for teachers' pedagogical beliefs

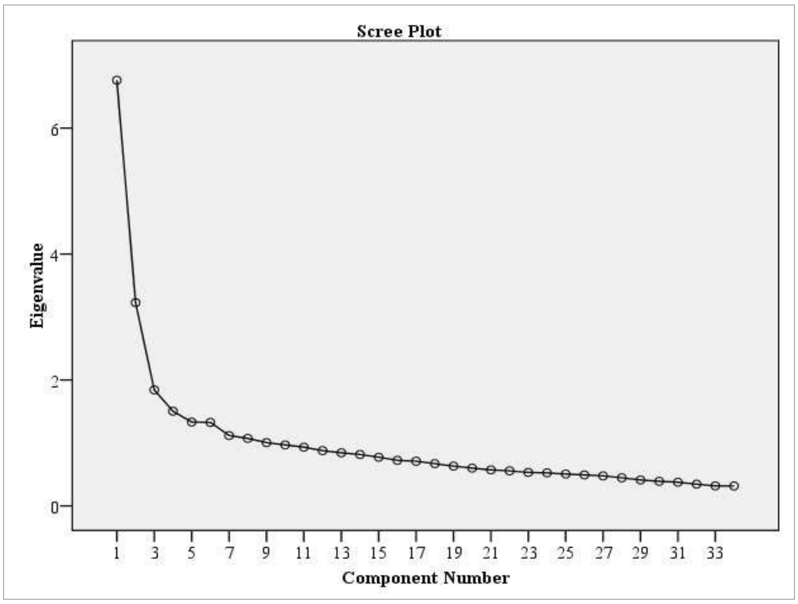

Figure 7.1: Scree plot for teachers' pedagogical beliefs scale

In order to facilitate the interpretation of the five factors, varimax orthogonal rotation was performed, to ensure that the factors remain independent and uncorrelated (Field 2005). Table 7.8 presents the rotated solution. Each factor represents a separate theme in relation to teachers' pedagogical beliefs. The first factor includes statements that describe teacher as a 'facilitator'; the second factor, includes statements that describe teacher as an 'expert'; the third factor, includes statements that describe teacher as a 'formal authority'; the fourth factor, includes statements that describe teacher as a 'personal model'; and the fifth factor, includes statements that describe teacher as a 'delegator'. The solution explained a total of 43.1% of the variance, with factor 1 contributing 11.6%, factor 2 contributing 10%, factor 3 contributing 8.2%, factor 4 contributing 7.7%, and factor 5 contributing 5.6%. The labels given to the resulting factors were adopted from the 'Grasha's Teaching Styles Inventory' (Grasha 1996), which has inspired the construction of question C.1.

Factor	Statements	Components				
Teacher as 'facilitator'	My teaching goals and methods address a variety of ways that the students learn (different learning styles of students).	0.702				
	Activities in my class encourage students to develop their own ideas about content issues.	0.674				
	Small group discussions are employed to help students develop their ability to think critically.	0.648				
	The activities that I organise encourage students to take initiative and responsibility for their learning.	0.557				
	I spend time consulting with students on how to improve their work on individual and/or group projects.	0.537				
	I set high standards for my students.	0.497				
	Developing the ability of students to think and work independently is an important goal.	0.463				
	What I say are important for students in order to acquire a broader perspective on the under study issues.	0.435				
Teacher as 'expert'	Students might describe me as a "storehouse of knowledge" who dispenses the fact, principles, and concepts they need.		0.679			
	Lecturing takes a significant part of my teachings.		0.637			
	My expectations for what I want students to do in the class are clearly defined in the curriculum.		0.594			
	Eventually, many students begin to think like me about a teaching's content.		0.593			
	My expertise is typically used to resolve disagreements about content issues.		0.550			
	What I say and do models appropriate ways of thinking for students with respect to issues in the content.		0.526			
	Students would describe my standards and expectations as somewhat strict and rigid.		0.489			
	My approach to teaching is similar to a manager of a work group who delegates tasks and responsibilities to subordinates.		0.450			
Teacher as 'formal authority'	My teachings have very specific goals and objectives that I want to accomplish.			0.733		
	Students receive frequent verbal and/or written comments on their performance.			0.622		
	I give students a lot of personal support and encouragement to do well in their assigned activities.			0.586		
	I provide clear guidelines for how I want the tasks that I assign to be completed.			0.452		
	Students might describe me as a "coach" who works closely with them to correct problems in how they think and behave.			0.433		
Teacher as 'personal model'	Examples from my personal experiences often are used to illustrate points about the material.				0.653	
	I guide students' work on course projects by asking questions, exploring options, and suggesting alternative ways to do things.				0.600	
	I often show students how they can apply the principles and pieces of information they learn.				0.533	
	It is my responsibility to define what students must learn and how they should learn it.				0.501	
	I typically show students how and what to do in order to master a lessons' content.				0.381	
	Sharing my knowledge and expertise with students is very important to me.				0.379	
Teacher as 'delegator'	I solicit student advice about how and what to teach in the context of a subject.					0.599
	My students can make choices among many activities in the context of a teaching.					0.524
	Students typically work on course projects alone with little supervision from me.					0.443
	Students set their own pace for completing independent and/or group projects.					0.434
	In the classroom, I assume the role of a resource person who is available to students whenever they need help.					0.385

Table 7.8: Factor loadings for scale C.1 (teachers' pedagogical beliefs) after varimax rotation

Table 7.9 shows the descriptive analysis of the statements included in each of the five factors. The mean scores as well as the average percentages of teachers' responses, show that the great majority of them tended to agree with statements included in the first factor (teacher as 'facilitator'). Specifically, the mean scores for the included statements range from 4.64 to 5.23, while, on average, 93.7% of the teachers tended to agree with them. Also, 55.8% of the teachers tended to agree with the statements included in the second factor ('teachers as expert'). Moreover, 94.7% of the teachers agreed with the statements included in the third factor (teacher as 'formal authority'). The mean scores for the included items ranged from 4.57 to 5.07. At the same time, 86.7% of the teachers tended to agree with the statements included in the fourth factor (teacher as 'personal model). Finally, 64.9% of the teachers tended to agree with the statement included in the final factor (teacher as 'delegator'), while the teachers' responses mean scores for these statements ranged from 3.29 to 4.74.

These results verify that, in their effort to fulfil their teaching objectives, teachers assume and adopt several roles and behaviours, which, in many cases are conflicting and varied. The participant teachers are appeared to hold student-centred and constructivist pedagogical beliefs, since they tended to agree with the statements included at the 'facilitator' and 'delegator' factors. However, they are appeared to retain and support teacher-centred and more traditional pedagogical philosophies, since they also tended to agree with the statements included in the 'expert', 'formal authority', and 'personal model' factors. These results suggest that teachers were not feeling secure to abolish teacher-centred, and non-constructivist pedagogical beliefs, and were resisting changing their more comfortable traditional instructional practices. Nevertheless, they were simultaneously adopting teaching approaches which were allowing students more autonomy in their learning and more initiatives during the learning procedure.

These results are consistent with the results found by Levin and Wadmany (2007) longitudinal study in Israel. The researchers found that the teachers' pedagogical beliefs were distinguished into two poles, traditional, transmissionist beliefs, and constructivist compatible beliefs. However, they highlighted that these categories can be refined and additional facets of beliefs can be included. They argue that teachers' beliefs and pedagogical philosophies cannot always be classified simply and dichotomously. According to their study's results, the majority of the participant teachers were not consistently holding a particular pedagogical orientation. Therefore, they note that the teachers in their study demonstrated multiple views rather than pure beliefs, a result that made them conclude that teachers' beliefs form a mosaic of complementary visions, even conflicting ones. Similarly, the teachers who participated in this study did not also demonstrate pure pedagogical beliefs; rather, they showed multiple views which were simultaneously complementary and conflicting.

What is more, in the context of a report about teachers' pedagogical beliefs and practices, which was based on the TLC survey in the US, Ravitz et al (2000) concluded that most teachers were eclectic, choosing from a large repertoire of teaching strategies as the particular situation demanded. The researchers argued that traditional transmission instruction and constructivist-compatible instruction were behind all of these teaching practices and beliefs about teaching, as underlying models of good pedagogy. One of the study's objectives was to examine if teachers' pedagogical beliefs and philosophies were reflecting their teaching practices. The study's data showed that to a large extent, teachers' instructional practices reflected what they believed to be good teaching, and their beliefs about good teaching reflected their understandings about how students learn. It was also found that the teachers appeared to be more constructivists than traditional, but because of a number of limitations, like the school bureaucratic culture and public expectations for measurable documentation of student 'achievement', teachers' efforts to implement constructivist pedagogy in daily practice, were constrained and hindered.

Also, as discussed by Grasha (1996) the 'Teaching Styles Inventory' intention is not to place teachers into one of five boxes of different teaching style. In line with the results found in this study, he suggests that everyone who teaches possesses each of the five teaching styles in varying degrees, and when a specific situation demands, different roles are assumed. The five teaching styles are compared to different colours on an artist's pallet, and just like the different colours on a pallet, they could be blended together to create new shades and colourings. According to the author's observations of teachers in the classroom, interviews, and responses by a large number of teachers, the use of some styles is more often than others. The primary or dominant styles are described as the foreground in a painting, which can be easily seen and is central to understanding the overall concept, while the additional elements are similar to the background which support and add texture to what is presented. In this way, he suggests that a teacher can primarily assume the roles of expert and formal authority, while personal model, facilitator and delegator roles can be secondary, or at the other end, he/she can primary assume the roles of delegator, facilitator, and expert, with formal authority and personal model be the secondary teaching styles.

	Statements	Disagree (%)	Agree (%)	Mean	St. Dev
Teacher as 'facilitator'	My teaching goals and methods address a variety of ways that the students learn (different learning styles of students).	6.4	93.6	4.76	0.82
	Activities in my class encourage students to develop their own ideas about content issues.	8.1	91.9	4.69	0.87
	Small group discussions are employed to help students develop their ability to think critically.	9.0	91.0	4.67	0.91
	The activities that I organise encourage students to take initiative and responsibility for their learning.	4.1	95.9	4.83	0.80
	I spend time consulting with students on how to improve their work on individual and/or group projects.	5.7	94.3	4.89	0.90
	I set high standards for my students.	7.6	92.4	4.81	0.88
	Developing the ability of students to think and work independently is an important goal.	2.6	97.4	5.23	0.79
	What I say are important for students in order to acquire a broader perspective on the under study issues.	6.7	93.3	4.64	0.81
	Average	**6.3**	**93.7**		
Teacher as 'expert'	Students might describe me as a "storehouse of knowledge" who dispenses the fact, principles, and concepts they need.	52.7	47.3	3.38	1.17
	Lecturing takes a significant part of my teachings.	61.2	38.8	3.23	1.13
	My expectations for what I want students to do in the class are clearly defined in the curriculum.	38.9	61.1	3.66	1.15
	Eventually, many students begin to think like me about a teaching's content.	23.4	76.6	4.00	0.97
	My expertise is typically used to resolve disagreements about content issues.	38.0	62.0	3.72	1.22
	What I say and do models appropriate ways of thinking for students with respect to issues in the content.	20.0	80.0	4.15	0.99
	Students would describe my standards and expectations as somewhat strict and rigid.	69.3	30.7	2.87	1.21
	My approach to teaching is similar to a manager of a work group who delegates tasks and responsibilities to subordinates.	49.9	50.1	3.43	1.15
	Average	**44.2**	**55.8**		
Teacher as 'formal authority'	My teachings have very specific goals and objectives that I want to accomplish.	3.3	96.7	5.07	0.79
	Students receive frequent verbal and/or written comments on their performance.	6.7	93.3	4.90	0.89
	I give students a lot of personal support and encouragement to do well in their assigned activities.	3.6	96.4	5.01	0.80
	I provide clear guidelines for how I want the tasks that I assign to be completed.	3.6	96.4	5.00	0.78
	Students might describe me as a "coach" who works closely with them to correct problems in how they think and behave.	9.5	90.5	4.57	0.87
	Average	**5.3**	**94.7**		
Teacher as 'personal model'	Examples from my personal experiences often are used to illustrate points about the material.	11.2	88.8	4.59	0.98
	I guide students' work on course projects by asking questions, exploring options, and suggesting alternative ways to do things.	3.1	96.9	4.90	0.78
	I often show students how they can apply the principles and pieces of information they learn.	4.8	95.2	4.78	0.80
	It is my responsibility to define what students must learn and how they should learn it.	28.6	71.4	4.24	1.26
	I typically show students how and what to do in order to master a lessons' content.	28.3	71.7	4.05	1.22
	Sharing my knowledge and expertise with students is very important to me.	4.1	95.9	5.04	0.86
	Average	**13.4**	**86.7**		
Teacher as 'delegator'	I solicit student advice about how and what to teach in the context of a subject.	55.1	44.9	3.29	1.22
	My students can make choices among many activities in the context of a teaching.	31.7	68.3	3.94	1.00
	Students typically work on course projects alone with little supervision from me.	43.9	56.1	3.58	1.11
	Students set their own pace for completing independent and/or group projects.	35.5	64.5	3.84	1.19
	In the classroom, I assume the role of a resource person who is available to students whenever they need help.	9.3	90.7	4.74	0.91
	Average	**35.1**	**64.9**		

Table 7.9: Descriptive analysis for the teachers' pedagogical beliefs factors

The internal consistency of the teachers' pedagogical beliefs subscales was assessed. Table A4.1 (Appendix 4) shows that the Cronbach's Alpha coefficient for the first subscale was 0.769, for the second subscale was 0.717, for the third subscale was 0.731, for the fourth subscale was 0.679, and for the fifth subscale was 0.481. The reliability for the first four subscales is adequate, and therefore, they will be used in the subsequent analysis. However, Cronbach's Alpha for the last subscale is low. Nevertheless, it is noted that it is quite common to find low values in the case of a short scale, since Cronbach's Alpha values are quite sensitive to the number of items in the scale. In this way, it is suggested that it is more appropriate to inspect the mean inter-item correlation for the items (statements), which is recommended to range from 0.2 to 0.4 (Pallant 2005). For the specific subscale, the inter-item correlations range from 0.362 to 0.478, and therefore, it is considered to be consistent and will be included in the subsequent analysis.

Teachers' philosophical and pedagogical beliefs were also become apparent in the context of the interview sessions. The participant teachers expressed varied viewpoints about their roles in the classroom, the roles that should be assumed by the pupils, about their usual classroom setting arrangement, the degree of pupils' participation in the decision making process regarding educational objectives, teaching content, procedure, and assessment, as well as their usual teaching approach, which in turn revealed their perspectives on good pedagogy. The interviews confirmed that the teachers tend to adopt several roles in their teaching, while their pedagogical beliefs and philosophies are multidimensional and pluralistic. In line with the questionnaire results, the analysis of the interview data showed that teachers multiple views about pedagogy were simultaneously complementary and conflicting. Nevertheless, it was obvious that these beliefs can be distinguished into traditional, transmissionist, teacher-centred beliefs, and constructivist compatible, student-centred beliefs.

In this context, a number of teachers expressed viewpoints which are connected to traditional, teacher-centred pedagogical perspectives. For example, when a teacher was asked to discuss the roles that a teacher should have during teaching, she stressed that:

> The teacher's role is to organise and perform teaching. He/she sets teaching goals, and then prepares activities that help pupils fulfil these goals. (I.23)

Also, a teacher expressed a similar teacher-centred viewpoint when she asked to identify teachers' role in the classroom. She noted that:

> The teacher ought to be well prepared to diffuse his/her knowledge to the pupils in a simple and accessible way... He/she cultivates skills, attitudes to the pupils, and he/she has to transmit right messages in the classroom. (I.4)

A third teacher highlighted the moralistic role that a teacher should assume. She noted that:

> As teachers, we ought to help pupils become good citizens in our society and learn how to recognise what's wrong and what's right. (I.2)

Teacher-centred views were also expressed when teachers were requested to discuss pupils' roles in the classroom. For example, a teacher referred to the positive attitudes that pupils should have. She noted that:

> Pupils must have positive attitudes toward their responsibilities as students... study, participation in teaching, creativity, inventiveness, etc... Furthermore, they must have other positive attitudes like good behaviour toward themselves and toward other, friendliness, democratic spirit, cleanliness, neatness in their work, etc. (I.25)

Similarly, a teacher expressed a strong teacher-centred viewpoint when she asked to discussed the pupils' roles in the classroom. She noted that:

> Pupils must obey teacher's directions and ask questions for things they don't know or understand. Furthermore, pupils must actively participate in teaching and not to be ashamed to express their opinion. They must be effective listeners and participate in teaching. (I.4)

At the same time, several teachers expressed much more student-centred viewpoints, indicating a more constructivist-compatible philosophical profile. A teacher suggested that:

> The teacher cooperates with them (pupils) to conquer knowledge. Everyone is a participant in this process. Teaching becomes more interesting and constitutive when it includes prolific discussion, opinions and experiences sharing. Pupils are not empty containers which need to be filled with readymade knowledge; they are individuals with needs and capabilities. (I.1)

In line with this disposition, a second teacher argued that:

> According to constructivism, a student can perceive and apply a piece of newly acquired knowledge when he/she is capable to connect it with previous experiences. Having this in mind, a teacher ought to organise activities that are suitable for each individual student, in accordance to the predetermined teaching objectives. He/she can then guide them or leave them to experiment to discover new knowledge. (I.13)

Similarly a third teacher stressed that:

> Teacher provides opportunities to the pupils to discover knowledge. He/she encourages them to participate in teaching procedure, and when possible to take initiatives. He/she also coordinates their actions so as to understand the teaching content. (I.9)

The same teacher also highlighted pupils' responsibility for self-regulation of the own learning. When she asked to discuss pupils' roles, she argued that:

> Through group and individual work, pupils should take initiatives to discover new concepts. They must acquire skills which will allow them to regulate their own learning. They also need to acquire metacognitive skills; skills that will help them acknowledge their talents and their weaknesses, and in this way regulate their actions to conquer knowledge. (I.9)

While teachers indicated varied viewpoints when they were asked to discussed their roles and their pupils' roles, expressing both teacher-centred and pupil-centred viewpoints, their perspectives on pupils' participation in decision making regarding educational objectives, teaching content, teaching procedure, as well as the assessment methodology, were consistently teacher-centred and less varied. The majority of the participant teachers appeared to be reluctant to accept pupils' increased participation in the classroom decision making process, permitting only restricted student initiatives regarding decisions about the teaching procedure and less often for teaching content. Their responses revealed that they were afraid to relinquish responsibilities that would alter their authoritarian profile over students. In this context a teacher argued that:

> I believe that pupils' participation in the decision making process for all these issues should be allowed in a small degree. They could certainly not determine teaching content, their assessment, as well as teaching goals. With respect to teaching activities, they could have few choices. The rest of the other issues are definitely teacher's choices because he/she is the only one who knows the level and needs of his/her pupils. (I.4)

A second teacher expressed a similar viewpoint but she justified that this is what is being prescribed by the curriculum:

> Pupils' participation in decision making for all these issues should be limited. After all, many of these issues are predetermined by the school curriculum and the teacher. (I.3)

A teacher expanded this viewpoint, arguing that:

> Teaching goals, content, teaching process, and assessment are issues that a teacher needs to deal with in his/her weekly programming, according to the guidelines in the school curriculum. However, the new school books that were introduced recently by the Ministry of Education provide the opportunity to the teacher to choose with his/her pupils certain texts to be taught. I believe that teaching goals, procedure and definitely assessment should be teacher's decisions. (I.2)

More flexibly, a teacher stressed that teachers' should retain responsibility for the specific decisions, however, she appeared to recognise that students' perspectives should be taken into account. Specifically, she noted that:

> I believe that it's plausible for pupils to participate in the decision making process, since these decisions concern issues which are relevant to them. However, the extent of their participation should have some limits. Teacher and pupils have their own distinct roles that should not be violated. Teacher's role in the classroom must not be depreciated, nevertheless, could be simply altered. He/she could become more alternative and more democratic. He/she should respect pupils and take into account their viewpoints regarding these issues. This could make children feel more helpful. (I.1)

7.5 The integration of ICT in Cyprus primary education: the current situation (1st research question)

7.5.1 Issues regarding teachers' use of ICT

The extent to which teachers were using the various ICT resources in the context of their work is explored. At the same time, the ways in which they were using these resources to support and facilitate their professional responsibilities and duties are discussed. Also, teachers' views regarding the impact of ICT use on their professional responsibilities are presented, while their perceived competence with respect to ICT use for personal and professional activities are described.

7.5.1.1 Teachers' use of ICT

The data for teachers' use of ICT were collected by question B.5 of the questionnaire. The Cronbach's Alpha coefficient is 0.895 for the final version of the scale (Table A2.2 in Appendix 2). The frequency of teachers' use of the ICT and audiovisual resources is presented in Table A3.2 (Appendix 3).

In Table 7.10, teachers' responses were re-coded into three categories (No or rare use, Infrequent use, and Frequent use), presenting in this way a more informative and comprehensive picture. On a first consideration, it is indicated that the use of ICT and audiovisual resources by teachers is to a large extent diverse. A number of resources were being used by a considerable percentage of teachers quite frequently, while other resources were completely underused. Also, it can be concluded that teachers' overall use of ICT and audiovisual resources is quite restricted. The examination of the last row of the table shows that on average, 44.8% of the teachers rarely used ICT and audiovisual resources, 27.4% made infrequently/occasionally use, and only 27.8% of the them reported making frequent use of the resources. Real objects, printer, radio, and word processing software, were the most frequently used resources. Also, the Internet was regularly used by the 47.5% of the respondents. Graphic/design software, spreadsheets, databases, and video conferencing were reported as the least frequently used resources. These results are summarised in Figure 7.2. Teachers' use mean score for each ICT and audiovisual resource is also presented in Table 7.10 (a mean score above 3.5 indicates frequent use of a specific resource, while a mean score below 3.5 indicates infrequent use). The mean scores of use for the majority of resources are below 3.5 denoting that they are infrequently used. This information is summarised in Figure 7.3.

Resources	No or rare use (%)	Infrequent use (%)	Frequent use (%)	Mean response	Standard deviation
Real Objects	11	20.2	68.8	4.77	1.48
Printer	17.6	20.9	61.5	4.44	1.67
Radio (Tape or CD player)	13.5	34.7	51.8	4.30	1.40
Word Processor (Microsoft Word)	22.2	27.3	50.5	4.10	1.68
Internet	28.2	24.3	47.5	3.91	1.78
Maps	25.1	30.7	44.2	3.88	1.60
Presentation Software	37.5	35.1	27.4	3.27	1.53
CD-Roms for Educational games	36.6	39.5	23.9	3.22	1.51
E-mail	49.2	14.1	36.7	3.18	2.07
Educational software	41	32.5	26.5	3.14	1.62
Television (video or DVD)	46.9	35.5	17.6	2.94	1.39
CD-Roms Information Sources	48.2	33.8	18	2.87	1.50
Digital Camera	50.8	29.1	20.1	2.80	1.60
Models	51.1	30.8	18.1	2.76	1.54
Overhead Projector	50.2	33.8	16	2.72	1.51
Data Projector	52.3	31.4	16.3	2.68	1.53
Scanner	57.5	28.1	14.4	2.58	1.54
Graphic/Design Software (Paint)	62.2	28	9.8	2.37	1.41
Spreadsheets (Microsoft Excel)	70.1	21.9	8	2.15	1.25
Databases (Microsoft Access)	78.5	17.3	4.2	1.83	1.16
Video conferencing	92.2	6.3	1.5	1.27	0.76
Average	**44.8**	**27.4**	**27.8**		

Table 7.10: Descriptive analysis for the use of ICT and audiovisual resources (scale B.5)

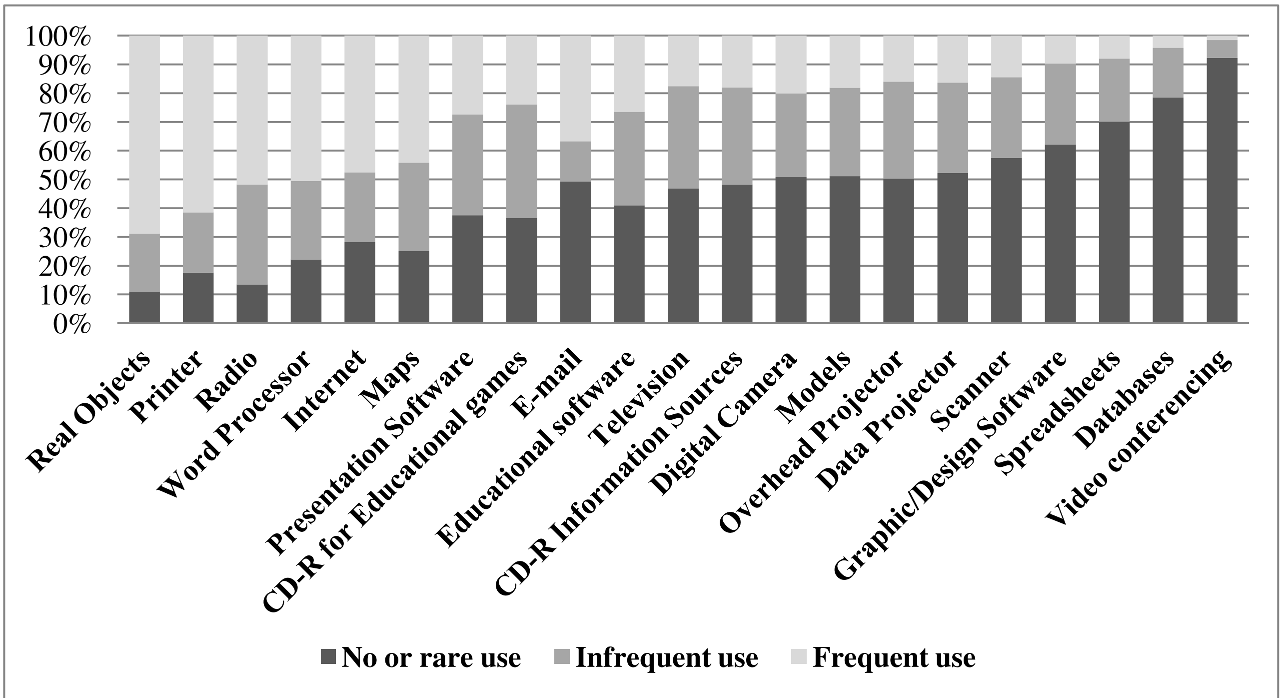

Figure 7.2: Frequency of teachers' use of ICT and audiovisual resources (stacked column chart)

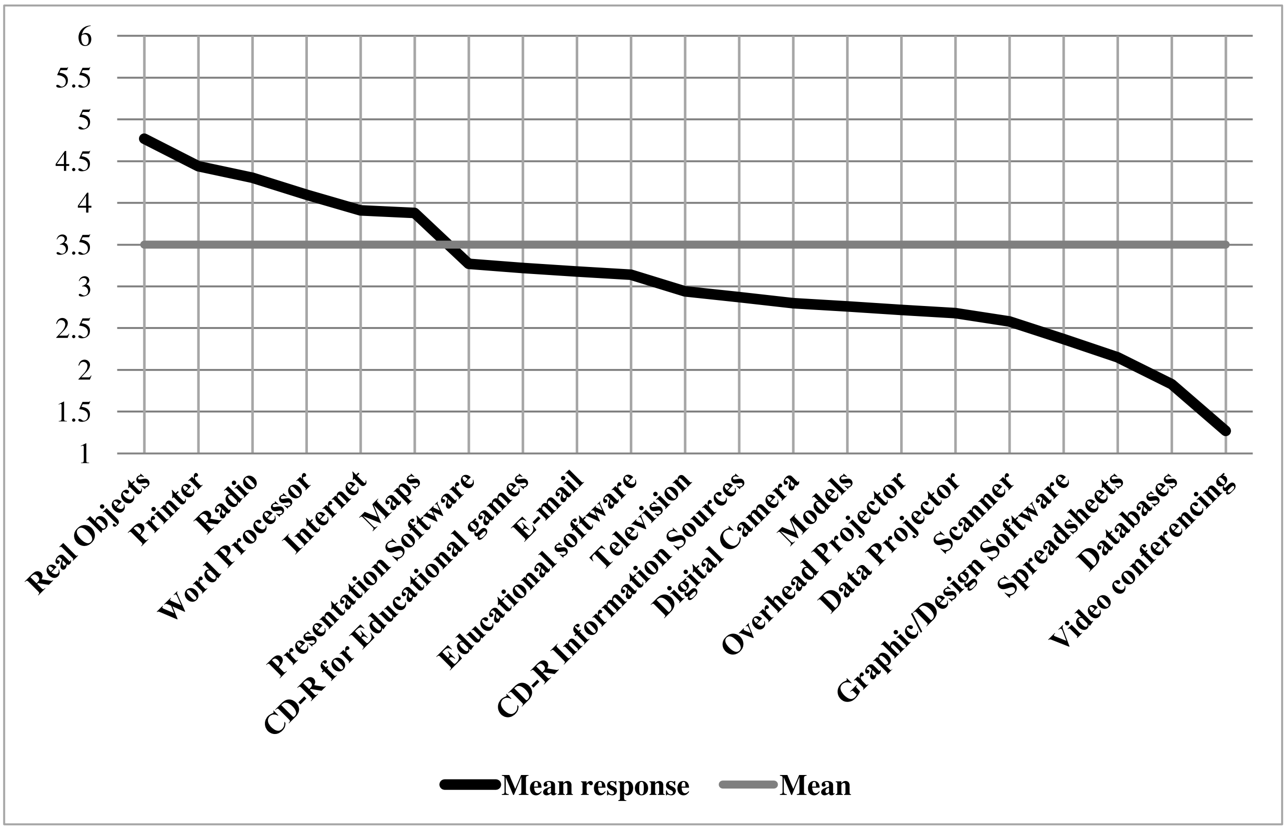

Figure 7.3: Teachers' use mean score for ICT and audiovisual resources

Also, the interviews with teachers confirmed that a number of them had a little awareness of the audiovisual and ICT resources available to them, and in this way, their use was restricted to a small number of resources which mostly represented traditional audiovisual aids. For example, when a teacher was asked to describe her usual classroom setting arrangement, noted that:

> My classroom's setting is characterised by the presence of many audiovisual aids which help pupils summarise of what has been learned. For example, I have designed cards and posters with many concepts that are included in my teachings. I have also indicated a corner in the room where the pupils' products and projects are exhibited. (I.4)

Additionally, a second teacher provided the following answer to the same question:

> My classroom's environment is enhanced by the presence of many audiovisual aids which support learning, like cubes, sticks, cards with words and sentences. I use all these audiovisual aids when I teach and my pupils' participation is increased. (I.25)

The results presented in this section are consistent with the results of other studies discussed in Chapter 4. For instance, the study by Williams et al (1998) of 400 Scottish schools, surveyed more than 3000 teachers and showed that teachers' use of ICT had a limited focused on a narrow range of ICTs. Also, Wozney et al (2006) studied 764 teachers in Quebec and found that 59% were using ICT 'occasionally' or 'infrequently', only 7% of them reported that computer technologies were used 'almost always' or 'all the time', while 39% of them reported that ICT was 'rarely' or 'not at all' integrated in their classroom activities. In addition, the results from a study conducted in Irish schools and aimed to evaluate a programme launched by the Irish Ministry for Education and Science, to promote the use of ICT in primary and secondary schools (NPADC 2001), showed that 16% of the primary teachers and 39% of post-primary teachers were using computers in school less than once a month or never. Finally, a study conducted by Vannata and Fordham (2004), and aimed to examine teacher dispositions as predictors of technology use in the classroom among K-12 teachers, showed that teachers' use of ICT was fairly low. The study was conducted in six schools in Ohio and the data were collected by questionnaires to 177 teachers. The researchers provided to the participant teachers with a list of 14 technology tools and applications in the classroom, and asked them to indicate how often they were using them, using a four-point scale, in which 1 was 'none', 2 was 'rarely – once or twice per semester', 3 was 'moderate – several times per semester', and 4 was 'high – almost weekly per semester'. The study showed that teachers' overall use of ICT mean score was 2.07 (SD=0.61), while the use mean scores of 11 items were below 2.5, which indicates low usage.

Further examination of teachers' use of ICT resources was conducted by applying factor analysis, (principal components extraction and varimax rotation) on the data collected from the teachers' ICT use scale. Prior to performing the factor analysis on scale B.5, the suitability of the data was assessed. Inspection of the produced correlation matrix revealed the presence of many coefficients of 0.3 and above. The Kaiser-Meyer-Oklin measure of sampling adequacy produced value was 0.911, exceeding the recommended value of 0.6, and the Bartlett's Test of Sphericity was significant ($p>0.05$), supporting the factorability of the correlation matrix (Tabachnick and Fidell 2007). In order to examine teachers' actual use of ICT, only ICT resources items included in scale

B.1 were entered for factor analysis. Therefore, the audiovisual aids were excluded. Table 7.11 shows the principal component analysis of the 14 ICT resources items which produced 3 factors with initial eigenvalues larger than 1, and explained 42.8%, 8.8%, and 6.9%, of the variance respectively. Inspection of the scree plot (Figure 7.4), led to the retention of the three factors for further analysis.

Factors	Total	% of variance	Cumulative
1	6.423	42.821	42.821
2	1.315	8.765	51.587
3	1.035	6.903	58.489

Table 7.11: Total variance explained (Initial eigenvalue of ICT use scale)

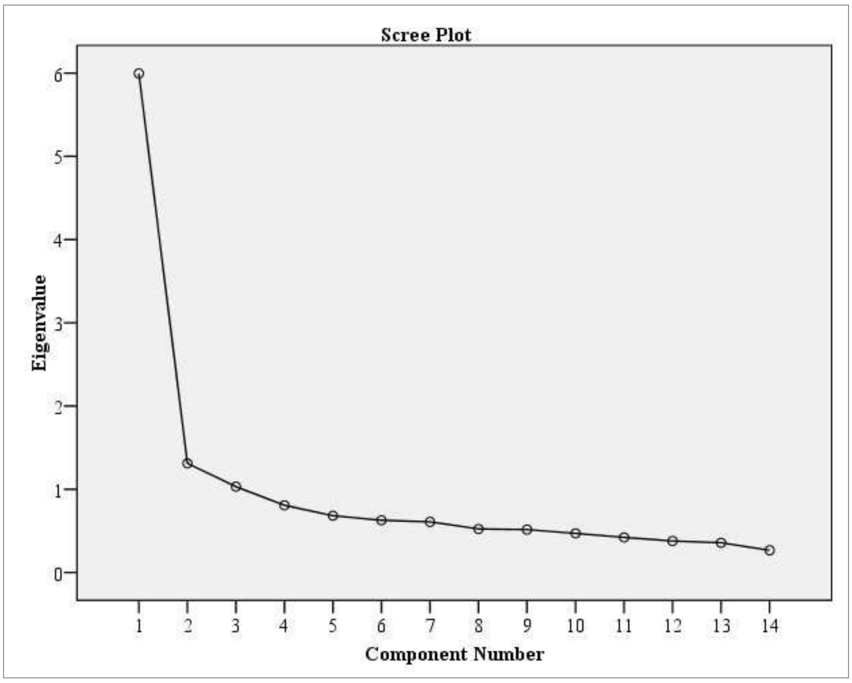

Figure 7.4: Scree plot for teachers' use of ICT resources scale

The rotated solution presented in Table 7.12, revealed the presence of a simple structure, with the components showing a number of strong loadings and all items loading substantially on only one component. Table 7.13 summarises the frequency of use of the items for the various factors. Infrequently used ICT resources have high loadings on the first component, more frequently use ICT resource on the second component and the underused ICT resources are loaded on the third component. The three-component solution explained a total of 58.5% of the variance, with component 1 (Infrequently used ICT resources) contributing 42.8%, component 2 (Frequently used ICT resources) contributing 8.8%, and component 3 (Underused ICT resources) contributing 6.9%.

Factors	Resources	Components		
Infrequently used ICT resources	Presentation Software (Microsoft PowerPoint)	0.768		
	CD-Roms Information Sources	0.730		
	Data Projector	0.714		
	Educational software	0.682		
	CD-Roms for Educational games	0.624		
	Digital Camera	0.489		
	Scanner	0.451		
Frequently used ICT resources	Printer		0.757	
	E-mail		0.756	
	Internet		0.726	
	Word Processor (Microsoft Word)		0.686	
Underused ICT resources	Video conferencing			0.805
	Databases (Microsoft Access)]			0.757
	Spreadsheets (Microsoft Excel)			0.559
	Graphic/Design Software (Paint)			0.437

Table 7.12: Factor loadings for scale B.5 (ICT use) after varimax rotation

Table 7.13 shows that the mean scores for all ICT resources included in the first factor are below 3.5, indicating infrequent use; the mean scores for factor 3 are even lower, indicating minimal use. However, the mean scores for the second factor are above 3.5, except for e-mail (3.18), which indicates frequent use. From these results, it can be concluded that teachers' use of ICT resources is uneven, and fairly restricted. Teachers tend to regularly use only a small number of the available ICT resources. The majority are used infrequently, and for a number of resources use is rare. This was also confirmed by teachers' interviews. When a teacher was asked to discuss ICT's role in education, she noted that "currently, ICTs' role is only supportive and quite limited" (I.20). This viewpoint was more extensively discussed by another teacher who argued that:

> For the moment, ICTs and especially the computer, are tools found in the back of a classroom and are not part of the classrooms' other audiovisual aids. Usually, they are abandoned and dusted, and their use is rare. (I.1)

Factors	Resources	No/rare use (%)	Infrequent use (%)	Frequent use (%)	Mean value	Standard deviation
Infrequently used ICT resources	Presentation Software	37.5	35.1	27.4	3.27	1.53
	CD-R Information Sources	48.2	33.8	18	2.87	1.5
	Data Projector	52.3	31.4	16.3	2.68	1.53
	Educational software	41	32.5	26.5	3.14	1.62
	CD-R Educational games	36.6	39.5	23.9	3.22	1.51
	Digital Camera	50.8	29.1	20.1	2.8	1.6
	Scanner	57.5	28.1	14.4	2.58	1.54
	Average	**46.3**	**32.8**	**20.9**		
Frequently used ICT resources	Printer	17.6	20.9	61.5	4.44	1.67
	E-mail	49.2	14.1	36.7	3.18	2.07
	Internet	28.2	24.3	47.5	3.91	1.78
	Word Processor	22.2	27.3	50.5	4.1	1.68
	Average	**29.3**	**21.7**	**49.1**		
Underused ICT resources	Video conferencing	92.2	6.3	1.5	1.27	0.76
	Databases	78.5	17.3	4.2	1.83	1.16
	Spreadsheets	70.1	21.9	8	2.15	1.25
	Graphic/Design Software	62.2	28	9.8	2.37	1.41
	Average	**75.8**	**18.4**	**5.9**		

Table 7.13: Descriptive analysis for the use of ICT factors

These results are consistent with the results of other studies discussed in Chapter 4. Becker (2000), through the data collected from more than 4000 teachers in schools across the United States in the context of the Teaching, Learning, and Computing (TLC) survey, found that although many teachers had students use a variety of software and resources at least occasionally, the only resources which were being used frequently were word processing, skill practice games, and CD-rom. Specifically, 46% of the primary teachers reported using word processing frequently, while 32% of them reported frequently using skill practice games and 28% of them CD-rom. Other resources like graphics and presentation were underused. Similarly, Williams et al (1998) found that for most primary teachers the use of ICT was restricted to word processing while other ICT resources (video conferencing, digital camera etc.) were completely underused. In this way they concluded that primary teachers were a long way from making daily use of ICT in a full range of professional contexts.

More recently, Wozney et al (2006) found that teachers were frequently using resources like word processing, the Internet and CD-rom, but for predominantly informative and expressive purposes. Other resources like educational games, computer conferencing, and instructional software, were found to be completely underused (‘never’ or ‘practically never’). Also, Vannata and Fordham (2004) found that word processing, e-mail, and the Internet were the only applications utilised by teachers several times or more per semester. The use of digital cameras, databases, spreadsheets, and presentation software was restricted and slightly exceeded once or twice per semester. In addition, Totter et al (2006), carried out a study in Austria and Switzerland, as part of the Lab@Future project funded by the European Commission. 52 teachers responded to a questionnaire which aimed to investigate the factors that could explain the use of new media in classrooms. The results showed that teachers were making restricted use of new media in the classroom, while office software and the internet were the only applications used to some extent. The participant teachers were given a four-point likert scale (0=never to 3=very often used), and included 12 items, both ICT resources and traditional audiovisual aids. The study showed that the mean score for office software was 1.23 (SD=0.92) and for the internet was 1.25 (SD=0.90), while the mean scores for other ICT resources like chat, web logs, audio/video conferencing, computer games, newsgroups and others, were >1, indicating minimal use.

In the studies conducted by Becker (2000) and Williams (1998), the use of the Internet by the teachers was found to be quite infrequent. Contrarily, in this study, as well as in the studies conducted by Wozney (2006), Vannata and Fordham (2004), and Totter et al (2006) the use of the Internet was found to be much more frequent, and the specific ICT resource was included in the list of the most frequently used resources found in schools. This is probably due to the fact that the Internet has proven to be a flexible and useful ICT resource for teachers, and in this way, its use has dramatically increased over the years.

As indicated in Chapter 2, similar results were also produced by studies conducted in Cyprus. For instance, the study carried out by Eteokleous (2008) showed that 65% of the teachers seldom used computers in their classroom. She surveyed 292 teachers in 2003 in the district of Nicosia to investigate the integration of ICT in Cyprus primary schools. Also, the results of two independent studies carried out by Karagiorgi and Charalambous in 1996 and in 1998 respectively and are reported in a joint article by the researchers (2004), showed that teachers' use of ICT was quite restricted. Specifically, the first study, which was conducted in the schools that were participating in the initial programme for the introduction of ICT in schools, showed that only 21.3% of the teachers were involved in ICT integration by making use of computers. Similarly, the second study showed that only 24% of the teachers were making to some extent use of ICT in their teaching. Comparing the results of the studies discussed in this paragraph with the results in this study, it can be concluded that the increase in the use of ICT in the Cypriot primary schools over the last years is not considerable. As indicated in Table 7.13 the majority of the ICT resources available to teachers are infrequently used or underused, while the increased use concerns only a small number of resources (word processing, printer, the Internet, and email).

Table A4.2 (Appendix 4) shows that the ICT use subscales have good internal consistency, since the Cronbach's Alpha for the first subscale is 0.852, for the second is 0.806, and for the third is 0.672. Therefore, they will be used in the subsequent analysis.

7.5.1.2 Manners of ICT use and their impact

In question B.1, the participant teachers were asked to indicate how they were using ICT and its related resources, to support and facilitate a range of professional responsibilities. Their responses are presented in Table 7.14. Almost 90% of the teachers noted that they were employing ICT for teaching preparation, while 81.3% of them indicated that they were using ICT resources to support their teaching. At the same time, 67.2% and 68.1% of them indicated that they were using ICT in the context of classroom management activities and for communication respectively. Finally, 52.2% of the teachers noted that ICT was used to support professional development activities, while only 29.7% of the teachers were using technology to facilitated students' assessment practices.

Use of ICT for:	N	%
Teaching preparation (i.e. preparing lesson plans, teaching tools)	382	89.5
Teaching support (i.e. presenting lesson plans, facilitating a project-based learning activity, or researching information)	347	81.3
Classroom management activities (i.e. tracking attendance or word processing worksheets)	287	67.2
Professional Development (i.e. skill training or reading articles about teaching with technology)	223	52.2
Communication (i.e. emails, newsletters, or class websites)	291	68.1
Student assessment (i.e. online testing or student portfolios)	127	29.7

Table 7.14: Use of ICT for professional responsibilities (Question B.1)

It may be assumed that in the light of these results there should be no cause of concern, since teachers' use of ICT is satisfactory and adequate. But as Williams et al (1998; 2000) – who found that the vast majority of teachers (98%) were making use of some computer-based resources in the context of their research in Scottish schools – note, these results do not mean that the vast majority of teachers use ICT resources often, nor that they use a variety of resources, nor that they feel competent enough to use ICT as core teaching resource. After all, as has become evident by the results presented in the previous section, teacher use of ICT was patchy and restricted only to a small range of resources. Similar results were also found by the study conducted in Irish schools (NPADC 2001). Although 67.8% of the primary teachers reported making use of ICT in school, it was simultaneously found that less than one fifth of the teachers were using a computer for everyday teaching.

Also, the interview sessions with teachers revealed more details on how they were using ICT to support their professional responsibilities. When a teacher was asked to comment on ICT's role in education she noted that:

> Using ICTs, a teacher can design, prepare and apply appropriate teaching plans. Also, with the help of technology, he can discover new sources of learning and use new audiovisual aids which motivate and direct pupils' learning. (I.12)

The overall picture illustrated by the interview sessions, was similar to this teacher's comment. Teachers considered ICT quite useful in searching, accessing, and finding information which could be used primarily for teaching preparation and for use in the classroom as teaching materials or audiovisual aids. In several cases, a number of teachers indicated that technology made available easy ways of researching information, helped them design and create attractive audiovisual materials, and improved their teaching presentations. For example, a teacher argued that:

> Using technology can help a teacher create teaching materials that are more attractive to pupils. Also, computer-based presentations as well as teaching materials from the Internet can make teaching more interesting and pupils more focused during the lesson. (I.4)

Similarly, a second teacher noted that:

> A teacher can enhance the activities he prepares for his pupils. He can use computer resources to find pictures, play CDs and DVDs. (I.13)

When a teacher was discussing the advantages of ICT in the education, she stressed that:

> You can easily collect information, using a wide range of resources. With the same ease you can then store these pieces of information which can simply be retrieved and reused. (I.3)

When these results are linked with the results presented in the previous section, in which teacher's use of the various ICT resources available to them was explored, it becomes evident that teachers are mostly using the Internet to find information and teaching materials to design activities and produce teaching plans. At the same time, word processing is being used to edit and prepare these teaching materials, while the printer is being used for printing out the materials for use in the classroom. In some cases, these materials are shown in the classroom using computer-based presentations. These results are consistent with the results found by O'Dwyer et al (2004), in a study conducted in 96 schools in 22 Massachusetts districts, and intended to identify teacher, school, and district characteristics associated to teachers' use of technology. They surveyed 1490 elementary school teachers and they found that teachers used technology most frequently for preparation purposes and least frequently for directing their students to create products using technology. Also, the study conducted by Eteokleous (2008) in Cyprus primary schools showed that teachers were primarily using computers for support of their traditional practices. She notes that ICTs were being used as 'fancy chalkboards', while their use as educational tools integrated in teaching and learning was practiced only by a small number of teachers. Similarly, the study carried out by Karagiorgi and Charalambous (2006) showed that although the Cypriot teachers were progressing with ICT integration in their practices, the diverse patterns of ICT use developed were not indicating a transformation of teaching and learning. The researchers note that ICT has ended up being used for word processing and low-end applications that maintain rather than alter existing practices.

Furthermore, in question B.2 teachers were asked to indicate the area of their professional responsibilities wherein the use of ICT had had the greatest impact. Table 7.15 and Figure 7.5, 50.6% of the teachers stated that ICT use had impacted the ways in which they were preparing their teaching and lessons, while 28.8% and 9.4% of them noted that it had impacted their actual teaching and the activities they were organising to manage their classroom respectively. Moreover, the percentages of teachers who supported that ICT use had impacted their professional development (4.9%), their communication (3.3%) and the methods they were using to assess their students (1.4%), are very low.

Impact of ICT in	N	%
Teaching preparation (i.e. preparing lesson plans, teaching tools)	216	50.6
Teaching support (i.e. presenting lesson plans, facilitating a project-based learning activity, or researching information)	123	28.8
Classroom management activities (i.e. tracking attendance or word processing worksheets)	40	9.4
Professional Development (i.e. skill training or reading articles about teaching with technology)	21	4.9
Communication (i.e. emails, newsletters, or class websites)	14	3.3
Student assessment (i.e. online testing or student portfolios)	7	1.6
No impact	6	1.4
Total	427	100

Table 7.15: ICT use impact on areas of teachers' professional responsibilities (Question B.2)

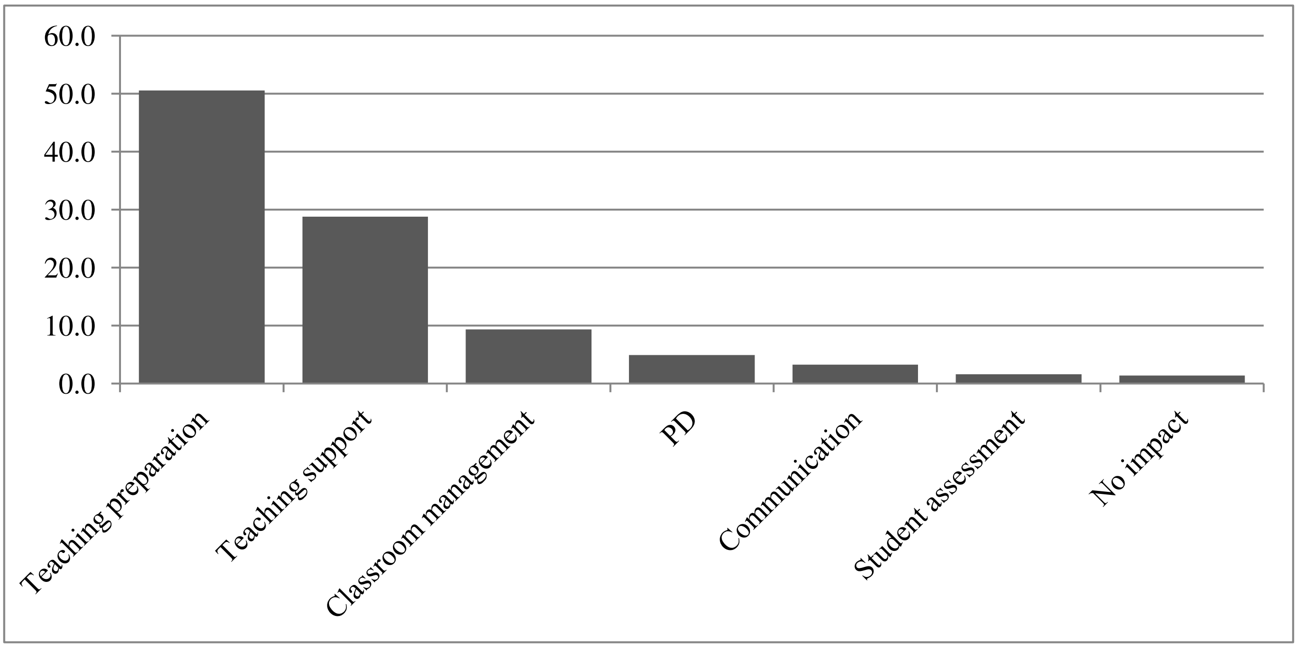

Figure 7.5: ICT use impact of areas of teachers' professional responsibilities (bar chart)

Therefore, as the results presented in this section suggest, teachers' use and integration of ICT in their classroom activities are not developed and extended enough to influence and impact substantially their teaching or other areas of their professional responsibilities. Although the great majority of them (81.3%) claimed to employ ICTs to support and facilitate their actual work in the classroom, only 28.8% of them believed that their teaching had been impacted and influenced by the utilisation of technology. This is probably due to the fact that teachers' use of ICT is restricted only to a small range of resources, which are primarily used for finding information to be used for teaching preparation and for the creation of other audiovisual and teaching materials, which are eventually used in the classroom. For this reason half of the teachers considered that their teaching preparation was impacted by the use of ICT.

7.5.1.3 Teachers' perceived competence in the use of ICT

Question B.3 and B.4 of the questionnaire requested teachers to rate their level of competence in the use of ICT for their personal and professional tasks. Table 7.16 shows that the majority of teachers were generally feeling competent not only in the use of ICT for personal tasks, but also in the use of ICT for their professional responsibilities. This is evident from the percentages of teachers who chose the options 4 (29.3%, 34.7%), 5 (37.7%, 25.3%), and 6 (13.6%, 8.4%), and also from the mean scores of their responses (a mean score above 3.5 denotes more perceived competence, while a mean score below 3.5 entails less perceived competence).

Nevertheless, what it is noteworthy in Table 7.16, and also in Figure 7.6, which graphically depicts teachers' responses to questions B.3 and B.4, is that teachers were feeling more competent in the use of technology for personal tasks (4.37) than in the use of ICT in the context of their work (3.94). Moreover, the histograms depicted in Figure 7.6 are negatively skewed which means that teachers' responses are clustered to the right, showing that in general teachers were feeling competent in the use of ICT. However, as shown in Table 7.16, the value of skewness for the first histogram is larger than the second one which denotes that teachers were considering themselves more competent in the use of ICT for personal tasks than for their professional responsibilities.

Perceived competence		**1**	**2**	**3**	**4**	**5**	**6**	**Mean response**	**Standard deviation**	**Skewness**
Personal	**N**	10	21	49	125	161	58	4.37	1.15	-0.782
	%	2.3	4.9	11.5	29.3	37.7	13.6			
Professional	**N**	16	39	78	148	108	36	3.94	1.22	-0.419
	%	3.7	9.1	18.3	34.7	25.3	8.4			

Table 7.16: Teachers' perceived competence in the use of ICT for personal and professional tasks (Descriptives)

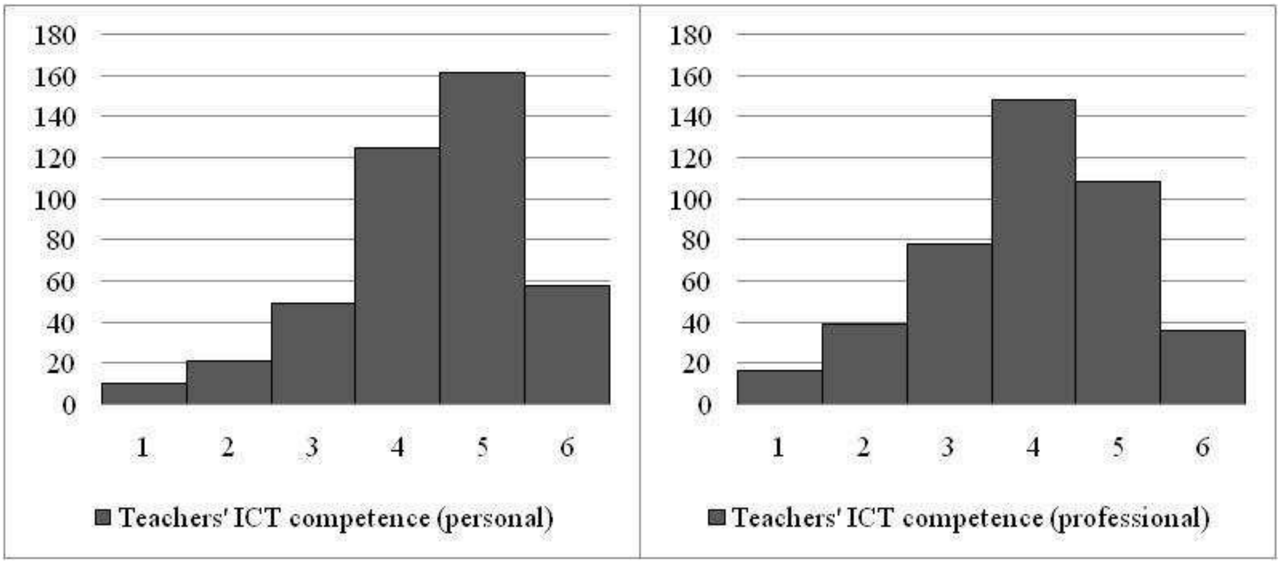

Figure 7.6: Teachers' perceived competence in the use of ICT for personal and professional tasks (histograms)

The ratings of the teachers' professional competence in the use of ICT is fairly similar to the way that the teachers, in the Wozney et al (2006) study had rated their own compentence. In the case of this study, teachers were asked to indicate their proficiency level in relation to computer technology, using a six-point scale, in which 1 was ‘unfamiliar’, 2 was ‘newcomer’, 3 was ‘beginner’, 4 was ‘average’, 5 was ‘advanced’, and finally 6 was ‘expert’. 19% of respondents reported being at an ‘advanced’ or ‘expert’ level of proficiency, and 11% indicated being ‘newcomers’ or ‘unfamiliar’ with technology, while teachers’ responses mean score was 3.71 (SD=1.07). Also, as noted in Chapter 6, these questions were adapted from the Irish study that aimed to evaluate aspects of ‘Schools IT 2000’ (NPADC 2001). However, in the case of this study, the teachers were provided with a ten-point scale in which 1 was ‘not at all competent’ and 10 was ‘very competent’. As this study’s results showed, the mean score of the responses of the 350 primary teachers who had taken part in the study was 4.77. This indicates that Irish teachers were feeling less competent in the use of ICT than the Cypriot teachers, and this is probably due to the fact that the Irish study was conducted in 1999, and therefore, the use of ICT was not as widespread as it is now. Also, the levels of self-rated computing competence by 350 Australian teachers who had taken part in a study conducted by Bradley and Russell (1997), were moderately low. The results showed that the mean score on the computer competence scale (five-point likert scale, where higher scores indicate greater levels of perceived competence), was 2.69 (SD=1).

Furthermore, in the study conducted by Williams et al (1998), the participant teachers were asked to indicate their perceived levels of ICT competence in classroom practice, professional development, personal use, and administration, choosing among four choices, ‘very competent’, ‘competent’, ‘not competent’, and ‘don’t know’. 66% of the teachers said that they were feeling competent or very competent with ICT in classroom practice, 39% with ICT use for professional development, 29% for administration, and 53% for personal use. It is therefore indicated that the teachers in that study were feeling more competent in the use of ICT in the classroom than in their personal ICT use, a result which is different from what was found in this study. Nevertheless, based on the qualitative analysis results, the researchers in that study noted that very few teachers described themselves as very competent in any of those categories, while it was common to find teachers worrying that they might be unable to cope if things went wrong.

7.5.2 Teachers' attitudes toward ICT

In this section, teachers' attitudes toward ICT are explored. The data regarding this issue were collected by question D.1 in the questionnaire. Table A2.3 (Appendix 2) shows that scale's Cronbach's Alpha coefficient is 0.915, which means that its internal consistency is adequate. However, items 1, 3, 5, 6, 9, 14, 16, and 20 were reversed, because their phrasing was reversed in relation to the rest of the items included in the scale. The inclusion of reverse phrasing of items in a scale is important for reducing response bias (Field 2005). Also, item 15 was excluded from the subsequent analysis since its item-total correlation was negative. Table A3.3 (Appendix 3) presents the frequencies of teachers' responses to the ICT attitudes statements included in the scale.

In Table 7.17, teachers' responses were summarised in two categories, 'disagree' and 'agree', while the direction [(+) positive or (–) negative] of each item is noted. The mean scores of teachers' responses for each statement were calculated, and statements of the scale D.1 were reordered according to the mean scores. On looking at the percentages it becomes evident that teachers' attitudes toward ICT are generally positive. The mean scores for the majority of the positive to ICT statements are above 3.5, while, for the majority of the negative statements are below 3.5. More analytically, the great majority of teachers agreed that ICT was useful in helping them find, and better manage, information for their teaching. This result also confirms what was discussed in Section 7.5.1.2, about the different ways in which teachers were using ICT for their professional responsibilities. Also, they tended to agree that ICT was making their work easier, and that it was motivating pupils to learn, acquire new knowledge effectively, and work collaboratively. They indicated that it was easy to select appropriate ICT resources for their teaching, although they tended to agree that using ICT during teaching was time consuming, and approximately half of them indicated that they did not have time to prepare teachings using ICT. In addition, they tended to disagree with the view that ICT could distract pupils and that it swamps them with information.

The majority of them disagreed with the statements that computers should have never been invented, that they were scared of them, and that they preferred to use computers alone when no-one was around to see them make mistakes. Also, they disagreed that they knew just the basic, and that they did not have the appropriate skills to use it effectively. However, they appeared to be divided when they asked to indicate their extent of their agreement with the statement ‘I don’t know what I would do without ICT’. Also, half of them agreed that it was easier for them to use ICT for personal affairs than for work-related tasks, although they tended to disagree that ICT was only useful for non-work related tasks.

Statement		Disagree (%)	Agree (%)	Mean	St. Dev.
ICT helps me find heaps of relevant information for my teaching	+	4.3	95.7	5.20	0.88
ICT makes my work easier.	+	7.6	92.4	4.89	0.98
I manage information more effectively because of ICT.	+	14.5	85.6	4.59	1.15
ICT seems to motivate the pupils to learn.	+	12	88	4.56	1.06
ICT helps pupils acquire new knowledge effectively.	+	14.9	85.1	4.36	1.03
ICT encourages pupils to work together collaboratively.	+	24.3	75.7	4.13	1.13
I find it easy to select appropriate ICT resources for my teaching.	+	25.2	74.8	4.11	1.09
I find using ICT during teaching time consuming.	-	42.6	57.4	3.53	1.41
I don't know what I would do without ICT.	+	50.1	49.9	3.47	1.52
I use ICT resources effectively myself but I'm not sure how to include them in my work.	-	47.3	52.7	3.45	1.36
I don't have time to prepare teachings using ICT.	-	49.7	50.3	3.30	1.29
Pupils can get distracted by all the technology.	-	58.1	41.9	3.14	1.30
I find it helpful for non-work related tasks.	-	69.2	30.8	2.83	1.37
ICT swamps pupils with information.	-	69.6	30.4	2.79	1.30
Systems are slow, I'd be quicker using a book.	-	70.7	29.3	2.75	1.32
Some pupils are as scared as me when using ICT and its resources.	-	68.6	31.4	2.71	1.41
The pupils are way ahead of me in their use of ICT.	-	72.7	27.3	2.60	1.41
I can't cope with all the ICT jargon.	-	72.1	27.9	2.53	1.40
I know the basics but that is all.	-	72.4	27.6	2.50	1.49
I don't have the appropriate skills to use it effectively.	-	74.6	25.4	2.48	1.45
I tried to include ICT resources to my teachings but it was unsuccessful.	-	80.2	19.8	2.44	1.26
When teaching with ICT resources the classroom is transformed into a chaos.	-	83.9	16.1	2.26	1.16
I feel lost in the Information Age.	-	78.1	21.9	2.24	1.39
I don't want to use ICT resources because I consider my established practices adequate.	-	86.7	13.3	2.19	1.14
I prefer using computer on my own when no-one is around to see me make mistakes.	-	80.1	19.9	2.18	1.43
Computer scares me.	-	80.8	19.2	2.14	1.39
I can never find anything relevant for my pupils when surfing to the web.	-	90.6	9.4	1.83	1.11
I wish that computer had never been invented.	-	91.8	8.2	1.57	1.15

Table 7.17: Descriptive analysis for teachers' attitudes toward ICT (scale D.1)

Teachers' attitudes toward ICT were also expressed thought their comments in the context of the interview sessions. To a great extent teachers' positive attitudes toward technology were also confirmed by the interviews. The participant teachers indicated that ICT can facilitate teaching and learning in a diversity of different ways, while they acknowledged ICT's important role in helping them succeed in their teaching goals. The majority of them underscored that the use of ICT resources makes the teaching process more interesting and motivating for students. For instance, when a teacher was asked to talk about ICT's advantages, argued that:

> When the teaching materials used during the lesson are relevant to technology, pupils are more active and motivated to participate... the teacher enjoys more his work and this is reflected on his pupils' progress and performance. (I.12)

Also, another teacher claimed that:

> Pupils are interested in learning in this way (using ICT). It is quite amusing for them. They can create astonishing learning products using a variety of programmes. (I.2)

Similarly, a third teacher noted that:

> Technology attracts pupils' attention, and its use in the classroom ensures their active participation in the teaching procedure. (I.24)

Additionally, a number of teachers believed that ICT was helping their students experience difficult and abstract concepts. A teacher said:

> The use of technology expands learning... pupils can visually experience phenomena, concepts, and situations which could not be accessible otherwise. (I.8)

A second one suggested that:

> Using simulations, pupils can visualise teaching concepts, experiencing in this way various things – not only imagine them – which can definitely help them learn more. (I.1)

Once more, several teachers highlighted ICT's value as a means of finding, editing, and presenting information, while others indicated that ICT was also helpful in enhancing their teaching with audiovisual aids. Finally, teachers noted technology's value for managing issues related to their work. For example, a teacher argued that:

> Technology provides the opportunity to keep pupils' record, analyse data, set teaching goals and be informed about educational issues. (I.12)

Nevertheless, teachers also expressed negative attitudes toward ICT, as well as concerns and worries regarding the increased use of technology in schools. For example, a number of teachers noted that technology could outshine school's core process of learning. A teacher argued that:

> ICTs should be tools which support teaching. However, it is often evident that pupils are impressed by the equipment neglecting in this way the teaching content. (I.19)

Also, the time factor was also raised by a group of teachers. They pointed out that technology use has a significant cost on the valuable teaching time, and they considered the use of ICT as time-consuming. Specifically, a teacher stressed that:

> Teaching time is valuable and limited. ICT use can outspend this time which in turn definitely affects student learning. (I.3)

Moreover, teachers underscored that due to technology other important sources of information are neglected by students. A teacher argued that:

> The frequent use of technology overrides book reading by pupils. Books and especially literature books play a significant role in a person's life. Pupils will lose too many things if they neglect book reading. (I.1)

In line with this teacher's comment, a second one said:

> Pupils are becoming too dependent on computer which eventually makes them incompetent to use or to learn how to use other sources of information; for instance encyclopaedias. (I.2)

Finally, a number of teachers indicated that the use of ICT and specifically the use of the Internet by students can become dangerous. A teacher noted that:

> Not all information resources in the Internet are valid. Pupils could access websites which are inappropriate for their age. (I.13)

Factor analysis was carried out to examine the internal structure of teachers' attitudes toward ICT scale. Prior to performing the analysis the suitability of the data was assessed. The correlation matrix revealed that there were many coefficients of 0.3 and above, the Kaiser-Meyer-Oklin measure of sampling adequacy produced value was 0.927 (>0.6), and the Bartlett's Test of Sphericity was significant ($p>0.05$). In this way, the factorability of the correlation matrix was supported. Factor analysis revealed the existence of five factors (Table 7.18) with initial eigenvalues larger than 1. The factors explained 33.7%, 8.4%, 5.8%, 4.6%, and 3.9% of the variance. It was decided to further explore only the three first factors which explain 47.9% of the variance, based on the inspection of the scree plot (Figure 7.7). The initial solution was rotated (varimax rotation) to facilitate interpretation of the factors. The rotated solution is presented in Table 7.19.

Factors	Total	% of variance	Cumulative
1	9.435	33.695	33.695
2	2.359	8.425	42.120
3	1.625	5.804	47.924
4	1.279	4.568	52.492
5	1.098	3.921	56.413

Table 7.18: Total variance explained (Initial eigenvalue attitudes to ICT scale)

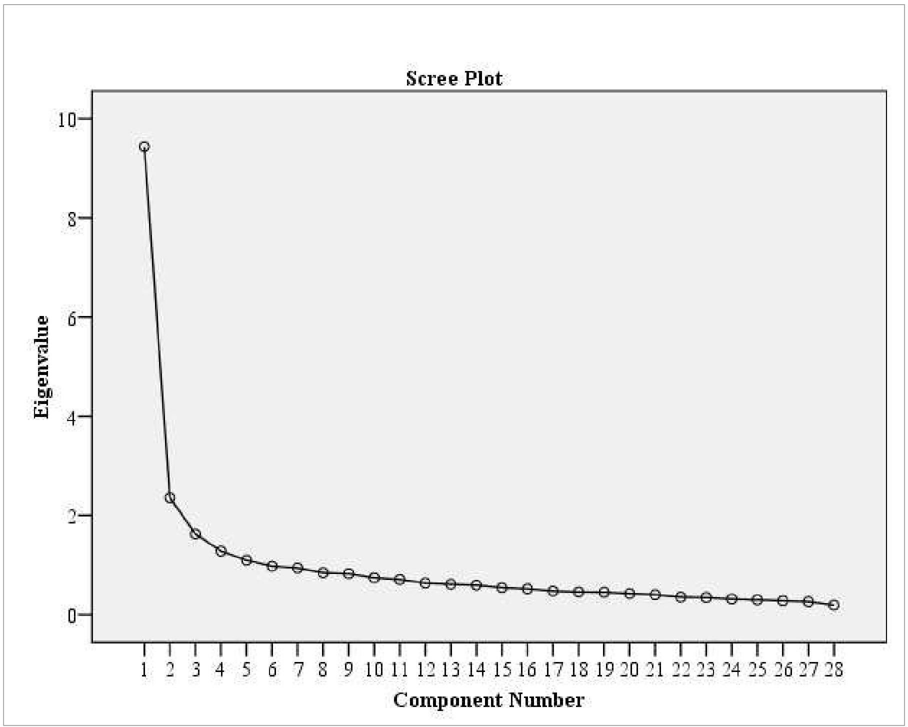

Figure 7.7: Scree plot for teachers' attitudes toward ICT scale

Table 7.19 shows the statements included in each factor, with the loadings in each factor. All the statements in each factor represent a separate theme in the context of teachers' attitudes toward ICT. Factor 1 includes statements related to attitudes that reflect low confidence in the use of ICT; Factor 2, statements that represent negative attitudes toward ICT; Factor 3, reflects positive attitudes.

Factors	Statements	Components		
Factor1: Low confidence in the use of ICT	I feel lost in the Information Age.	0.731		
	I know the basics but that is all.	0.731		
	The pupils are way ahead of me in their use of ICT.	0.707		
	I prefer using computer on my own when no-one is around to see me make mistakes.	0.702		
	I can't cope with all the ICT jargon.	0.695		
	I don't have the appropriate skills to use it effectively.	0.691		
	Computer scares me.	0.683		
	I wish that computer had never been invented.	0.446		
Factor 2: Negative attitudes toward ICT	I don't want to use ICT resources because I consider my established practices adequate.		0.683	
	When teaching with ICT resources the classroom is transformed into a chaos.		0.673	
	Systems are slow, I'd be quicker using a book.		0.646	
	I tried to include ICT resources to my teachings but it was unsuccessful.		0.610	
	Pupils can get distracted by all the technology.		0.600	
	I don't have time to prepare teachings using ICT.		0.589	
	ICT swamps pupils with information.		0.546	
	I find it helpful for non-work related tasks.		0.540	
	I can never find anything relevant for my pupils when surfing to the web.		0.518	
	I find using ICT during teaching time consuming.		0.495	
	I use ICT resources effectively myself but I'm not sure how to include them in my work.		0.420	
	Some pupils are as scared as me when using ICT and its resources.		0.407	
Factor 3: Positive attitudes toward ICT	ICT helps pupils acquire new knowledge effectively.			0.740
	I manage information more effectively because of ICT.			0.708
	ICT makes my work easier.			0.641
	I don't know what I would do without ICT.			0.637
	ICT encourages pupils to work together collaboratively.			0.584
	ICT helps me find heaps of relevant information for my teaching			0.572
	ICT seems to motivate the pupils to learn.			0.562
	I find it easy to select appropriate ICT resources for my teaching.			0.413

Table 7.19: Factor loadings for scale D.1 (ICT attitudes) after varimax rotation

Table 7.20 presents the descriptive analysis of the statements included in each of the three factors. The mean scores and the average percentages of teachers' responses show that teachers tended to disagree with the statements in Factor 1 which is about low ICT confidence attitudes. Specifically, on average, 77.8% of the teachers disagreed with these statements, while the mean scores for all statement are well below 3.5. This result is consistent with the results of a small scale survey of 170 teachers conducted by BECTA (2004) in the UK. The study was carried out in the context of a report about the barriers to the uptake of ICT by teachers and showed that 21.2% of teachers' total responses were related to ICT confidence issues, which were particularly focused on a fear of admitting to their pupils that they had limited knowledge in the area of ICT. As Table 7.20 shows, on average only 22.2% of the teachers tended to agree with the statements included in the 'low ICT confidence' factor. Similarly, the study conducted by Bradley and Russell (1997) showed that the mean score on the computer anxiety scale (five-point likert scale) was 2.66 (SD=0.94), indicating that teachers' level of anxiety was moderately low. The researchers report that approximately one quarter to one third of the sample agreed with the statements that suggested that computers were a source of 'anxiety', 'tension' or a 'sinking feeling'.

Also, teachers tended to disagree with the statements that comprise Factor 2, negative attitudes toward ICT. On average, 68.1% of the teachers disagree with these statements, with the mean scores tending to be <3.5. However, teachers tended to agree with Factor 3 statements dealing with positive attitudes toward ICT. The mean scores for the majority of these statements are >3.5, with on average, 80.9% of teachers agreeing with these statements. In this way, it can be concluded that in general teachers' attitudes toward ICT are quite positive, and that they appreciate the usefulness and usability of ICT in the context of education, and therefore, in their work.

Factors	Statements	Disagree (%)	Agree (%)	Mean	St. D.
Factor1: Low confidence in the use of ICT	I feel lost in the Information Age.	78.1	21.9	2.24	1.39
	I know the basics but that is all.	72.4	27.6	2.50	1.49
	The pupils are way ahead of me in their use of ICT.	72.7	27.3	2.60	1.41
	I prefer using computer on my own when no-one is around to see me make mistakes.	80.1	19.9	2.18	1.43
	I can't cope with all the ICT jargon.	72.1	27.9	2.53	1.4
	I don't have the appropriate skills to use it effectively.	74.6	25.4	2.48	1.45
	Computer scares me.	80.8	19.2	2.14	1.39
	I wish that computer had never been invented.	91.8	8.2	1.57	1.15
	Average	**77.8**	**22.2**		
Factor 2: Negative attitudes toward ICT	I don't want to use ICT resources because I consider my established practices adequate.	86.7	13.3	2.19	1.14
	When teaching with ICT resources the classroom is transformed into a chaos.	83.9	16.1	2.26	1.16
	Systems are slow, I'd be quicker using a book.	70.7	29.3	2.75	1.32
	I tried to include ICT resources to my teachings but it was unsuccessful.	80.2	19.8	2.44	1.26
	Pupils can get distracted by all the technology.	58.1	41.9	3.14	1.3
	I don't have time to prepare teachings using ICT.	49.7	50.3	3.3	1.29
	ICT swamps pupils with information.	69.6	30.4	2.79	1.3
	I find it helpful for non-work related tasks.	69.2	30.8	2.83	1.37
	I can never find anything relevant for my pupils when surfing to the web.	90.6	9.4	1.83	1.11
	I find using ICT during teaching time consuming.	42.6	57.4	3.53	1.41
	I use ICT resources effectively myself but I'm not sure how to include them in my work.	47.3	52.7	3.45	1.36
	Some pupils are as scared as me when using ICT and its resources.	68.6	31.4	2.71	1.41
	Average	**68.1**	**31.9**		
Factor 3: Positive attitudes toward ICT	ICT helps pupils acquire new knowledge effectively.	14.9	85.1	4.36	1.03
	I manage information more effectively because of ICT.	14.5	85.6	4.59	1.15
	ICT makes my work easier.	7.6	92.4	4.89	0.98
	I don't know what I would do without ICT.	50.1	49.9	3.47	1.52
	ICT encourages pupils to work together collaboratively.	24.3	75.7	4.13	1.13
	ICT helps me find heaps of relevant information for my teaching	4.3	95.7	5.2	0.88
	ICT seems to motivate the pupils to learn.	12	88	4.56	1.06
	I find it easy to select appropriate ICT resources for my teaching.	25.2	74.8	4.11	1.09
	Average	**19.1**	**80.9**		

Table 7.20: Descriptive analysis for attitudes toward ICT factors.

As noted in Chapter 6, the statements included in the ICT attitudes scale, were adapted from Williams et al (1998) study in Scotland. In the context of that study, it was found that although teachers' attitudes toward ICT were mixed and varied, the majority of them were generally positive and wanted to develop their ICT skills and knowledge. It was also found that negative attitudes amongst primary teachers were more usually associated with awareness of the difficulties they had to overcome in order to be able to use ICT effectively. Nevertheless, this result is not consistent with what has been found in this study. As Table 7.20 shows, teachers' negative attitudes toward ICT are predominately associated with time restrictions to prepare and perform teachings using ICT, as well as with teachers' unawareness and difficulty in finding effective ways of infusing and using ICT in their work. Moreover, Wozney et al (2006) also found that teachers' attitudes toward ICT were generally positive. The statements used to assess teachers' ICT attitudes were grouped in three categories: value statements, expectancy statements, and cost statements. Value items assessed the degree to which teachers perceived ICT as worthwhile, expectancy items explored teachers' perceptions of the contingency between their use of the strategy and the desired outcomes, and cost items assessed they perceived physical and psychological demands of implementation operating as a disincentive to ICT implementation. Teachers responses' mean score for value statements was 4.10 (SD=0.80) and for expectancy statements was 4.12 (SD=0.53). Teachers showed less positive agreement towards cost statements, compared to the expectancy and value items, and their responses' mean score was 3.58 (SD=0.83).

In line with the results found in this study, the study conducted by Michaelidou-Evripidou (1995) to explore teachers' perspectives on the initial introduction of computers in Cyprus primary schools in the early 1990s showed that teachers' attitudes toward computers were quite positive. The teachers were found to be willing to get involved with ICT integration, since they thought that computers could facilitate teaching and become a useful tool in the hands of students. Nevertheless, what was found to be inconsistent with this study's results is that teachers appeared to be concerned and unsure with ICT's consequences on their professional roles in the classroom, indicating at the same time low confidence in the use of ICT. More recently, the study conducted by Karagiorgi (2003) to examine teachers' concerns about ICT in schools in the context of the programme for the initial introduction of computers in Cyprus primary schools, showed that teachers were mostly putting their emphasis on self concerns. Namely, they were more concerned about their personal adequacy in the use of ICT than about the effective and successful use of ICT in the classroom. This result is also inconsistent with what was found in this study. Moreover, the study conducted by Eteokleous (2008), and it was based on data that were collected in 2003, showed that 53% of the teachers did not have positive attitudes towards ICT integration in their classroom practices, while they reported their personal attitudes toward computer technology as the most significant factor in terms of integrating computer in their classroom practices. This result is also inconsistent with what was found in this study. Comparing the results of those studies with the results of this study it can be concluded that over the years, Cypriot teachers' attitudes toward ICT has become more positive and their confidence in the use of ICT has been increased.

The internal consistency of ICT attitudes subscales was assessed. The Cronbach's Alpha coefficient for the first subscale was 0.896, for the second 0.857, and for the third was 0.787 (Table A4.3).

7.5.3 Barriers and enablers to teachers' use of ICT

The data for the diverse barriers and enablers that affect teachers' use of ICT in their work were collected by question E.1. The Cronbach's Alpha coefficient is 0.803 for the scale, which means that its internal consistency is adequate (Table A2.4 in Appendix 2). However, the coding for statements 2, 4, 7, 9, 11, 14, 16, and 18 was reversed, since they have a reverse phrasing compared to other items included in the scale. Table A3.4 (Appendix 3) presents the frequencies of teachers' responses to the statements included in the scale.

In Table 7.21, teachers' responses were re-coded into two categories (disagree, agree), while the statements were reordered according to their responses mean scores. The majority of teachers (87.8%) considered their schools administration to be quite supportive in their effort to integrate ICT in their work. At the same time, they tended to agree with the view that the proportion of pupils and the availability of ICT equipment created problems in the process of including technology in teaching. Moreover, although they agreed that the available software was adequately current, they indicated that there was not enough of software and especially that written in Greek. Also, teachers tended to disagree with the statements that every time they were using technology they encountered technical troubles and that the available equipment was obsolete. However, they indicated that technical problems were not timely fixed, although someone was accessible to turn to when they encountered a technical problem.

Statement	**Disagree (%)**	**Agree (%)**	**Mean**	**St. Dev.**
The administration of my school is quite supportive with respect to ICT use.	12.2	87.8	4.73	1.12
The proportion of pupils and the available equipment averts the use of ICT.	23.1	76.9	4.41	1.39
The educational software available in my school is updated and current.	28	72	3.99	1.22
There is not adequate number of software in Greek.	40.3	59.7	3.76	1.31
I can easily find advice when I use ICT during my teaching.	40.9	59.1	3.70	1.21
The current curriculum is not suitable for ICT integration.	43.7	56.3	3.69	1.38
The dissemination of ICT resources in my school is well organised.	45.7	54.3	3.59	1.48
There are enough resources that illustrate how to integrate ICT into the curriculum.	48.5	51.5	3.45	1.26
The school I work don't have adequate equipment so as to promote the use of ICT.	50.2	49.8	3.38	1.61
I'm willing to use ICT but the access to the equipment is difficult and time consuming.	52.4	47.6	3.38	1.46
Nobody asks for my suggestions when a new ICT innovation is introduced to my school.	57.1	42.9	3.31	1.41
My classroom is suitable for the use of ICT resources.	52.8	47.2	3.31	1.45
The availability and diversity of educational software is satisfactory.	54.2	45.8	3.25	1.27
My effort to use ICT resources is prevented by pupils' inadequate technology skills.	56.1	43.9	3.22	1.26
Every time I use a piece of equipment, there are technical troubles.	59.4	40.6	3.08	1.40
Although there is equipment in my school, it is obsolescent to be used efficiently.	65.1	34.9	2.93	1.42
There is nobody to turn to when I have a technical problem.	66.1	33.9	2.94	1.41
Devices with technical problems are immediately fixed.	71.2	28.8	2.69	1.35

Table 7.21: Descriptive analysis for factors' affecting teachers' ICT use (scale E.1)

In order to achieve further examination of the internal structure of the scale, factor analysis was carried out. The data were suitable for the specific analysis since the produced correlation matrix showed the existence of many coefficients above 0.3, the Kaiser-Meyer-Oklin measure of sampling adequacy value was 0.816 (>0.6), and the Bartlett's Test of Sphericity was significant (p>0.05). The initial solution showed the existence of six factors with initial eigenvalues above 1.

The produced factors explained 60.6% of the variance (Table 7.22). After examining the scree plot (Figure 7.8) it was decided to keep two factors for further exploration. In order to facilitate the factors' interpretation the initial solution was rotated using varimax rotation. The rotated solution is presented in Table 7.23.

Factors	Total	% of variance	Cumulative
1	4.462	24.788	24.788
2	1.842	10.233	35.020
3	1.392	7.736	42.756
4	1.171	6.504	49.261
5	1.039	5.773	55.033
6	1.006	5.590	60.623

Table 7.22: Total variance explained (Initial eigenvalue) Factors affecting teachers' use of ICT

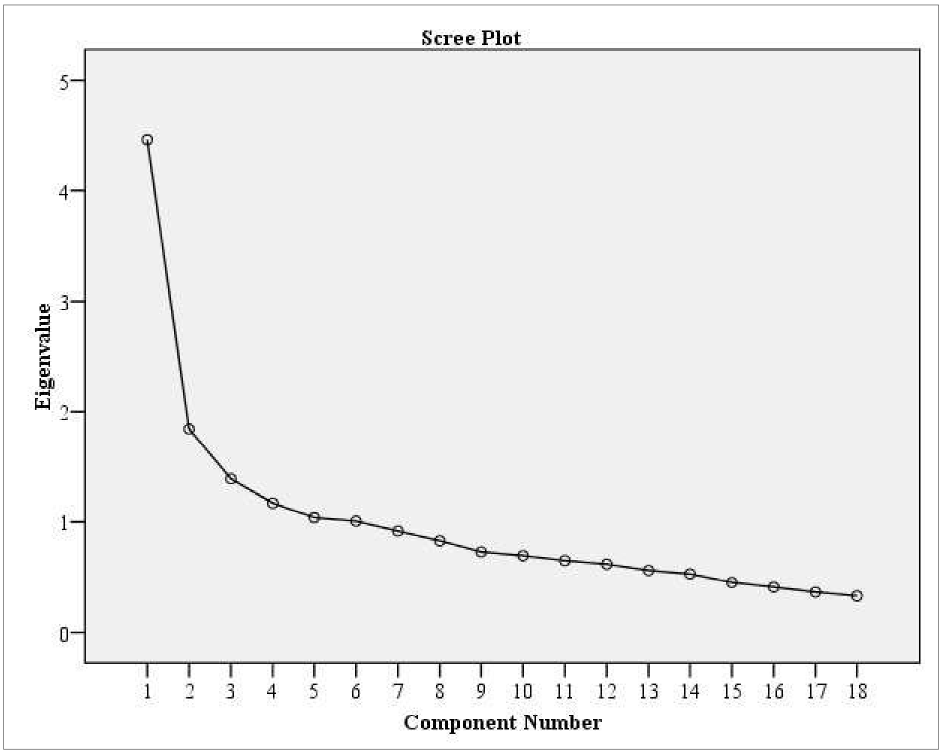

Figure 7.8: Scree plot for factors affecting teachers' use of ICT scale

The rotated solution (Table 7.23) revealed the existence of a simple structure, with the included statements loading on each of the two components. It is revealed that the statements which describe facilitating the teachers' use of ICT situations are loading on the first factor. Therefore, the theme of factor 1 is: 'ICT use enablers'. Factor 2 has loadings on the statements that describe situations that hinder ICT use. Therefore, the theme of factor 2 is: 'ICT use barriers'.

Factors	Statements	Components	
ICT use enablers	The educational software available in my school is updated and current.	0.703	
	The dissemination of ICT resources in my school is well organised.	0.699	
	My classroom is suitable for the use of ICT resources.	0.608	
	There are enough resources that illustrate how to integrate ICT into the curriculum.	0.587	
	The availability and diversity of educational software is satisfactory.	0.561	
	The administration of my school is quite supportive with respect to ICT use.	0.503	
	I can easily find advice when I use ICT during my teaching.	0.472	
	Devices with technical problems are immediately fixed.	0.397	
ICT use barriers	Every time I use a piece of equipment, there are technical troubles.		0.706
	There is nobody to turn to when I have a technical problem.		0.674
	Although there is equipment in my school, it is obsolescent to be used efficiently.		0.631
	I'm willing to use ICT but the access to the equipment is difficult and time consuming.		0.545
	My effort to use ICT resources is prevented by pupils' inadequate technology skills.		0.523
	There is not adequate number of software in Greek.		0.440
	The current curriculum is not suitable for ICT integration.		0.397
	Nobody asks for my suggestions when a new ICT innovation is introduced to my school.		0.378
	The school I work don't have adequate equipment so as to promote the use of ICT.		0.377

Table 7.23: Factor loadings for scale E.1 (factors affecting ICT use) after varimax rotation

In Table 7.24 the descriptive analysis of the statements included in each of the two factors is presented. For factor 1 (ICT use enablers) the statements that received the wider agreement by teachers are the support provided by the school administration, the quality of the available software in schools, as well as the easy access to advices regarding ICT in teaching. Teachers tended to disagree with statements that are related to the immediate repairing of technical problems, the availability and diversity of educational software, and the suitability of the classrooms in which they teach with the help of ICT. For factor 2 (ICT barriers), the teachers tended to agree that there is a lack of adequate number of Greek software in schools and that the school curriculum was not suitable for ICT integration. Also, almost half of the teachers agreed that the access to equipment was difficult and time consuming and that there was not adequate equipment in their schools. However, they indicated that the available ICT equipment in schools was not obsolete, and that the essential technical support was available.

Factors	Statements	Disagree (%)	Agree (%)	Mean	St. Dev.
ICT use enablers	The administration of my school is quite supportive with respect to ICT use.	12.2	87.8	4.73	1.12
	The educational software available in my school is updated and current.	28	72	3.99	1.22
	I can easily find advice when I use ICT during my teaching.	40.9	59.1	3.70	1.21
	The dissemination of ICT resources in my school is well organised.	45.7	54.3	3.59	1.48
	There are enough resources that illustrate how to integrate ICT into the curriculum.	48.5	51.5	3.45	1.26
	My classroom is suitable for the use of ICT resources.	52.8	47.2	3.31	1.45
	The availability and diversity of educational software is satisfactory.	54.2	45.8	3.25	1.27
	Devices with technical problems are immediately fixed.	71.2	28.8	2.69	1.35
	Average	**44.2**	**55.8**		
ICT use barriers	There is not adequate number of software in Greek.	40.3	59.7	3.76	1.31
	The current curriculum is not suitable for ICT integration.	43.7	56.3	3.69	1.38
	I'm willing to use ICT but the access to the equipment is difficult and time consuming.	52.4	47.6	3.38	1.46
	The school I work don't have adequate equipment so as to promote the use of ICT.	50.2	49.8	3.38	1.61
	Nobody asks for my suggestions when a new ICT innovation is introduced to my school.	57.1	42.9	3.31	1.41
	My effort to use ICT resources is prevented by pupils' inadequate technology skills.	56.1	43.9	3.22	1.26
	Every time I use a piece of equipment, there are technical troubles.	59.4	40.6	3.08	1.4
	There is nobody to turn to when I have a technical problem.	66.1	33.9	2.94	1.41
	Although there is equipment in my school, it is obsolescent to be used efficiently.	65.1	34.9	2.93	1.42
	Average	**54.5**	**45.5**		

Table 7.24: Descriptive analysis for factors affecting teachers' use of ICT

These results are similar with findings of other studies discussed in Chapter 4. For instance the survey carried out by Franklin (2007) in the US with the participation of 121 elementary school teachers, showed that the greatest barriers to computer use were (a) too much curriculum to cover, and (b) lack of time in daily schedule. Also, access to and availability of equipment was identified as a factor that influenced teachers' computer use. Furthermore, the study carried out by Tearle (2004) in three UK schools and included questionnaire survey, interviews and contextual observations, showed that the main factors that inhibit teachers' use of ICT was the lack of time to set up ICT activities, the number of other demands on their available time, and teachers' difficult access to computers when needed. In addition, Williams et al (1998; 2000) study showed that the lack of availability of some ICT resources was the main reason given by primary teachers for non use of ICT. However, the researchers note that other inhibiting factors existed but the access and availability of equipment tended to override all other factors. The teachers that participated in the research in Ireland (NPADC 2001) also indicated that the lack of equipment and resources was the main factor that discouraged their use of ICT. Lack of training and confidence in the use of ICT, and lack of time to examine the available software were additional important factors indicated by the participant teachers.

Also, similar results were found by the study conducted by Eteokleous (2008). Specifically, the analysis of the qualitative data collected in the context of that study also showed that the lack of resources was one of the most significant factors that inhibited teachers' use of ICT. The teachers who participated in that study highlighted that the lack of Greek educational software was a great barrier as well. Additionally, the unsuitability of the national curriculum to promote effective integration of ICT was indicated as an equally significant factor. The extensive volume of the curriculum, its philosophical direction which is not aligned with progressive instructional practice and does not support in high degree ICT integration, and finally the pressures to timely cover its content, were some of the participant teachers' arguments.

Table A4.4 (Appendix 4) shows that the internal consistency of the two subscales derived by factor analysis was satisfactory, since the Cronbach's Alpha coefficients were 0.732 and 0.722 respectively.

What is more, teachers' perspectives on the barriers and enablers that affect their use of ICT were also expressed during the interview sessions. A teacher noted that:

> When a teacher wants to use the classroom's computer, he needs at least half hour to connect its various parts and prepare it for the teaching. It is definitely a useful learning tool, but unfortunately there are many difficulties when trying to include it into a teaching. These difficulties can be the lack of support and the pressure by the curriculum which is not designed to include ICT. (I.1)

This quotation reflects to a great extent the teachers' concerns, as they were expressed in the context of the interview sessions. A number of teachers indicated that technological infrastructure available to schools was insufficient and in many cases, the access to the equipment was difficult or time consuming. A teacher argued that:

> The number of computers and other ICT resources in school is limited. Sometimes, you need to move in other classrooms so as to use a video projector. (I.13)

Moreover, teachers highlighted that inefficient and obsolete equipment could become a barrier in their effort to integrate ICT in their work. For example, a teacher noted that:

> Sometimes a computer can be slow which creates many problems in your teaching. The most horrible scenario could be a computer malfunction which can spoil your whole teaching planning. (I.4)

The quality of the available software was also considered to be a significant problem according to teachers' comments. They indicate that it was challenging for them to find appropriate software for use in a variety of school subjects. Specifically, a teacher noted that:

> There is lack of worthy software and at the same time, there is no information about what is available for each subject. (I.17)

The unsuitability of the school curriculum for ICT integration was also identified by a number of teachers as a significant factor that affected their successful use of ICT in their work. A teacher argued that:

> The curriculum's inflexibility, as well as the obligation to exactly follow its guidelines leaves little space of ICT integration. (I.1)

A second teacher noted that:

> A great challenge is time. There are so many things that we should teach according to the curriculum that we don't have time to include ICT resources in our teaching. (I.8)

Finally, a number of teachers mentioned that the use of ICT in schools was prevented by teachers and students lack of ICT use skills.

7.6 Teachers' professional development in ICT: the current situation (2nd research question)

7.6.1 Teachers' participation in formal professional development opportunities in ICT

In question F.1, the participant teachers were asked to indicate if they had participated in the ICT seminars organised by the Pedagogical Institute of Cyprus. Table 7.25 shows that 52.9% of the teachers' had attended the seminars, while 45.2% of them had not yet received this type of training. These figures reflect to a great extent the actual number of teachers who participated in these seminars: according to the Annual Report 2007, published by the Ministry of Education and Culture (2008), about 2000 primary school teachers have attended these seminars, since the initiative's launching in 2003.

Participation in ICT seminars	**N**	**%**
Yes	226	52.9
No	193	45.2
Not stated	8	1.9
Total	427	100

Table 7.25: Teachers' participation in ICT seminars

In question F.2 the participant teachers were asked to indicate if they had received in-service training by the ICT coordinators appointed by the Ministry's ICT unit. Table 7.26 shows that the ICT coordinators had provided training to 72.8% of the teachers. 25.3% of the teachers reported that they had not received any training by the ICT coordinators.

Training by ICT coordinator	**N**	**%**
Yes	311	72.8
No	108	25.3
Not stated	8	1.9
Total	427	100

Table 7.26: Training provided by ICT coordinators

A more comprehensive picture, regarding teachers' participation in formal professional development in ICT, is presented in Table 7.27. It is shown that 10.1% of the teachers had participated only in the seminars organised by the Pedagogical Instituted, while 30.4% of the teachers had received training only by the ICT coordinators. 42.6% of the teachers had attended the particular seminars, and also had received training and support by the ICT coordinators. Finally, 15% of the teachers reported that they had not participated in any type of formal professional development opportunity in ICT. These results are also graphically presented in Figure 7.9.

Participation in ICT training	N	%
Seminars	43	10.1
Coordinators	130	30.4
Both (seminars + coordinators)	182	42.6
No training	64	15.0
Not stated	8	1.9
Total	427	100

Table 7.27: Overview of teachers' participation in ICT training

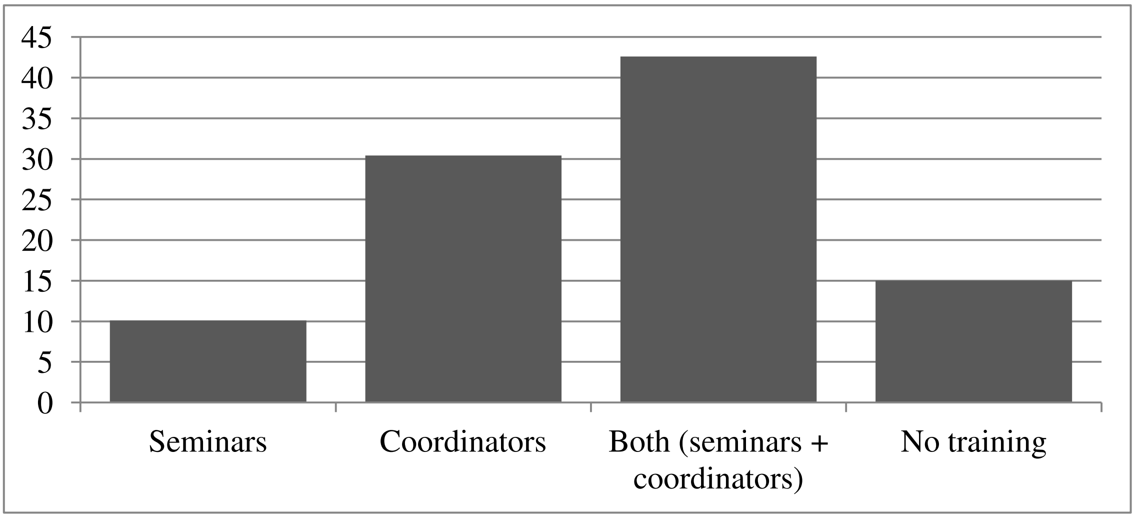

Figure 7.9: Overview of teachers' participation in ICT training (bar chart)

7.6.2 Teachers' training needs in ICT

In this section teachers' ICT training needs are explored. What teachers expect to learn, when participating in ICT professional development opportunities and ICT-based training activities, is examined. Also, what teachers' considered as the ideal way of receiving ICT training is discussed. These aspects are simultaneously reflecting teachers' training needs with respect to ICT.

7.6.2.1 Teachers' ICT training expectations

The data regarding teachers' ICT training expectations were collected by question F.5 of the questionnaire. The scale's Cronbach's Alpha coefficient is 0.932 (Table A2.5 in Appendix 2). Teachers' responses to the items included in the scale are presented in Table A3.5 (Appendix 3)

In Table 7.28, teachers' responses were re-coded into two categories, 'minimal need' and 'considerable need'. Also, the statements were reordered according to teachers' responses mean scores. Teachers' responses mean scores for all statements is well above 3.5, which means that they felt that they needed training in all areas described by the provided statements in the scale. Simultaneously, it suggests that teachers recognised and acknowledged the importance of ICT training to effectively and efficiently integrate ICTs into their professional responsibilities. These conclusions are also confirmed by the examination of the last row of the table which shows that on average, only 12.8% of teachers considered their ICT training needs as minimal, while the great majority of them (87.2%) assessed their needs as considerable.

More analytically, the teachers indicated that their greater need was to learn how to combine the use of ICT with other resources and methods to achieve their teaching goals. This was followed by their need to learn how to prepare lessons using ICT, as well as to acquire skills to select and use the most appropriated software and ICT resources for specific educational instances and situations in the classroom. Also, they equally provided high ratings for their need to become skilled in employing the most appropriate ICTs for whole classroom teaching. However, teachers indicated that their need to understand the advantages and disadvantages of ICT in school, as well as to become capable to access research and inspection evidence and to use ICT to aid record keeping, analysis of data, target-setting, etc, were not as considerable as the ones mentioned before. This suggests that teachers were more interested in learning about practical issues which have direct applications in the classroom, than to learn about theoretical technology-related concepts or about issues that were not directly relevant to their actual everyday teaching practice.

These results are confirmed by teachers' responses during the interview sessions, when they were asked to identify their ICT training needs and to indicate what they were expecting to learn when participating in ICT professional development opportunities. Several teachers mentioned that they needed to learn how to use and integrate new types of software in their teaching, while others indicated that they were expecting to learn how to generally apply ICT in their teaching. For example, a teacher noted that:

> I expect that I will learn how to integrate a number of computer-based activities in specific subjects which would stimulate my pupils' interest. (I.8)

Similarly, another teacher argued that:

> I would generally expect to learn how to use ICT resources in my classroom and in the various subjects that I teach. (I.14)

In addition, a number of teachers indicated that they needed to learn how to use ICT tools and resources for teaching preparation. A teacher said that:

> Finally, I want to learn how to create attractive teaching material, prepare presentations, and find pictures and other material in the Internet, presumably from websites with educational content that are yet not known to me. (I.4)

In line with this comment, a second teacher noted that:

> I am also expecting that I will become capable to organise teaching materials and enhance my teaching plans with attractive activities for my pupils. (I.12)

When I receive training on ICT, I expect that I will:	Minimal need (%)	Considerable need (%)	Mean	St. Dev.
be capable to combine the use of ICT with other resources and methods to achieve my teaching objectives.	6.1	93.9	5.07	0.93
be capable to prepare lessons using ICT by selecting and preparing appropriate sources of information.	7.5	92.5	5.04	1.00
acquire the skills to select and use the most appropriate software and ICT resources for specific educational situations.	5.4	94.6	5.03	0.92
be skilled to employ the most appropriate technologies for whole class teaching.	6.5	93.5	5.02	0.95
learn how to extend pupils' learning in various subjects through the use of ICT.	6.8	93.2	5.00	0.98
obtain the competence to use generic and/or subject-specific hardware and software e.g. databases, internet, presentation tools, scanners, printers etc.	8.1	91.9	4.88	1.01
acquire the competence to enable pupils to demonstrate their knowledge, understanding and skills in the different subjects while using ICT.	8.3	91.7	4.79	0.98
be capable to decide the most effective organisation of the classroom and pupils so as to fulfil my teaching goals.	11.9	88.1	4.75	1.11
be adequately competent so as to intervene and pose questions to stimulate, direct, monitor and assess the learning of pupils who are using ICT.	13.6	86.4	4.67	1.06
learn how to access and use resources, including resources from online communities, websites on education and from websites of the Ministry.	17.7	82.3	4.66	1.32
be capable to judge the effectiveness of using ICT in achieving teaching objectives.	15.7	84.3	4.61	1.13
learn how to ensure that pupils' learning in the different subjects is not masked by the technology being used.	16.9	83.1	4.57	1.16
be skilled to use ICT to aid record-keeping, analysis of data, target-setting, reporting, transfer of information etc.	20.7	79.3	4.49	1.28
be capable to access research and inspection evidence.	25.2	74.8	4.40	1.3
understand and consider the advantages and disadvantages of using ICT for teaching and teaching preparation.	22.3	77.7	4.32	1.36
Average	**12.8**	**87.2**		

Table 7.28: Descriptive analysis for teachers' training needs (scale F.5)

Further exploration of teachers' ICT training needs was achieved by applying factor analysis on the data sought by scale F.5. Prior to applying factor analysis the data's suitability was examined: the correlation matrix included many coefficients of 0.3 and above, the Kaiser-Meyer-Oklin measure of sampling adequacy value was 0.933 (>0.6), and the Bartlett's Test of Sphericity was significant ($p>0.05$). Therefore, the factorability of the correlation matrix was supported. Table 7.29 shows that factor analysis revealed the existence of three factors with initial eigenvalues larger than 1, which explained 52.9%, 9.3%, and 7% of the variance. After the inspection of the scree plot (Figure 7.10), it was decided to retain two factors for further analysis.

Factors	Total	% of variance	Cumulative
1	7.934	52.890	52.890
2	1.389	9.262	62.153
3	1.043	6.952	69.105

Table 7.29: Total variance explained (Initial eigenvalue of teachers ICT training needs scale)

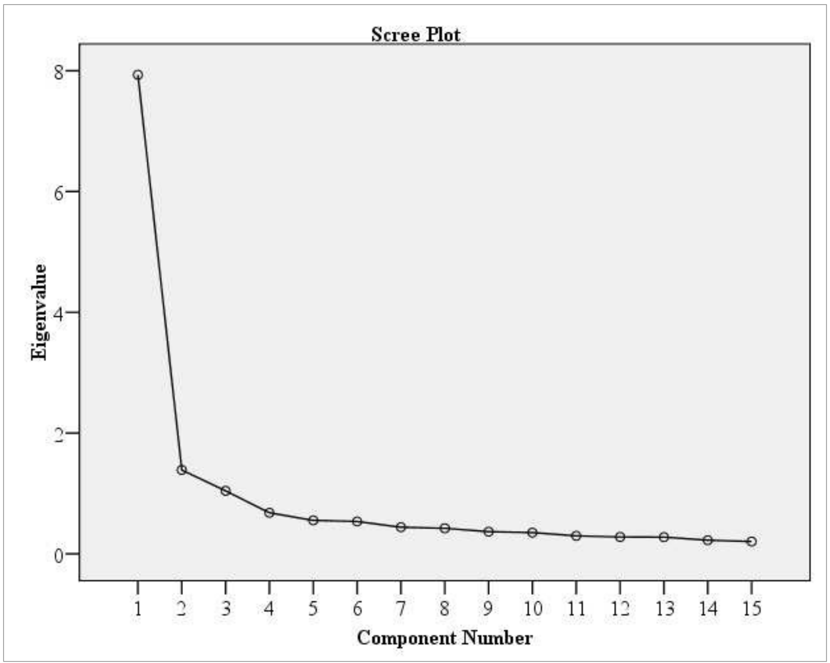

Figure 7.10: Scree plot for teachers' ICT training needs scale

In order to facilitate the factors' interpretation, the initial solution was rotated using varimax rotation. The rotated solution is shown in Table 7.30. The first factor includes statements which describe teachers' ICT training needs in areas that are related to practical applications of ICT in the classroom. The second factor includes statements which describe training needs for more theoretical and indirect to teachers' everyday work issues. The two-factor solution explained a total of 62.2% of the variance, with factor 1 contributing 36.2% and factor 2 contributing 26%.

Factors	**When I receive training on ICT, I expect that I will:**	**Components**	
Training needs for practical applications	be capable to combine the use of ICT with other resources and methods to achieve my teaching objectives.	0.800	
	learn how to extend pupils' learning in various subjects through the use of ICT.	0.783	
	be skilled to employ the most appropriate technologies for whole class teaching.	0.771	
	acquire the skills to select and use the most appropriate software and ICT resources for specific educational situations.	0.755	
	be capable to decide the most effective organisation of the classroom and pupils so as to fulfil my teaching goals.	0.739	
	be adequately competent so as to intervene and pose questions to stimulate, direct, monitor and assess the learning of pupils who are using ICT.	0.702	
	acquire the competence to enable pupils to demonstrate their knowledge, understanding and skills in the different subjects while using ICT.	0.673	
	be capable to prepare lessons using ICT by selecting and preparing appropriate sources of information.	0.672	
	obtain the competence to use generic and/or subject-specific hardware and software e.g. databases, internet, presentation tools, scanners, printers etc.	0.536	
Training needs for theoretical issues	be capable to access research and inspection evidence.		0.854
	be skilled to use ICT to aid record-keeping, analysis of data, target-setting, reporting, transfer of information etc.		0.827
	learn how to access and use resources, including resources from online communities, websites on education and from websites of the Ministry.		0.822
	be capable to judge the effectiveness of using ICT in achieving teaching objectives.		0.624
	learn how to ensure that pupils' learning in the different subjects is not masked by the technology being used.		0.561
	understand and consider the advantages and disadvantages of using ICT for teaching and teaching preparation.		0.455

Table 7.30: Factor loadings for scale F.5 (training needs after varimax rotation)

Table 7.31 presents the descriptive analysis of the statements included in each of the two factors. Teachers’ responses mean scores, as well as the average percentages, show that teachers were feeling that they needed more training in practical applications of ICT and considered these needs as more substantial than the needs which are relevant to more theoretical issues. More analytically, on average, 91.8% of teachers indicated that they considered the training needs included in the first factor as considerable and the mean scores for these statements ranged from 4.67 to 5.07. For the second factor, on average 80.2% of teachers indicated that they considered the training needs related to theoretical issues as considerable, while the mean scores for the included statements ranged from 4.32 to 4.66.

The internal consistency of the ICT training needs subscales was assessed, and the Cronbach's Alpha coefficient for the first subscale was 0.917 and for the second was 0.869 (Table A4.5 in Appendix 4).

The results presented in this section are in line with what was found in the study conducted by Williams et al (1998) in Scottish schools. The researchers found that the teachers in Scotland valued the ICT training which was appropriate to classroom use, had a hands-on practical element, provided on-the-spot help, and it was generally useful in helping them to learn how to apply their acquired knowledge within the curriculum. This conclusion was based on the finding that the training that the teachers had already received left them feeling they had some competence to use a narrow range of ICT but they were not progressing beyond this. They were feeling that they lacked the kind of understanding they needed to integrate ICT fully within the curriculum. The researchers argued that teachers needed to be aware of a broader range of ICT than they were at that time, since without this awareness, many of them were feeling that they could not assess their own ICT development needs.

Also, these results are in line with results found by the study carried out by Karagiorgi and Charalambous (2006). The study aimed at measuring the perceptions of primary school teachers in Cyprus regarding the impact and efficiency of the ICT training scheme offered by the Pedagogical Institute, and it was based on data collected though telephone semi-structured interviews with 23 teachers who participated in ICT training in 2004. The study showed that the majority of teachers were interested in ICT training that would be focused on skills on how to effectively incorporate ICT in teaching, expressing at the same time their dissatisfaction for the existing ICT training scheme. As indicated in Chapter 2, the training offered by the Pedagogical Institute is mostly focused on basic ICT skills while any practice on ICT applications are left for the end of the course and are allocated only a few teaching hours. Also, a number of the participant teachers stressed that they needed more specialised training on particular software. Based on these results, the researchers suggest that the ICT training offered in Cyprus should shift beyond the acquisition of basic ICT skills towards improvement of teachers' professional skills and change of the way ICT is envisaged in teaching.

Factors	When I receive training on ICT, I expect that I will:	Minimal need (%)	Considerable need (%)	Mean	St. Dev.
Training needs for practical applications	be capable to combine the use of ICT with other resources and methods to achieve my teaching objectives.	6.1	93.9	5.07	0.93
	learn how to extend pupils' learning in various subjects through the use of ICT.	6.8	93.2	5.00	0.98
	be skilled to employ the most appropriate technologies for whole class teaching.	6.5	93.5	5.02	0.95
	acquire the skills to select and use the most appropriate software and ICT resources for specific educational situations.	5.4	94.6	5.03	0.92
	be capable to decide the most effective organisation of the classroom and pupils so as to fulfil my teaching goals.	11.9	88.1	4.75	1.11
	be adequately competent so as to intervene and pose questions to stimulate, direct, monitor and assess the learning of pupils who are using ICT.	13.6	86.4	4.67	1.06
	acquire the competence to enable pupils to demonstrate their knowledge, understanding and skills in the different subjects while using ICT.	8.3	91.7	4.79	0.98
	be capable to prepare lessons using ICT by selecting and preparing appropriate sources of information.	7.5	92.5	5.04	1.00
	obtain the competence to use generic and/or subject-specific hardware and software e.g. databases, internet, presentation tools, scanners, printers etc.	8.1	91.9	4.88	1.01
	Average	**8.2**	**91.8**		
Training needs for theoretical issues	be capable to access research and inspection evidence.	25.2	74.8	4.40	1.30
	be skilled to use ICT to aid record-keeping, analysis of data, target-setting, reporting, transfer of information etc.	20.7	79.3	4.49	1.28
	learn how to access and use resources, including resources from online communities, websites on education and from websites of the Ministry.	17.7	82.3	4.66	1.32
	be capable to judge the effectiveness of using ICT in achieving teaching objectives.	15.7	84.3	4.61	1.13
	learn how to ensure that pupils' learning in the different subjects is not masked by the technology being used.	16.9	83.1	4.57	1.16
	understand and consider the advantages and disadvantages of using ICT for teaching and teaching preparation.	22.3	77.7	4.32	1.36
	Average	**19.8**	**80.2**		

Table 7.31: Descriptive analysis for the ICT training needs factors

7.6.2.2 Teachers' perspectives on the ideal way of receiving ICT training

Teachers' perspectives on the ideal way of receiving training in ICT also reflect other aspects of their ICT training needs. These perspectives could represent their preferences regarding the content of ICT training and also their notions regarding the way that ICT training should be offered.

The data concerning teachers' ICT training preferences were collected by question F.3 in the questionnaire: the teachers were asked to indicate a specific form of training in ICT, which, according to their opinion, was the most appropriate. The teachers had to choose among four given options: training for ICT skills, training for ICT applied generally across the curriculum, training for ICT applied specifically to a particular subject, and finally, ICT training for pedagogical use of ICT. Table 7.32 shows that only a small percentage of the teachers (8.2%) had chosen training for ICT skills, as their preferred form of ICT training. The great majority of the participant teachers chose one of the three alternative options which describe ICT training forms that are concerned with more practical applications of ICT. Teachers' tendency to prefer ICT training which is related to practical application of ICT in the classroom confirms what was discussed in Section 7.6.2.1 when teachers' expectations regarding ICT training were examined. Nevertheless, as Table 7.32 presents, there is not a clear difference regarding teachers' preferred form of ICT training with respect to these three options: 32.6% of the teachers chose the option of training for ICT applied generally across the curriculum, 32.6% chose the option of ICT training for pedagogical use of ICT, and finally, 23.9% of them chose ICT training specifically to a particular subject. These results are also graphically presented in Figure 7.11.

These results are consistent with the results found in the study conducted by Wozney et al (2006). The researchers report that the teachers in their study indicated their need for in-service training, and more specifically, for applied training that goes beyond skill development. However, the results are not consistent with the results found in the study conducted in Scotland (Williams, Wilson et al. 1998). In the case of that study it was found that the highest priority for primary teachers was the acquisition of technical skills and knowledge, while the percentages of the teachers who had chosen training for application of ICT (general), for applications of skills (pedagogical), for management (general), for management (classroom), and for teaching ICT skills, were quite low. The differences between this study and the study conducted by Wozney et al (2006), with the study conducted by Williams et al (1998) study, are probably due to the fact these studies are more recent. Teachers nowadays are much more experienced in the use ICT, not only in the context of their work, but also for personal purposes. In this way, they were more interested in becoming more knowledgeable in the practical application of ICT in the classroom.

ICT training	**N**	**%**
ICT skills training	35	8.2
ICT applied generally across the curriculum	139	32.6
ICT applied specifically to a particular subject	102	23.9
ICT training for pedagogical usage of ICT resources	139	32.6
Not stated	12	2.8
Total	427	100

Table 7.32: Teachers' ICT training preferences

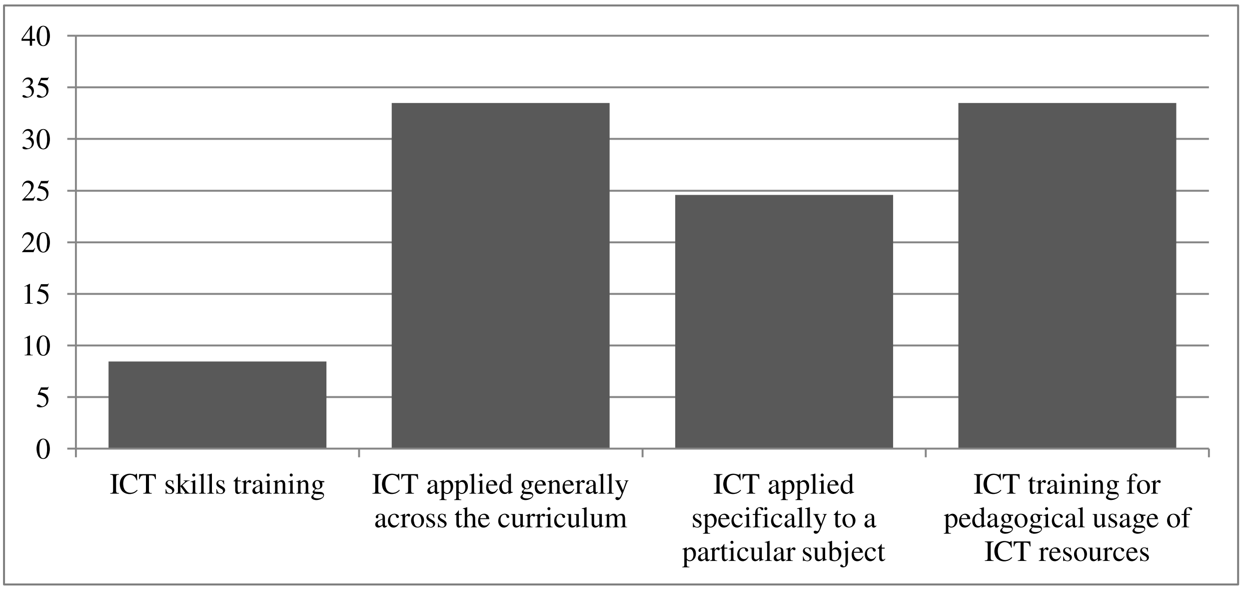

Figure 7.11: Teachers' ICT training preferences (bar chart)

Further examination of teachers' perspectives and opinions on the ideal way of receiving ICT training was achieved through the interviews. The data regarding this issue were collected through a question which requested from teachers to describe the ideal way of receiving training in

ICT. The participant teachers expressed a variety of viewpoints regarding the way that ICT training should be provided and offered to them. However, the majority of their proposals and suggestions were limited to traditional approaches and views of ICT professional development, and were mostly based on their existing experiences of ICT training. At the same time, it was revealed that they were not aware of the multiple ways in which they can receive ICT training. Also, their proposals showed that they were not willing to take responsibility for their ICT training, since they did not propose any form of training which is based on personal initiative or collaboration with their colleagues. Nevertheless, through the perspectives and views that the teachers expressed during the interview sessions, they revealed their willingness for more ICT training, and above all, they showed their demand for more qualitative professional development opportunities in ICT.

More analytically, the majority of the teachers suggested that ICT training should be provided through seminars and workshops, which should aim to help them practically apply and integrate ICT in their work. In this context, a teacher argued that:

> ICT training should consist of seminars on multiple practical applications, with exemplary proposals and specific examples. (I.18)

Similarly, a second teacher argued that:

> An ideal ICT training must include school-based, exemplary computer-based teachings. In addition, it should include seminars which help teachers prepare technology-based teachings for particular school subjects. (I.26)

Also, a teacher suggested that the ICT seminars should not be focused on theoretical issues, but on practical applications of ICT:

> There must be organisation of seminars which teach teachers how to use specific educational software and help them with their work. I must also note that generalities and theoretical approaches should be avoided. (I.5)

In addition, a number of teachers suggested that ICT training should also include training on basic technology skills:

> ICT training could include experiential workshops for ICT and ICT resources basic usage skills. In addition, it must include educational applications. (I.9)

In line with this view, a second teacher commented that:

> Initially, ICT training should be focus on basic skills, but, it is important to quickly move on, on a higher level. This level could include seminars which show teachers' efficient ways of integrating ICT resources into teaching procedure. After all, this is the goal that needs to be achieved. (I.1)

What is more, a group of teachers proposed that students could participate and be involved in ICT training. A teacher said that:

> A good way to provide ICT training is through frequent teachers' seminars. At the same time, pupils could participate in courses which could also include ICT basic skills. (I.3)

Similarly, a teacher argued that:

> ICT training should include seminars, exemplary ICT-based teachings in specific subjects and workshops, both for teachers and pupils. (I.8)

Also, a teacher argued that:

> It would be ideal if ICT training included practical projects for small groups of teachers and pupils, who would actively participate in various activities. (I.14)

Finally, a teacher suggested that the seminars should be structured in thematic stages, while she underscored that the training should be continuous:

> ICT training should consist of seminars with small number of teacher participants, structured in thematic stages. Teachers should have the opportunity to select what seminar-stages they want to participate in. Each seminar's duration should be short, repeated every six months and updated frequently. (I.13)

What is more, many teachers suggested that ICT training should be provided, not only through seminars, but also by ICT coordinators or ICT specialists and experts. For example, a teacher noted that:

> It would be ideal if teachers were asked to participate in compulsory training seminars on Microsoft Word, PowerPoint, Excel, Access and Internet use. In this way, teachers would

> have the opportunity to acquire knowledge and apply it into their teachings. Additionally, the existing computer counsellors ought to visit schools more frequently to help and train teachers. (I.4)

A teacher suggested that ICT specialists could train teachers in the context of their work in the classroom:

> ICT training could be provided by ICT specialists who frequently visit schools and train teachers how to use special software, in the classroom, during the actual teaching. (I.2)

In addition, a teacher stressed that:

> The number of ICT coordinators must be bigger. Also, the number of seminars offered must be increased. CDs and DVDs with supportive information should be issued and distributed to teachers. (I.16)

Finally, a teacher proposed that ICT training should be compatible with the current pedagogical developments. She noted that:

> Training should be school-based, contemporary and in relation to the demands of our society. It should be provided by specialist trainers and be in accordance to the contemporary pedagogical perspectives. (I.19)

Furthermore, the participant teachers expressed their views on other, more practical issues, concerning their training in ICT. The majority of them stressed that ICT training should be school-based. This result is consistent with the results found in the study conducted in Ireland (NPADC 2001). As reported, for the majority of the teachers, the most effective method of receiving training was with staff from their own school on their school premises. In addition, a number of teachers argued that ICT training should be provided during the school hours. Generally speaking, these results could suggest that the teachers were unwilling to relinquish spare time for their professional development in ICT. However, as Vannata and Fordham (2004) research findings suggest, "whereas technology training is obviously important in developing technology-using educators, a willingness to commits one's time 'above and beyond the call of duty' and a risk-taking attitude are also essential" (p:261). In the light of these results, the researchers suggests that the process of learning to use technology requires time; not only time spent in training, but also time that one is willing to commit beyond the typical work week to prepare instructional activities. Nevertheless, teachers' responses during the interview sessions showed that they were inclined to and more interested in a more contextualised, authentic, and relevant training in ICT. In this context, a teacher suggested that:

> ICT training should include seminars on practical applications of educational software. It must also be conducted during teachers' working time. (I.17)

Similarly, a second teacher argued that:

> ICT training should include practical applications of ICT resources in teachings followed by discussions. Training should be school-based. (I.11)

More flexibly, a teacher suggested that:

> Training seminars could be school-based, during teachers' time of work or during summer vacations, but not in the afternoons. If these seminars are not compulsory, then I highly suggest that teachers should be provided with motives to participate. Finally, a good way to provide ICT training is online. (I.1)

It must be noted that the particular teacher was the only one who proposed that the Internet could be utilised and exploited in the context of their professional development in ICT. Finally, a teacher noted that:

> ICT training should be provided by well-trained personnel. It should include practical applications in specific subjects. It should also be organised based on teachers' age groups. Finally, it ought to be school-based and during teachers' work time. (I.15)

7.6.3 Teachers' attitudes toward ICT training

In this section, teachers' attitudes toward ICT training are examined. A number of statements included in scale F.4 had a positive direction while others negative direction indicating positive and negative attitudes. Therefore, prior to checking the scale's reliability, the coding of items 1, 3, 4, 5, 8, and 13 were reversed, since their phrasing was reversed in relation to the other statements included in the scale. The scale's Cronbach's Alpha coefficient is 0.823 (Table A2.6 in Appendix 2). Nevertheless, item 17 was excluded from the subsequent analysis since its item-total correlation was quite low (0.060). Teachers' responses to the statements included in the specific scale, and also the direction of each statement [(+) positive or (–) negative] are included in Table A3.6 (Appendix 3).

In Table 7.33, teachers' responses were re-coded into two different categories ('disagree' and 'agree'). Simultaneously, their responses' mean score for each attitude-statement was calculated, while the statements were reordered according to the mean scores. The table indicates that teachers' responses mean scores for all positive statements are well above 3.5 and for the majority of the negative statements are below 3.5. This suggests that teachers' attitudes toward ICT training are fairly positive. Teachers indicated that they were interested in learning more about using ICT in the context of their work, they agreed that the offered training courses in ICT were useful, and that they really wanted to know more about developing their skills in ICT. Also, they agreed that they needed to develop their ICT skills for their pupils' benefit, for their general professional development, and for keeping up to date with the developments in teaching. However, a great number of them indicated that although they were interested they did not have time to participate in ICT training activities. Similarly, for a considerable number of teachers, the existence of negative attitudes toward ICT training was mostly associated with difficult access to training and lack of availability of ICT training opportunities. Also, a number of teachers were feeling that the available ICT training opportunities were not relevant to their work and considered them to be not appropriate for their teaching.

As noted in Chapter 6, the specific scale was adopted from the study conducted by Williams et al (1998), in Scottish schools. The results of that study are similar and consistent with the results found in this study. The researchers of that study found that the vast majority of the primary school teachers (92%) were interested in developing their ICT skills and knowledge, while 90% of them disagreed with the statement that they did not see the need to learn about ICT. Furthermore, the majority of them (over 80%) agreed that ICT training was important for their professional development, for their pupils' benefit, and for helping them keeping up to date with teaching.

Similarly, approximately 90% of the Cypriot teachers who had taken part in this study agreed with the specific statements. In addition to these, the researchers found that 19% of the Scottish teachers did not consider ICT training as a priority. The respective percentage for the Cypriot teachers is 20.4. Nevertheless, some results are not consistent between the two studies. For instance, in the Scottish study, 45% of the teachers indicated that were interested in ICT training but they did not have the time, 29% of them indicated that they were interested but did not have access, and 35% indicated they were interested but training was not available. The percentages of the Cypriot teachers who agreed with the specific statements are higher, and specifically, the percentage of teachers who agreed that did not have the time to participate in ICT training. This denotes that practicalities, like the available time, and the lack of access and availability were making teachers have negative attitudes toward ICT training. Similarly, the study conducted by BECTA (2004) about the barriers that affect teachers' use of ICT, found that many respondents who identified the lack of time as a cause of problems of using ICT in general, also indicated that their training suffered as a result.

Statements		Disagree (%)	Agree (%)	Mean	St. Dev.
I am interested in learning more about using ICT.	+	3.9	96.1	5.21	0.91
I find training courses in ICT useful.	+	3.9	96.1	5.21	0.88
I really want to know more about developing my skills in ICT.	+	10.5	89.5	4.81	1.16
I need to develop my skills and knowledge for the pupils' benefit.	+	9.5	90.5	4.77	1.06
I need to develop my skills and knowledge for professional development.	+	10.2	89.8	4.73	1.06
I feel I should develop my skills to keep up to date with developments in teaching.	+	11.5	88.5	4.72	1.08
I'm interested but I don't have the time.	-	42.1	57.9	3.60	1.40
I'm interested but training doesn't seem to be available.	-	61.0	39.0	3.11	1.40
I'm interested but I don't have the access.	-	63.5	36.5	2.95	1.38
I feel ICT training is not appropriate to my teaching.	-	68.1	31.9	2.79	1.52
I'm interested personally but developing my skills/knowledge in ICT isn't appropriate to my teaching	-	81.1	18.9	2.43	1.34
I don't think I need ICT skills to progress in the profession.	-	80.9	19.1	2.37	1.26
ICT is not a priority for me.	-	79.6	20.4	2.34	1.27
I'm not that interested but I suppose I should be.	-	79.7	20.3	2.31	1.36
I don't need to use ICT in my teaching.	-	89.1	10.9	1.94	1.12
I don't think it's necessary, no-one else in the school is bothering.	-	89.9	10.1	1.94	1.14
I don't see the need to learn about ICT.	-	89.9	10.1	1.90	1.13

Table 7.33: Descriptive analysis for teachers' attitudes toward ICT training (scale F.4)

Further examination of the internal structure of teachers' attitudes toward ICT training scale was attempted through factor analysis. The factorability of the correlation matrix was supported, since the initial examination of the suitability of the data, showed the existence of many coefficients of 0.3 and above, while the Kaiser-Meyer-Oklin measure of sampling adequacy value was 0.881 (>0.6) and the Bartlett's Test of Sphericity was significant (P>0.05). Table 7.34 shows that factor analysis revealed the existence of three factors with initial eigenvalue above 1, which explained 31.2%, 18.3%, and 5.9% of the variance respectively. After considering the scree plot (Figure 7.12), it was decided to keep the first two factors for further examination. The initial solution was then rotated, using varimax rotation, in order to facilitate the factors' interpretation. The solution after the rotation is shown in Table 7.35. The two-factor solution explained a total of 49.9% of the variance, with factor 1 contributing 27.2% and factor 2 contributing 22.3%.

Factors	Total	% of variance	Cumulative
1	5.299	31.172	31.172
2	3.119	18.347	49.519
3	1.005	5.910	55.428

Table 7.34: Total variance explained (Initial eigenvalue attitudes to ICT training scale)

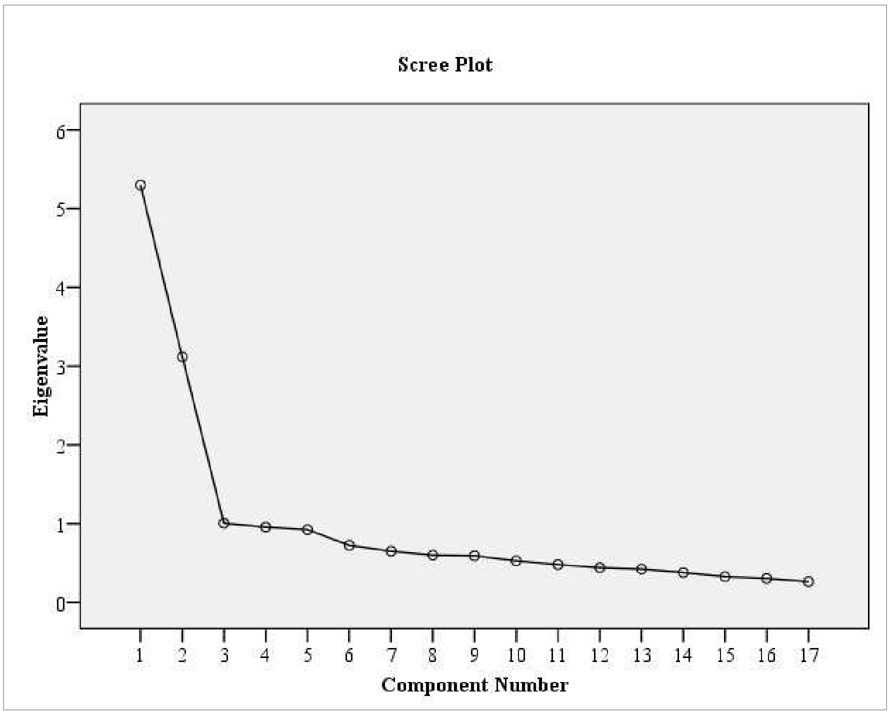

Figure 7.12: Scree plot for teachers' attitudes toward ICT training scale

Table 7.35 shows that the statements that describe negative attitudes toward ICT training are loading on the first factor; therefore, the factor theme is 'negative attitudes toward ICT training'. Similarly, the statements that describe positive attitudes toward ICT training are loading on the second factor. In this way, this factor's theme is 'positive attitudes toward ICT training'.

Factor	Statements	Components	
Negative attitudes toward ICT training	I don't see the need to learn about ICT.	0.738	
	I don't think it's necessary, no-one else in the school is bothering.	0.737	
	I don't need to use ICT in my teaching.	0.718	
	I'm interested personally but developing my skills/knowledge in ICT isn't appropriate to my teaching	0.699	
	I'm not that interested but I suppose I should be.	0.685	
	ICT is not a priority for me.	0.677	
	I'm interested but I don't have the access.	0.613	
	I don't think I need ICT skills to progress in the profession.	0.587	
	I'm interested but I don't have the time.	0.498	
	I'm interested but training doesn't seem to be available.	0.485	
	I feel ICT training is not appropriate to my teaching.	0.450	
Positive attitudes toward ICT training	I need to develop my skills and knowledge for professional development.		0.784
	I feel I should develop my skills to keep up to date with developments in teaching.		0.773
	I am interested in learning more about using ICT.		0.755
	I need to develop my skills and knowledge for the pupils' benefit.		0.665
	I find training courses in ICT useful.		0.661
	I really want to know more about developing my skills in ICT.		0.654

Table 7.35: Factor loadings for scale F.4 (ICT training attitudes) after varimax rotation

The descriptive analysis of the statements in each of the two factors is presented in Table 7.36. It is once again confirmed that teachers' attitudes toward ICT training are quite positive. On average, 91.7% of the teachers tended to agree with the statements included in the 'positive attitudes' factor, while 75% of them tended to disagree with the statements included in the 'negative attitudes' factor. At the same time, teachers' responses means scores for all statement included in the second factor are above 4.5. Teachers indicated that they acknowledged training's importance, not only for developing their ICT skills, but also for their students' benefit, for their general professional development, and for keeping up to date with developments in teaching. These attitudes were also confirmed by the interview sessions. A number of teachers indicated that their expectation, when participating in ICT training, was to learn about new teaching methods, and they considered this type of training as a part of their general professional development. For instance, a teacher argued that:

> I expect to learn about new teaching methods which have been emerged because of ICT in education. (I.5)

Another teacher noted the following:

I suppose that I will improve my skills and expand my knowledge on ICT in education as a part of my continuous professional development. (I.13)

Furthermore, and as mentioned before, teachers' negative attitudes toward ICT training were principally due to time restrictions, lack of available opportunities, lack of access to training activities, and inappropriate training. In addition, a number of teachers disregarded the importance of acquiring ICT skills and they did not considered ICT training as necessity or a priority to them. Also, some teachers indicated that they did not need to use ICT in their work, they considered ICT training as not necessary, and they did not feel that there was a need to learn about ICT.

Factor	Statements	Disagree (%)	Agree (%)	Mean	St. Dev.
Negative attitudes toward ICT training	I'm interested but I don't have the time.	42.1	57.9	3.60	1.40
	I'm interested but training doesn't seem to be available.	61.0	39.0	3.11	1.40
	I'm interested but I don't have the access.	63.5	36.5	2.95	1.38
	I feel ICT training is not appropriate to my teaching.	68.1	31.9	2.79	1.52
	I'm interested personally but developing my skills/knowledge in ICT isn't appropriate to my teaching	81.1	18.9	2.43	1.34
	I don't think I need ICT skills to progress in the profession.	80.9	19.1	2.37	1.26
	ICT is not a priority for me.	79.6	20.4	2.34	1.27
	I'm not that interested but I suppose I should be.	79.7	20.3	2.31	1.36
	I don't need to use ICT in my teaching.	89.1	10.9	1.94	1.12
	I don't think it's necessary, no-one else in the school is bothering.	89.9	10.1	1.94	1.14
	I don't see the need to learn about ICT.	89.9	10.1	1.90	1.13
	Average	**75.0**	**25.0**		
Positive attitudes toward ICT training	I am interested in learning more about using ICT.	3.9	96.1	5.21	0.91
	I find training courses in ICT useful.	3.9	96.1	5.21	0.88
	I really want to know more about developing my skills in ICT.	10.5	89.5	4.81	1.16
	I need to develop my skills and knowledge for the pupils' benefit.	9.5	90.5	4.77	1.06
	I need to develop my skills and knowledge for professional development.	10.2	89.8	4.73	1.06
	I feel I should develop my skills to keep up to date with developments in teaching.	11.5	88.5	4.72	1.08
	Average	**8.3**	**91.7**		

Table 7.36: Descriptive analysis for attitudes toward ICT training factors

The internal consistency of the teachers' attitudes toward ICT training subscales was assessed. The Cronbach's Alpha coefficient for the first subscale was 0.842, and for the second 0.817 (Table A4.6 in Appendix 4).

7.7 Summary

This chapter included the first part of the analysis of the data collected by the questionnaire and the interview, and its aim was to answer to the first two research questions of this study. In general, its aim was to describe the current situation with respect to ICT integration in Cyprus primary education as well as the current situation with respect to teachers' ICT training. The next chapter concludes the analysis of the data collected for this study's purposes. Its aim is to answer the third and final research question which is related to the factors that affect and predict teachers' use of ICT.

Chapter 8: Data analysis (Part II)

8.1 Introduction

Chapter 7 presented the first part of the analysis of the data collected for this study's purposes and its aim was to answer the first two research question. This chapter, which constitutes the second part of the data analysis, concludes the analysis of the collected data, and aims to answer the third and final research question of this study: 'Which are the factors that affect teachers' use of ICT and which of these variables can predict teachers' use of ICT?'

8.2 Factors affecting teachers' use of ICT

The factors affecting teachers' use of ICT will be explored in this section. More analytically, it will be explored if teachers' background characteristics, like their gender, age, teaching experience, grade responsibility, and occupational status, are affecting their ICT use. Furthermore, the relationships between teachers' use of ICT and their perceived ICT competence, their attitudes toward ICT, their perspectives on the ICT use barriers and enablers, their ICT training needs, and their attitudes towards ICT training, will be examined. Finally, the relationship between teachers' ICT use and their pedagogical beliefs will be explored.

8.2.1 The relationship between teachers' background characteristics and ICT use

Teachers' use of ICT will be explored using the ICT use subscales (Section 7.5.1.1) factor scores and the factor scores of teachers' overall use of the ICT resources included in scale B.5. It should be noted that presentation software, CD-R (information sources or educational games), data projector, educational software, digital camera, and scanner, are the ICT resource included in the 'infrequently used ICT resources' factor. The 'frequently used ICT resources' factor includes ICT resources, like, printer, E-mail, the Internet, and word processing. Finally, video conferencing, databases, spreadsheets, and graphic/design software are the ICT resources are included in the 'underused ICT resources' factor.

In this context, a set of Independent sample t-tests were carried out to examine if there were statistically significant differences in teachers' ICT use in relation to their gender and their occupational status (temporary or permanent school teacher). The tests showed that no statistically significant differences existed between temporary and permanent teachers in relation to the frequency of ICT use. However, Table 8.1 shows that significant differences existed between male and female teachers in relation to the overall use of the ICT resources included in scale B.5, and also in relation to the use of the ICT resources included in the 'underused ICT resources' factor. It is shown that male teachers were generally using and integrating ICT resources more in their teaching than their female colleagues. Moreover, it is shown that male teachers were also using the ICT resources included in the 'underused ICT resources' factor more frequently than the female teachers. No statistically significant difference was found between male and female teachers with respect to the use of the ICT resource included in the 'infrequently used ICT resources' factor and the ICT resources included in 'frequently used ICT resources' factor. In addition, one way analysis of variance (ANOVA) was carried out to determine if teachers' use of ICT is associated with other background characteristics like their age, their teaching experience, and grade responsibility. However, no statistically significant differences were found between the teachers of different age groups, between teachers with different teaching experience, or between teachers responsible for different grades. Therefore, it can be concluded that the only demographic characteristic that seems to be affecting teachers' ICT use is gender.

ICT use	**Background characteristic**		**N**	**Mean**	**St. dev.**	**t value**	**sig.**
Overall	Gender	Male	61	49.5738	15.3704	3.399	***0.001**
		Female	320	42.6094	14.5303		
Infrequently used ICT resources	Gender	Male	61	0.2260	1.0495	1.945	0.052
		Female	320	-0.0449	0.9865		
Frequently used ICT resources	Gender	Male	61	0.1989	0.9807	1.661	0.066
		Female	320	-0.0337	1.0058		
Underused ICT resources	Gender	Male	61	0.2715	1.2120	2.613	***0.009**
		Female	320	-0.0815	0.9135		

Table 8.1: T-test for teachers' ICT use (gender)

8.2.2 The relationship between teachers' personal beliefs and attitudes and ICT use

8.2.2.1 The relationship between teachers' pedagogical beliefs and ICT use

The relationship between teachers' pedagogical beliefs and ICT use was examined using Pearson product-moment correlation coefficient. Table 8.2 shows positive correlations between teachers' overall ICT use, use of the ICT resources included in the 'infrequently used ICT resources' factor, the ICT resources included in the 'frequently used ICT resources' factor, in relation to the teacher as 'facilitator' factor. It is therefore indicated that the teachers who tended to agree with the statements included in the 'facilitator' factor were using ICT resources more frequently. Furthermore, a negative correlation was found between teachers' use of the ICT resources included in the 'frequently used ICT resources' factor and the teacher as 'expert' factor. It is indicated that the teachers' who, during their teaching, assume the role of an expert, are not using the resources included in this factor. Also, negative correlations were found between teachers' overall ICT use, the use of the resources included in the 'frequently used ICT resources' factor, and the use of the resources included in the 'underused ICT resources' factor, in relation to the teacher as 'formal authority' factor. A positive correlation was found between teachers' use of the ICT resources included in the 'frequently used ICT resources' factor and the teacher as 'personal model factor. At the same time, a negative correlation between teachers' use of the ICT resources included in the 'underused ICT resources' factor and the teacher as 'personal model' factor. Finally, positive correlations were found between teachers' overall ICT use, the use of the ICT resources included in the 'infrequently used ICT resources' factor, and the resources included in the 'underused ICT resources' factor, in relation to the teacher as 'delegator' factor.

The results presented in Table 8.2 are in line and consistent with the results of other researches discussed in Chapter 4. For instance, Totter et al (2006) study in Austria and Switzerland showed a significant correlation (r= 0.522) between teachers' use of new media and constructivist teaching style. In this way, the researchers argue that the teachers who adopt pupil-oriented, constructivist teaching style are more likely to make use of new technology in classrooms.

Furthermore, Becker (2000) discussing the results found by the TLC survey in the US, argues that the computer-using teachers are not very comfortable with a transmission-oriented pedagogy. He notes that these teachers endorse an alternative philosophy of teaching, which is more compatible with constructivist theory of learning rather than transmission-oriented pedagogy. More specifically, he notes that the TLC survey revealed clear relationships between teaching philosophy and whether a teachers used computers with students, the particular objectives for computer use the teacher had, and the types of software used frequently with students. In this context, he concludes that computer-using teachers were appeared to be distinctly more constructivist than non-using teachers. In a different report about TLC survey, Ravitz et al (2000) argue that constructivist-oriented teachers use computers professionally in more varied ways, have greater technical expertise in the use of computers, use computer more frequently with students, and use them in apparently more powerful ways.

In addition, a study conducted by Becker and Ravitz (1999) in 151 US schools, showed that when favourable circumstances are in place, teachers' sustained use of computers and exploration of Internet resources is related to their increased use of constructivist teaching practices and may even change teachers' pedagogical beliefs that underlie such practices. Also, the researchers, who surveyed 441 teachers, found that those teachers who were using computer technology regularly with students, over many years, and with student productivity goals (rather than knowledge-absorption or skills-mastery goals) in mind, are the same teachers who reported having made important changes in their teaching.

Furthermore, the results of a longitudinal, three-years study in Israel, carried out by Levin and Wadmany (2007), showed that teachers' pedagogical beliefs can be significantly altered after multi-year experiences in technology-based classrooms. The findings showed that whereas at the beginning of study most teachers expressed behaviourist and transmissionist views on learning and teaching, after the study teachers expressed more varied views. The researchers argue that after three years of experience in a technology-rich classroom, teachers exhibited considerably fewer positivist beliefs and they focused more on student understanding than covering content. Similarly, Dexter et al (2000) study showed that the teachers who had adopted more progressive teaching practices over time felt that computers helped them change. However, they did not acknowledge computers as the catalyst for their change, since these changes were credited to reflection upon experience, as well as classes taken, and the context or culture of the school.

Pedagogical belief		**ICT use**			
		Overall	Infrequently used ICT resources	Frequently used ICT resources	Underused ICT resources
Teacher as 'facilitator'	r	0.254	0.246	0.178	-0.040
	sig.	***0.000**	***0.000**	***0.001**	0.464
Teacher as 'expert'	r	-0.098	-0.081	-0.143	0.103
	sig.	0.070	0.135	***0.008**	0.058
Teacher as 'formal authority'	r	-0.170	-0.053	-0.116	-0.155
	sig.	***0.002**	0.325	***0.032**	**0.004**
Teacher as 'personal model'	r	-0.047	-0.093	0.111	-0.128
	sig.	0.386	0.085	***0.039**	***0.018**
Teacher as 'delegator'	r	0.264	0.233	0.074	0.156
	sig.	***0.000**	***0.000**	0.175	***0.004**

Table 8.2: Pearson-moment correlations between pedagogical beliefs and ICT use

8.2.2.2 The relationship between teachers’ attitudes toward ICT and ICT use

Pearson product-moment correlation coefficient was used to determine the relationship between teachers’ use of ICT and their attitudes toward ICT. Negative correlations were found (Table 8.3) between teachers’ use of the ICT resources included in scale B.5, as well as, the resources included in the factor ‘infrequently used ICT resources’, with respect to low ICT confidence and negative attitudes toward ICT. Similarly, negative correlations were found between teachers’ use of the ICT resources included in the ‘infrequently used ICT resources’ in relation to low ICT confidence and negative ICT attitudes, while, a negative relationship was found between teachers’ use of the resources included in the ‘frequently used ICT resources’ factor and teachers negative ICT attitudes. At the same time, negative relationships were found between ICT use, and the use of the resources included in the ‘infrequently used ICT resources’ factor and in the ‘frequently used ICT resources’ factor, in relation to positive ICT attitudes. These results suggest that the teachers, who hold positive attitudes toward ICT and feel confident in its use, tend to use

ICT more and integrate ICT more frequently in the context of their work in the classroom. Similarly, the study conducted by Totter et al (2006) revealed a significant negative correlation (r = -0.513) between teachers' use of new media and the lack of ICT confidence.

ICT use		**Teachers' ICT attitudes**		
		Low ICT confidence	Negative attitudes	Positive attitudes
Overall	r	-0.118	-0.214	0.365
	sig.	***0.030**	***0.000**	***0.000**
Infrequently used ICT resources	r	-0.193	-0.259	0.316
	sig.	***0.000**	***0.000**	***0.000**
Frequently used ICT resources	r	-0.106	-0.166	0.226
	sig.	0.051	***0.002**	***0.000**
Underused ICT resources	r	-0.185	-0.146	0.028
	sig.	***0.001**	***0.007**	0.611

Table 8.3: Pearson-moment correlations between ICT attitudes and use of ICT

<u>8.2.2.3 The relationship between teachers' perceived ICT competence and ICT use</u>

Pearson product-moment correlation coefficient was used to determine the relationship between teachers' perceived ICT competence (personal and professional) and their use of ICT. Table 8.4 shows positive correlations between teachers' perceived personal and professional ICT competence and the use of the ICT resources included in scale B.5, as well as the use of the ICT resources included in the 'infrequently used ICT resources' factor and the ICT resources included in the 'frequently used ICT resources' factor. In this way, it can be concluded that teachers with high levels of perceived personal and professional ICT competence tend to use ICT more, and specifically those ICT resources included in these factors. This result is consistent with the results found by the study carried out by Totter et al (2006) in Austria and Switzerland. The researchers found a significant negative correlation (r = -0.588) between teachers' use of new media and the lack of ICT competence.

ICT use		Perceived ICT competence	
		Personal	Professional
Overall	r	0.396	0.468
	sig.	***0.000**	***0.000**
Infrequently used ICT resources	r	0.387	0.443
	sig.	***0.000**	***0.000**
Frequently used ICT resources	r	0.226	0.242
	sig.	***0.000**	***0.000**
Underused ICT resources	r	0.004	0.065
	sig.	0.932	0.200

Table 8.4: Pearson-moment correlations between perceived ICT competence and use of ICT

8.2.2.4 The relationship between teachers' views on ICT use enablers and barriers and ICT use

The relationship between teachers' use of ICT and their views regarding the factors that facilitate (enablers) or hinder (barriers) their use of ICT was also explored through Pearson product-moment correlation coefficient. Table 8.5 shows that teachers' overall ICT use, their use of the ICT resources included in the 'infrequently used ICT resources' factor and their use of the ICT resources included in the 'underused ICT resources' factor are positively related to the 'enablers' factor. At the same time, teachers' overall ICT use, their use of the ICT resources included in the 'infrequently used ICT resources' factor, their use of the ICT resources included in the 'frequently used ICT resources' factor, and their use of the ICT resources included in the 'underused ICT resources' factor, are negatively related to the 'barriers' factor. These results suggest that the teachers who are using ICT more tend to disregard the existence of unrivalled to ICT use barriers and also tend to believe that the enabling conditions needed for successful integration of ICT in schools are in place.

ICT use		Enablers	Barriers
Overall	r	0.143	-0.191
	sig.	***0.007**	***0.000**
Infrequently used ICT resources	r	0.109	-0.153
	sig.	***0.041**	***0.004**
Frequently used ICT resources	r	0.041	-0.216
	sig.	0.445	***0.000**
Underused ICT resources	r	0.109	0.106
	sig.	***0.042**	***0.047**

Table 8.5: Pearson-moment correlations between enablers and barriers and use of ICT

In order to examine how teachers' attitudes toward ICT are related to their views regarding the factors that facilitate (enablers) or hinder (barriers) their use of ICT Pearson product-moment correlation coefficient was used. Positive correlations were found between teachers' low ICT confidence and negative ICT attitudes in relation to their views regarding ICT use barriers. These results indicate that the teachers who hold negative attitudes toward ICT and are not feeling confident enough in the use of ICT tend to agree more that their use of ICT is hindered by the existence of several barriers. The results presented in Tables 8.5, 8.6 and 8.3 indicate the relationship between ICT use, teachers' attitudes toward ICT and their views regarding ICT use barriers. As discussed in Chapter 4, in many cases teachers use the existence of barriers as a handy excuse for not using ICT, while the real reasons lay with the their negative attitudinal stances toward ICT (Ertmer 1999; Stallard and Cocker 2001). Nevertheless, and since the direction of causality cannot be determined when using correlation coefficients (Field 2005), it can contrarily be argued that the existence of so many ICT usage barriers is the reason why teachers' confidence in using ICT is lowered and why teachers hold negative attitudes toward ICT.

Teachers' ICT attitudes		**Enablers**	**Barriers**
Low ICT confidence	r	0.076	0.216
	sig.	0.166	***0.000**
Negative attitudes	r	-0.063	0.373
	sig.	0.251	***0.000**
Positive attitudes	r	0.058	-0.037
	sig.	0.285	0.503

Table 8.6: Pearson-moment correlations between enablers and barriers and teachers' ICT attitudes

8.2.3 The relationship between teachers' participation in ICT training and ICT use

In this section, it is explored whether teachers' participation in the officially provided ICT training and professional development opportunities in ICT, has affected and impacted their ICT use. The intention in this section is not to evaluate the effectiveness of teachers' officially provided ICT training. Rather, the investigation of the impact of teachers' participation in ICT training could result in better understanding of the current situation regarding ICT training which could ultimately lead to useful insights of how to improve the offered to teachers ICT training.

Based on the data collected from questions F.1 and F.2 in the questionnaire (Section 7.6.1), a set of independent sample t-tests was carried out to determine if there were any differences between the teachers who had received ICT training (seminars and coordinator) and those who had not, in relation to their use of ICT. Table 8.7 shows that the only significant difference found between the teachers who had participated in training and those who had not, is related to the infrequently used ICT resources. It is indicated that the teachers who received ICT training were using more often the ICT resources included in the 'Infrequently used ICT resources' factor that their 'untrained' colleagues.

Test variables	**Participation in ICT training**	**N**	**Mean**	**St. dev.**	**t value**	**sig.**
Infrequently used ICT resources	Yes	325	0.0560	1.0050	2.750	***0.015**
	No	58	-0.3327	0.9105		

Table 8.7: T-test for participation in ICT training

Furthermore, independent sample t-tests were carried out to determine if there were any differences between the teachers who had attended the ICT seminars provided by the Pedagogical Institute and those who had not, in relation to teachers' use of ICT. The tests showed no statistically significant differences between teachers in the two groups.

Also, a series of independent sample t-tests was carried out to determine if there were significant differences in ICT use between teachers who had received training by an ICT coordinator and teachers who had not. Statistically significant differences were found in the case of overall ICT use and the use of the ICT resources included in the 'infrequently used ICT resources' factor. Table 8.8 shows that the teachers who had received ICT training by the ICT coordinators were generally using ICT more than their colleagues who did not. It is also shown that these teachers were using more the ICT resources included in the 'infrequently used ICT resources' factor.

Test variables	Training provided by ICT coordinator	N	Mean	St. dev.	t value	sig.
ICT use (overall)	Yes	285	44.9053	14.7023	2.431	***0.016**
	No	98	40.6633	15.4666		
Infrequently used ICT resources	Yes	285	0.0944	0.9530	3.288	***0.001**
	No	98	-0.2857	1.0816		

Table 8.8: T-test for training provided by ICT coordinator

Furthermore, teachers were organised into four groups according to the type of ICT training they received: the teachers who had only attended the ICT training seminars, the teachers who had only received ICT training by the ICT coordinators, the teachers who attended the ICT seminars and also received ICT training by the ICT coordinators, and finally, the teachers who had not received any type of training. One-way analysis of variance (ANOVA) was carried out to explore if there were any statistically significant differences between the four groups of teachers, in relation to their ICT use. Table 8.9 shows that the only difference found regarded the ICT resources included in the 'infrequently used ICT resources' factor.

Test variable	Type of training	df	Mean Square	F	Sig.
Infrequently used ICT resources	Between Groups	3	3.8041	3.8913	***0.009**
	Within Groups	379	0.9776		

Table 8.9: ANOVA test for types of training

Table 8.10 shows that the teachers who attended the ICT seminars and also received ICT training by the ICT coordinators, were using more frequently the ICT resources included in the 'infrequently used ICT resources' factor than their colleagues who had not received any type of ICT training.

Test variable	Type of training	Mean	Sig.			
			Seminars	Coordinator	Seminars& coordinator	No training
Infrequently used ICT resources	Seminars	-0.1885		0.696	0.226	0.896
	Coordinator	0.0099	0.696		0.650	0.134
	Seminars & coordinator	0.1477	0.226	0.650		***0.009**
	No training	-0.3326	0.896	0.134	***0.009**	

Table 8.10: Significant differences in mean scores for types of training

8.3 Factors that predict teachers' use of ICT

In the first part of the data analysis (Chapter 7), as well as in this chapter, the factors which could affect and influence teachers' use of ICT and their efforts to successfully integrate ICT resources in their teaching, were presented and discussed. These factors could be their demographic and personal characteristics, their attitudes toward ICT, their views regarding the factors that facilitate (enablers) or hinder (barriers) ICT use, their participation in ICT training, their ICT training needs, and finally their pedagogical beliefs and philosophies. The inclusion of these factors was based on thorough review of the respective literature and on considerations of previous research on the field, as presented in the theoretical part of the study.

In this context, multiple linear regression analysis was used to determine which of those factors can best predict teachers' use of ICT. In order to succeed a more detailed examination of teachers' use of ICT, the factor scores of teachers' overall use of the ICT resources included in scale B.5, as well as the factor scores of teachers' use of ICT resources included in the ICT use subscales (Section 7.5.1.1), were used in successive multiple regression analyses. Moreover, further examination of the factors that best predict teachers' use of ICT was attained through structural equation modelling (SEM), which facilitated the graphical depiction of the equations derived by the multiple regression analysis and allowed the assessment of the correlations between the predicator variables.

As discussed in Chapter 6, multiple linear regression analysis (multiple regression) is not just a single technique, but a family of techniques, that can be used to explore the relationship between a dependent variable and a number of independent variables (or predictors). It is based on correlation, but it allows a more sophisticated exploration of the interrelationship among these variables (Pallant 2005). It allows the analysis of the separate and joint influences of the independent variables on the dependent variable (Colman and Pulford 2006). It is noted that multiple regression is a popular technique which can be used in many situations, but especially in the case of real-world or very complicated problems (Tabachnick and Fidell 2007). In general, the aim of multiple regression is the estimation of a model in which an outcome is predicted from several predictor variables (Field 2005), and it is expressed through the equation: $Y=B_0+B_1X_1+B_2X_{2+}B_3X_{3+}\ldots+B_nX_n$. Y is the outcome variable (the predicted value on the dependent variable), B_0 or regression constant, is the intercept (the value of Y when all of the X values are 0), each X represents a different independent variable (predictor), and each B, is a regression coefficient assigned to each independent variable during regression (the change in the dependent variable that would be produced by a positive increase of one standard deviation in the independent variable). Furthermore, the proportion of variation in the dependent variable that is predictable from the best linear combination of the independent variables is expressed by R^2. Also, the unique contribution of each predictor variable to the total variance of the dependent variable is expressed by sr^2 (squared semipartial correlation), although the type of the multiple regression used affects they way is interpreted (Kinnear and Gray 2004; Field 2005; Colman and Pulford 2006; Tabachnick and Fidell 2007).

Multiple regression consists of three major types: standard (forced entry), sequential (hierarchical), and statistical (stepwise). The differences among them involve what happens to overlapping variability due to correlated independent variables and who determines the order of entry of independent variables into the equation (Tabachnick and Fidell 2007). In the case of standard multiple regression, all predictors are forced into the model simultaneously and the researchers makes no decision about the order in which variables are entered. In the case of hierarchical regression, the researcher decides in which order to enter predictors into the model, which are usually known predictors from other research, and are entered in the order of their importance in predicting the outcome. Also, new predictors can be entered at once or hierarchically according to their suspected importance. Finally, in the case of statistical regression, which is distinguished in other subtypes (forward selection, backward deletion, and stepwise regression), the predictors are entered into the model based on purely statistical and mathematical criteria (Field 2005).

For this study's purposes statistical regression, and more specifically stepwise statistical regression, was employed to determine which variables can best predict teachers' use of ICT. The decision for employing this type of regression was made after considering the reasons for using each of the three major types, as well as their diverse limitations. It is noted that when using standard regression it is possible for a variable (or variables) to appear unimportant in the model when it is actually highly correlated with the dependent variable. If the area of that correlation is 'covered' by other independent variables, the unique contribution of the independent variable is often small, and despite its substantial correlation with the dependent variable, is considered unimportant. Moreover, when hierarchical regression is used, the entrance of independent variables in the equation is determined by the researcher, based on their assumed importance, which in turn, is based on theoretical and logical considerations (Tabachnick and Fidell 2007). In the case of this study, the variables (factors that affect and influence teachers' use of ICT) which were considered as important to be included in the regression analysis, were derived by the review of the respective literature as well as by previous research evidence. However, the importance of each variable in relation to teachers' use of ICT is not always clear and in many cases the results of different researches are inconsistent. A final, but very significant reason why stepwise regression was employed in this study is related to the specific research question that the analysis intended to answer. It is argued that stepwise regression analysis is used for exploratory model building (Field 2005), and typically for the development of a subset of independent variables that is useful in predicting the dependent variable, and eliminating those independent variables that do not provided additional prediction compared to the independent variables already in the equation (Tabachnick and Fidell 2007). In the context of these arguments and since the objective is to identify the variables (factors) that best predict teachers' use of ICT, the use of stepwise regression analysis was considered to be the most appropriate.

As noted before, when using stepwise regression, the predictors are entered into the model based on statistical criteria. More analytically, with this method the equation (model) starts out including only the constant (β_0) and independent variables are entered one at a time starting with the predictor that best predict the dependent variable. At the same time, a removal test is made of the least useful predictor. In this way, the regression equation is constantly being reassessed to see if unimportant predictors can be removed (Field 2005). The fact that the predictors in stepwise regression are assessed and entered the model based on statistical criteria can make the specific procedure misleading. In this way, it is suggested that the analysis must be based on a large and highly representative sample of the population of interest (Pallant 2005; Tabachnick and Fidell 2007). In the case of this study, and as discussed in Chapter 6, several actions were taken to ensure that the sample was representative of the population from which it was drawn and that the collected data were valid and reliable, while the sample size was adequate.

In addition, prior to performing the analysis, the data were checked for outliers (cases that differ substantially from the main trend of the data), since their existence can affect multiple regression and cause the estimated model to be biased because they affect the values of the estimated regression coefficients (Field 2005; Pallant 2005). The existence of outliers was examined using Mahalanobis distance which measures the distance of cases from the means of the predictor variables, and also by examining the residual scatterplots (Field 2005). The examination of the residual scatterplots also allowed the assessment of other multiple regression assumptions like normality, linearity, and homoscedasticity.

Structural equation modelling (SEM) was used as a complimentary method to verify and confirm the results produced by regression analysis. SEM is a set of statistical techniques that is capable of a wide variety of output including for assessing regression models (Garson 2009). It is noted that SEM grows out of and serve purposes similar to multiple regression, but in a more powerful way since it allows the graphical modelling of the interactions and correlations between the variables included in the model. Also, sometimes SEM is preferred over conventional multiple regression because of some advantages including its more flexible assumptions and its better model visualisation through its graphical modelling interface (Garson 1998). These were the most significant reasons why it was decided to use this method to examine and confirm the results produced by multiple regression.

In addition, in the context of SEM, missing data or incomplete responses by the research participants are treated differently. The standard way of dealing with missing values in other conventional ways of analysis, like multiple regression, is listwise or pairwise deletion. Listwise deletion means that a case with missing values, namely a research participant who did not respond to one or more questionnaire items, is ignored in all calculations. In the case of pairwise deletion a case is ignored in a calculation when the missing value or response is related to the specific calculation. For instance, when calculating a mean value, the analysis ignores the cases where values are missing. Nevertheless, listwise deletion can result in data loss while pairwise deletion can result in substantial biases (Garson 1998; University of Texas 2002; Arbuckle 2007). Contrarily, the standard way of dealing with missing data in the context of SEM is maximum likelihood imputation. This means that the missing values in the dataset are replaced with maximum likelihood estimates without discarding any cases. Maximum likelihood estimates are those parameter estimates that maximise the probability of finding the sample data that actually have been found (Tabachnick and Fidell 2007). Therefore, the way in which missing data are dealt when using SEM is considered to have the least bias (Garson 1998).

As noted, SEM allows the graphical modelling of the variables under study. Structural equation models are graphically represented by path diagrams which allow the researcher to depict the hypothesised sets of relationships. A path diagram includes rectangles and circles (or ellipses) connected by lines. The rectangles represent variables that are observed (measured) while circles represent variables that are latent (unmeasured). Lines with single-headed arrows represent hypothesised direct relationships between two variables, while lines with two-headed arrows represent covariance or correlations with no implied direction of effect (causal direction) (Hox and Bechger 1998; Tabachnick and Fidell 2007).

8.3.1 Factors that predict teachers' overall use of ICT

In this context, stepwise multiple regression was performed between teachers' overall ICT use and their demographic/personal characteristics, their attitudes toward ICT, their views regarding the factors that facilitate (enablers) or hinder (barriers) ICT use, their participation in ICT training, their ICT training needs, and their pedagogical beliefs and philosophies. Table 8.11 displays the unstandardised regression coefficients (B), the standardised regression coefficients (β), the semipartial correlations (sr^2), the t-value, the significance, and tolerance, of the predictor variables as they were ensued by the multiple regression analysis. Also, the value of multiple R (the correlation between the observed values of Y and the values of Y predicted by the multiple regression model) and R^2 for the model is provided, as well as the value of F-ratio. It is shown that R for regression was significantly different from zero, since $F(8, 265)$ was 43.73 which is significant at $p<0{,}001$, indicating that the model results in a significantly good degree of prediction of teachers' overall ICT use. More specifically, the independent variables included in the model predicted 56.9% (R^2=0.569) of the variability in teachers' overall ICT use.

Moreover, Table 8.11 shows the t-values which are measures of whether each predictor variable is making significant contribution to the model. More specifically, the t-statistic tests whether the individual regression coefficient (B) value for each predictor variable is significantly different from zero, and therefore, if the predictor variable contributes significantly to the estimation of the dependent variable. It is noted that if the observed significance is less than 0.05 ($p<0.05$) then the B is significantly different from zero and in this way the predictor makes a significant contribution to predicting the outcome (Field 2005). At the same time, the table presents the unique contribution of each predictor variable to the total variance of the dependent variable (sr^2). As already noted, the interpretation of sr^2 differs in accordance to the type of multiple regression employed. In the case of stepwise multiple regression (and also of sequential multiple regression), sr^2 is interpreted as the amount of variance added to R^2 by each independent variable at the point that it enters the model, which means that its appeared importance is affected by its entry point in the equation (Tabachnick and Fidell 2007). Finally, the table presents the tolerance statistic, which is a way of examining if the assumption of multicollinearity in multiple regression is met. Multicullinearity exists when there is a strong correlation between two or more predictors in a regression model. It is noted that tolerance below 0.1 indicates a serious problem, while tolerance below 0.2 indicates a potential problem (Field 2005). As Table 8.11 shows, the tolerance of the predictor variables included in the model is quite high (0.828 to 0.959) indicating that the multicollinearity assumption is met.

In this context, the results of the multiple regression analysis (Table 8.11) showed that the best predictor of teachers' overall ICT use is the use of audiovisual aids (β=0.402), which explained 28.7% (sr^2=0.287) of the variability in teachers' overall ICT use. This result suggests that the teachers who have the tendency to use audiovisual aids and other teaching and learning tools in their teaching are also the teachers who would more likely integrate ICT resources in the effort to enhance their teaching with teaching and learning tools. In this way, it is indicated that teachers' overall ICT use is related to a more general attitude toward audiovisual aids: the teachers who consider the use of audiovisual tools in the classroom as facilitating the teaching and learning processes are more likely to employ technological tools and ICT resources to underpin their work. Additionally, Table 8.11 shows that teachers' perceived ICT use competence in teaching (β=0.330) is the second most important predictor for overall ICT use. It is indicated that the teachers who perceive that their ICT competence in teaching is high tend to use ICT resources more. It must be noted that the two variables (audiovisual aids use and perceived ICT competence in teaching) are appeared to be the strongest and most important predictors for teachers' overall ICT use, which in combination, contribute in 46.9% of the variability in teachers' overall ICT use.

Furthermore, teachers' positive attitude toward ICT (β=0.185) appears to be a predictor of teachers' overall ICT use. It is shown that the teachers who hold a positive attitude toward ICT tend to use ICT more. At the same time, it is shown that the teachers who, during their teaching, do not assume the role of 'formal authority' tend to use ICT more. Moreover, it appears that the teachers' beliefs about the factors that hinder ICT integration (barriers) is also a statistically significant ICT use predictor. The teachers who believe that their efforts to integrate ICT resources in their teaching are hindered by the existence of various barriers tend to use ICT less. Teachers' gender was found to be another predictor for their ICT use. It is indicated that male teachers tend to use ICT more than their female colleagues. In addition, the multiple regression analysis results showed that teachers' ICT training needs are also predictors for their overall ICT use. It is shown that the teachers who feel that they need more training for theoretical issues tend to use ICT more. Finally, Table 8.11 shows that the teachers who use ICT more tend to hold negative attitudes toward ICT training. This is probably due to the fact that the technology using teachers are feeling that the provided ICT training opportunities are inadequate and not compatible with the actual ICT training needs.

In this context, the final model of predicting teachers' overall ICT use, as it has been derived by the multiple regression analysis, is the following: Teachers' overall ICT use = 36.285 + (6.399 Audiovisual aids use) + (4.316 Perceived ICT competence in teaching) + (2.765 Positive ICT attitudes) – (1.705 Teacher as 'formal authority') – (1.979 ICT use barriers) – (5.254 Gender) + (2.051 Training needs for theoretical issues) – (1.655 Positive ICT training attitudes).

A number of these factors also appear in other studies as significant predictors to teachers' use of ICT. For instance, a study that has explored the use of ICT in teaching by basic education teachers in Oman (Al-Majeeni 2004) showed that one of the strongest predictor to ICT use by teachers is the use of traditional media. She noted that teachers' familiarity with these media made them less anxious toward modern technology. Also, the same study, that included data collected from 743 Omani teachers, showed that teachers' attitudes toward ICT as well as their gender were statistically significant predictors toward ICT use. It was found that less anxious teachers who hold positive attitudes toward ICT use ICT more. Also, it was found that male teachers were more likely to use ICT than female teachers. Moreover, the results of the TLC national survey (Becker and Ravitz 2001) in the US schools showed that among other factors teachers' pedagogical beliefs are determining factor that predict their ICT use. Specifically, the study showed that when teachers believe more strongly in a constructivist pedagogy that attends to making learning activities meaningful to student (rather than just transmitting content), are much more likely to use ICT and have their students exploit computer resources during teaching. Additionally, the TLC survey's findings showed that teachers' perceived ICT competence (self-reported expertise in using computers), is also a factor that affects teachers' ICT use. Additionally, the study conducted by Eteokleous (2008) and concerned the implementation of 'Evagoras' plan (Section 2.5.1) in Cyprus primary schools showed that teachers' attitudes toward computer use in education appeared to be significant predictor that affects computer use in schools.

Predictors	**B**	**β**	**sr^2**	**t-value**	**Sig**	**Tolerance**
(Constant)	36.285			9.338	0.000	
Audiovisual aids use	6.399	0.402	0.287	9.444	0.000	0.897
Perceived ICT competence in teaching	4.316	0.330	0.182	7.435	0.000	0.828
Positive attitudes toward ICT	2.765	0.185	0.023	4.183	0.000	0.833
Teacher as 'formal authority'	-1.705	-0.114	0.023	-2.760	0.006	0.959
ICT use barriers	-1.979	-0.130	0.018	-3.117	0.002	0.936
Gender	-5.254	-0.139	0.016	-3.354	0.001	0.951
Training needs for theoretical issues	2.051	0.134	0.011	3.124	0.002	0.880
Positive attitudes toward ICT training	-1.655	-0.103	0.009	-2.349	0.020	0.841
$F(8, 265) = 43.726$ $p=0.000$ $R = 0.754$ $R^2 = 0.569$						

Table 8.11: Regression analysis for teachers' ICT use (overall)

8.3.1.1 Factors that predict teachers' overall use of ICT (SEM)

The final model for predicting teachers' overall ICT as resulted by regression analysis was then examined and graphically depicted through structural equation modelling. The model was firstly specified by determining its parameters and is presented in Figure 8.1. The figure presents a path diagram of the hypothesised model to predict teachers' overall ICT use from the variables 'audiovisual aids use', 'perceived ICT competence in teaching', 'positive attitudes toward ICT', 'teacher as formal authority', 'ICT use barriers', 'gender', 'training needs for theoretical issues' and 'positive attitudes toward ICT training'. The hypothesised model is consisted of rectangles which represent the variables included in the model.

The figure makes clear that the independent variables are correlated in varying degrees which is a general assumption of multiple regression analysis. This is evident by the two-headed arrows between the predictor variables. It should be noted that strong positive relationships are highlighted with green colour while strong negative relationships are marked with red colour. Also, Figure 8.1 includes a latent variable, namely a variable which is not measured and directly observed. This variable is represented as a circle and is labelled ‘e’. This is the error variable and represents residual variance within the dependent variable not accounted for by the pathways included in the model. This variable, therefore, represents anything else on which teachers’ overall ICT use is depended on but was not measured in the study. The error variable is not connected with any other predictor variable with a double-headed arrow indicating that there is no correlation between them, which is also an assumption of multiple regression (Stoelting 2002; Arbuckle 2007; Tabachnick and Fidell 2007). As seen in Figure 8.1, independent variables in regression analysis are assumed to be measured without error and therefore no latent, error variables are connected to them (Garson 1998). At the same time, Figure 8.1 includes single-headed arrows (paths) which connect the independent variables with the dependent variable. The direction of the arrows, from the independent variables to the dependent variable, denotes that these variables are assumed to be causing or affecting or predicting the dependent variable. These arrows represent regression coefficients (B) to be estimated (Hox and Bechger 1998).

The estimation of the model’s parameters followed the model specification. Figure 8.1 shows the correlations between independent variables as well as the regression coefficients of the predictor variables in standardised form (β). Also, Table 8.12 displays the unstandardised regression coefficients (B) and the significance of the predictor variables.

Figure 8.1 shows that a positive correlation exists between teachers’ positive attitudes toward ICT training and teachers’ training needs for theoretical issues. It is indicated therefore that the teachers who hold positive attitudes toward ICT training tend to consider their needs for training in ICT in theoretical issues as more considerable. Another positive correlation exists between teachers positive attitudes toward ICT and their perceived ICT competence in teaching. This indicates that the teachers who perceive themselves as quite competent in the use of ICT in the context of their work tend to hold positive attitudes toward ICT. Additionally, correlation exists between teachers' use of audiovisual aids and positive attitudes toward ICT. This means that the teachers who tend to use audiovisual aids more are also holding more positive attitudes toward ICT.

The estimated structural model confirms the results of multiple regression analysis as reported in Section 8.3.1. Figure 8.1 as well as Table 8.12 shows that the teachers who tend to use audiovisual aids in their teaching (β=0.407), who perceive themselves as competent in ICT use during teaching (β=0.280), who hold positive attitudes toward ICT (β=0.178) and usually do not assume the role of 'formal authority' in the classroom (β=-0.091), and who do not consider that their efforts to integrate ICT are hindered by ICT use barriers (β=-0.096), tend to use ICT resources more in the context of their work. In addition, these teachers, who are more likely to be males (β=0.130), feel that they need more training in ICT in theoretical issues (β=0.166) and hold negative attitudes toward the available training opportunities in ICT (β=0.-137).

More than half (52.6%, R^2=0.526) of the variance in teachers' overall ICT use was accounted, explained and predicted by the independent variables included in the model. It should be noted that this result as well as the regression weight of each independent variable presented in Figure 8.1 and Table 8.12 are slightly different from the results produced by regression analysis reported in Table 8.11. This is due to the fact that in the context of SEM the standard way of dealing with missing data is maximum likelihood imputation (Section 8.3) and not listwise deletion of cases which is a common practice when performing multiple regression analysis. Maximum likelihood estimation of missing values permits the inclusion of all cases in the analysis and therefore, the results are slightly different. Nevertheless, both regression analysis and SEM produced the same results with respect to teachers' overall ICT use.

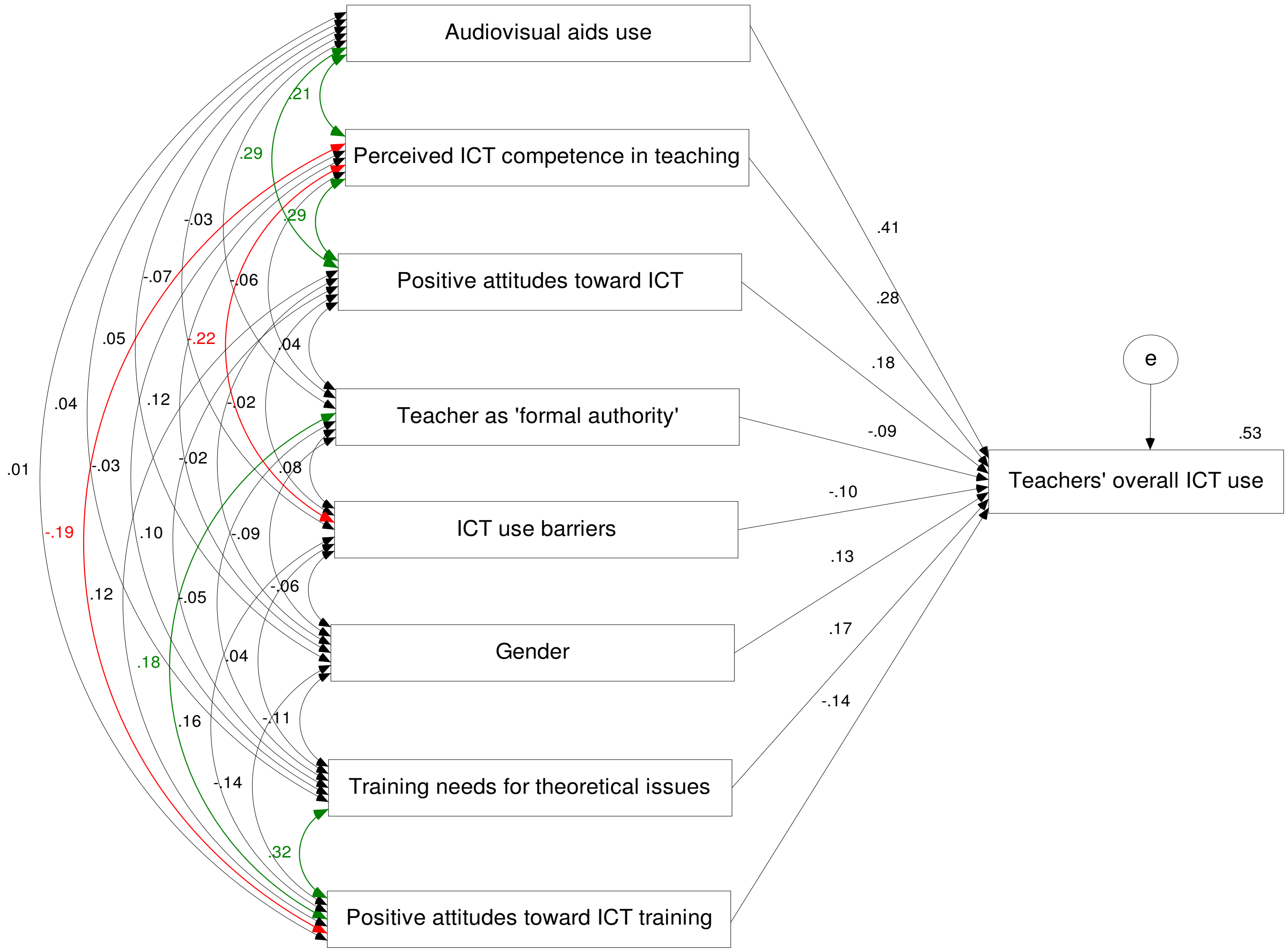

Figure 8.1: Multiple regression model of teachers' overall ICT use (path diagram)

Predictors	**B**	**β**	**Sig**
Intercept	29.428		0.000
Audiovisual aids use	6.105	0.407	0.000
Perceived ICT competence in teaching	3.446	0.280	0.000
Positive attitudes toward ICT	2.666	0.178	0.000
Teacher as 'formal authority'	-1.358	-0.091	0.019
ICT use barriers	-1.438	-0.096	0.012
Gender	5.354	0.130	0.000
Training needs for theoretical issues	2.486	0.166	0.000
Positive attitudes toward ICT training	-2.056	-0.137	0.000
R^2 = 0.526			

Table 8.12: Regression analysis for teachers' overall ICT use (SEM)

8.3.2 Factors that predict teachers' use of the infrequently used ICT resources

What is more, the thorough examination of teachers' ICT use was attempted by investigating the factors that predict teachers' use of the ICT resources included in the 'Infrequently used ICT resources' factors. Stepwise multiple regression analysis was performed between teachers' use of the ICT resources included in the 'infrequently used ICT resources' factor and their demographic/personal characteristics, their attitudes toward ICT, their views regarding the factors that facilitate (enablers) or hinder (barriers) ICT use, their participation in ICT training, their ICT training needs, and their pedagogical beliefs and philosophies.

Table 8.13 presents the results of the multiple regression analysis. It is shown that R for regression was significantly different from zero, since $F(5, 279)$ was 49.49 which is significant at $p<0,001$, indicating that the model results in a significantly good degree of prediction of teachers' use of the ICT resources included in the 'infrequently used ICT resources' factor. The independent variables included in the model contributed significantly to the prediction of teachers' use of the specific resources. Specifically, 47% ($R^2=0.470$) of the variability in teachers' use of these ICT resources was predicted. The last column of Table 8.15 shows that the tolerance of the predictor variables included in the model is quite high (0.796 to 0.903) which means that multicollinearity is not likely and the results are trustworthy.

The multiple regression analysis results (Table 8.13) showed that the strongest predictor of teachers' use of the ICT resources included in the 'infrequently used ICT resources' factor was once more the use of audiovisual aids ($\beta=0.426$), which explained 29.6% ($sr^2=0.296$) of the variability in teachers' use of the specific ICT resources. At the same time, teachers' perceived ICT competence in teaching appeared to be the second strongest predictor of teachers' use of the ICT resources included in this factor, explaining 12.3% ($sr^2=0.123$) of the variability. Altogether, the two variables explained 41.9% of the variability in teachers' use of the resources included in this factor. It is indicated that the teachers who have the tendency to generally include audiovisual aids in their teaching, who perceive that their ICT use competence in teaching is high, tend to use the specific

ICT resources more. Moreover, teachers' attitudes toward ICT (negative and positive) were also found to be predictors of teachers' use of this group of ICT resources. It is shown that the teachers who do not hold negative attitudes toward ICT tend to use these ICT resources more. Finally, Table 8.13 shows that the teachers who assume the role of 'facilitator' in the classroom are the teacher who would more likely use these ICT resources more.

In this context, the model of predicting teachers' use of the ICT resources included in the 'infrequently used ICT resources' factor, is the following: Use of the 'infrequently used ICT resources' = -0.936 + (0.455 audiovisual aids use) + (0.231 ICT competence in teaching) – (0.187 negative ICT attitudes) + (0.112 Positive ICT attitudes) + (0.119 Teacher as 'facilitator').

Predictors	**B**	**β**	**sr^2**	**t-value**	**Sig**	**Tolerance**
(Constant)	-0.936			-5.145	0.000	
Audiovisual aids use	0.455	0.426	0.296	9.165	0.000	0.879
Perceived ICT competence in teaching	0.231	0.255	0.123	5.264	0.000	0.807
Negative attitudes toward ICT	-0.187	-0.181	0.028	-3.953	0.000	0.903
Positive attitudes toward ICT	0.112	0.109	0.014	2.238	0.026	0.796
Teacher as 'facilitator'	0.119	0.104	0.009	2.215	0.028	0.860
$F (5, 279) = 49.489$ $p=0.000$ $R = 0.686$ $R^2 = 0.470$						

Table 8.13: Regression analysis for teachers' use of the 'infrequently used ICT resources'

8.3.2.1 Factors that predict teachers' use of the infrequently used ICT resources (SEM)

The resulting model for predicting teachers' use of the ICT resources included in the 'infrequently used ICT resources' factor was also examined through SEM. Figure 8.2 presents the path diagram of the model to predict teachers' use of the ICT resources included in the factor 'infrequently used ICT resources' from the variables 'audiovisual aids use', 'perceived ICT competence in teaching', 'negative attitudes toward ICT', 'positive attitudes toward ICT', and 'teacher as facilitator'.

Figure 8.2 presents the correlations (double-headed arrows) between the independent variables (predictors). It is shown that positive correlations exist between teacher as a 'facilitator' and positive attitudes toward ICT and perceived ICT competence in teaching. This means that the teachers who assume the role of facilitator during their teachings tend to hold positive attitudes toward ICT and perceive themselves as competent in the use of ICT while teaching. Also positive correlations exist between positive attitudes toward ICT and audiovisual aids and perceived ICT competence in teaching. This finding denotes that the teachers who hold positive attitudes toward ICT tend to use audiovisual aid more and perceive themselves as competent in the use of ICT in their work. Finally, Figure 8.2 shows a negative correlation between perceived ICT competence in teaching and negative attitudes toward ICT. It is indicated that the teachers who believe that they are competent in the use of ICT when teaching tend to have less negative attitudes toward ICT.

The estimated structural model confirms to a large extent the results of multiple regression analysis as presented in Section 8.3.2. However, the path diagram in Figure 8.2 and Table 8.14, which presents the estimation of the regression weights (standardised and unstandardised) of the predictor variables of the model, show that teacher as 'facilitator' ($\beta=0.057$, sig.>0.05) is not a significant predictor for teachers' use of the ICT resources included in the 'infrequently ICT resources' factor. As already noted, the different way in which missing data are treated in the context of SEM (maximum likelihood imputation) can produce differentiated results than the conventional multiple regression analysis. Nevertheless, the illustrated model shows that the teachers who tend to use audiovisual aids in their teaching ($\beta=0.454$), who perceive themselves as ICT competent during teaching ($\beta=0.231$), who hold positive attitudes toward ICT ($\beta=0.092$) and not negative attitudes ($\beta=-0.128$), will probably use more the ICT resources included in the 'infrequently used ICT resources' factor. The model indicates that 45.5% ($R^2=0.455$) of the variance in teachers' use of the specific ICT resources use was accounted, explained and predicted by the independent variables included in the model (excluding teacher as 'facilitator').

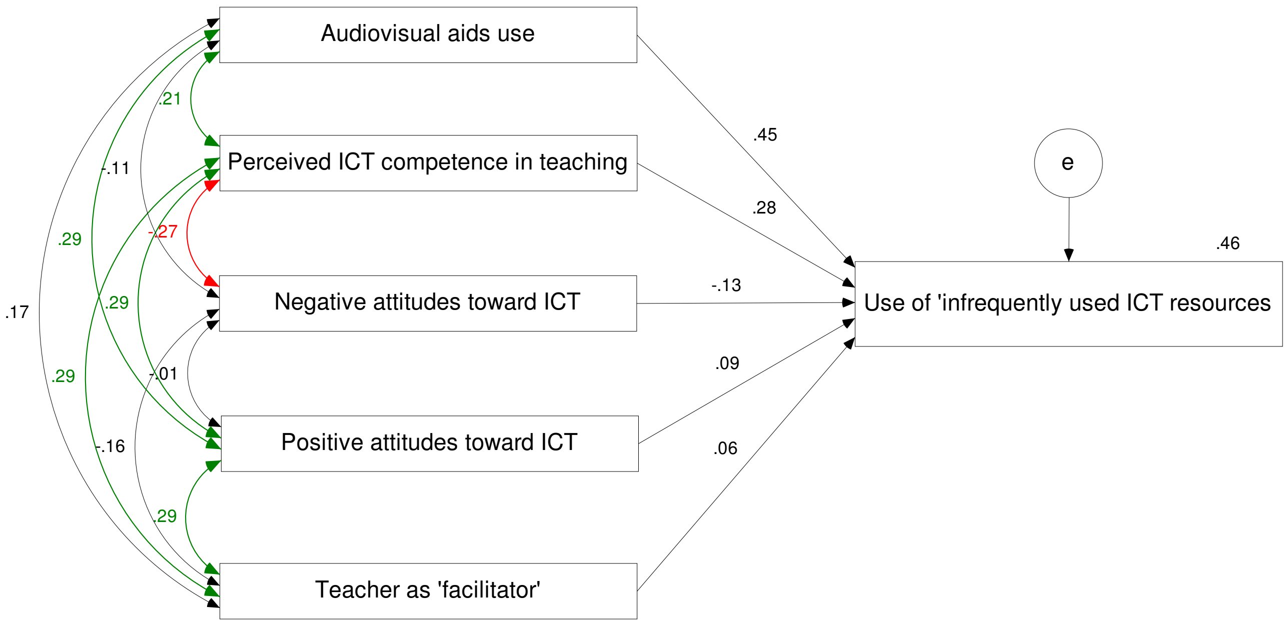

Figure 8.2: Multiple regression model of teachers' use of the infrequently used ICT resources (path diagram)

Predictors	**B**	**β**	**Sig**
Intercept	-0.917		0.000
Audiovisual aids use	0.454	0.450	0.000
Perceived ICT competence in teaching	0.231	0.280	0.000
Negative attitudes toward ICT	-0.128	-0.127	0.003
Positive attitudes toward ICT	0.092	0.092	0.039
Teacher as 'facilitator'	0.058	0.057	0.187
R^2 = 0.455			

Table 8.14: Regression analysis for teachers' use of the infrequently used ICT resources (SEM)

8.3.3 Factors that predict teachers' use of the frequently used ICT resources

In order to further examine teachers use of ICT, stepwise multiple regression analysis was performed between teachers' use of the ICT resources included in the 'frequently used ICT resources' factor and their demographic/personal characteristics, their attitudes toward ICT, their views regarding the factors that facilitate (enablers) or hinder (barriers) ICT use, their participation in ICT training, their ICT training needs, and their pedagogical beliefs and philosophies.

Table 8.15, which presents the results of the multiple regression analysis, shows that R for regression was significantly different from zero [F(5, 279)=11.84 p<0,001] indicating that the model results in a significantly good degree of prediction of teachers' use of the ICT resources included in the ‘frequently used ICT resources’ factor. It is shown that 17.5% (R^2=0.175) of the variability in teachers’ use of these ICT resources was predicted. The tolerance column shows that the tolerance values of the predictor variables included in the model are quite high, ranging from 0.796 to 0.903, which means that multicollinearity is not likely and the results are trustworthy.

The multiple regression analysis results showed that the strongest predictor of teachers’ use of the ICT resources included in the ‘frequently used ICT resources’ factor was their perceived ICT competence in teaching (β=0.19), which explained 8.6% (sr^2=0.086) of the variability in teachers’ use of the specific ICT resources. In this way, the teachers who believe that their ICT competence in teaching is high tend to use the specific ICT resources more. Moreover, the second strongest predictor was teachers’ positive attitudes toward ICT (β=0.21), which explained 3.5% (sr^2=0.035) of the variability. The third strongest predictor was teachers’ beliefs about the existence of ICT use barriers (β= -0.15), which explained 2.2% (sr^2=0.022) of the variance. It is indicated that the teachers who hold positive attitudes toward ICT and do not believe that their efforts to integrate ICT in their work is hindered by challenging barriers, tend to use this group of ICT resources more. Additionally, Table 8.15 shows that the teachers who need training for ICT practical applications tend to use less the ICT resources included in the ‘frequently used ICT resources’ factor. Finally, the teachers who assume the role of ‘personal model’ in the classroom are the teacher who would more likely use the specific ICT resources more.

In this context, the model of predicting teachers’ use of the ICT resources included in the ‘frequently used ICT resources’ factor, is the following: Use of the ‘infrequently used ICT resources’ = -0.695+ (0.186 ICT competence in teaching) + (0.209 positive ICT attitudes) – (0.147 ICT use barriers) – (0.144 training needs for practical applications) + (0.128 Teacher as ‘personal model’).

Predictors	B	β	sr^2	t-value	Sig	Tolerance
(Constant)	-0.695			-3.281	0.001	
Perceived ICT competence in teaching	0.186	0.214	0.086	3.657	0.000	0.867
Positive attitudes toward ICT	0.209	0.213	0.035	3.633	0.000	0.862
ICT use barriers	-0.147	-0.146	0.022	-2.605	0.010	0.943
Training needs for practical applications	-0.144	-0.145	0.018	-2.586	0.010	0.940
Teacher as 'personal model'	0.128	0.121	0.014	2.188	0.029	0.973
$F(5, 279) = 11.838$ $p=0.000$ $R = 0.418$ $R^2 = 0.175$						

Table 8.15: Regression analysis for teachers' use of the 'frequently used ICT resources'

8.3.3.1 Factors that predict teachers' use of the frequently used ICT resources (SEM)

The results produced by multiple regression were then examined through SEM. Figure 8.3 shows the path diagram of the model to predict teachers' use of the ICT resources included in the factor 'frequently used ICT resources' from the variables 'perceived ICT competence in teaching', 'positive attitudes toward ICT', 'ICT use barriers', 'training needs for practical applications', and 'teacher as personal model'.

The double-headed arrows, shown in Figure 8.3 and connect the independent variables, presents the correlations between the predictor variables. Negative correlation exists between perceived ICT competence in teaching and ICT use barriers. It is indicated therefore that the teachers who perceived themselves as competent in the use of ICT in the context of their work tend to believe that their efforts to integrate ICTs are not hindered by various barriers. Also, positive correlation exists between positive attitudes toward ICT and training needs for practical applications. This finding denotes that the teachers who hold positive attitudes toward ICT tend to assess their ICT training needs for practical applications as more considerable.

The structural model confirms the results of multiple regression discussed in Section 8.3.3. The path diagram in Figure 8.3 illustrates the estimation of the standardised (β) regression weights of the predictor variables of the model. Table 8.16 presents the standardised (β) and unstandardised (B) regression weights of these variables as well as their significance. The model indicates that the teachers who perceive themselves as competent in the use of ICT during teaching (β=0.162), who hold positive attitudes toward ICT (β=0.188), who do not believe that ICT use in schools is hindered by unrivalled barriers (β=-0.186), who do not rate their ICT training needs for practical applications (β=-0.130) as considerable, and who usually assume the role of 'personal model' (β=-0.129) while teaching will probably be frequent users of the ICT resources included in the 'frequently used ICT resources' factor. The model shows that 15% (R^2=0.150) of the variance in teachers' use of the ICT resources included in this factor was accounted, explained and predicted by the independent variables.

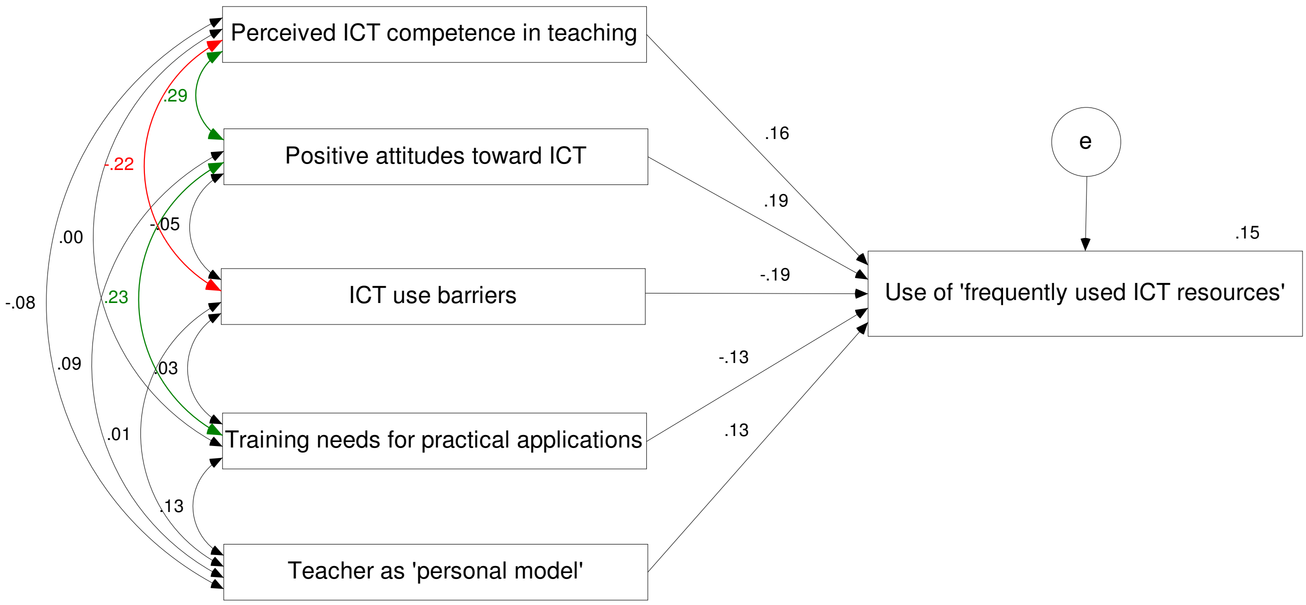

Figure 8.3: Multiple regression model of teachers' use of the frequently used ICT resources (path diagram)

Predictors	**B**	**β**	**Sig**
Intercept	-0.518		0.003
Perceived ICT competence in teaching	0.133	0.162	0.002
Positive attitudes toward ICT	0.187	0.188	0.000
ICT use barriers	-0.184	-0.186	0.000
Training needs for practical applications	-0.130	-0.130	0.009
Teacher as 'personal model'	0.129	0.129	0.011
R^2 = 0.150			

Table 8.16: Regression analysis for teachers' use of the frequently used ICT resources (SEM)

<u>8.3.4 Factors that predict teachers' use of the underused ICT resources</u>

Furthermore, the examination of teachers' use of ICT was continue with the exploration of the factors that predict teachers' use of the ICT resources included in the 'underused ICT resources' factor. Stepwise multiple regression analysis was performed between teachers' use of the ICT resources included in the 'underused ICT resources' factor and their demographic/personal characteristics, their attitudes toward ICT, their views regarding the factors that facilitate (enablers) or hinder (barriers) ICT use, their participation in ICT training, their ICT training needs, and their pedagogical beliefs and philosophies.

Table 8.17 presents the results of the multiple regression analysis. It is shown that R for regression was significantly different from zero, since $F(5, 269)$ was 22.04 which is significant at $p<0,001$, indicating that the model results in a significantly good degree of prediction of teachers' use of the ICT resources included in the 'underused ICT resources' factor. The independent variables in the model contributed adequately to the prediction of teachers' use of these ICT resources, since, 29.1% (R^2=0.291) of the variability in teachers' use of the specific group of ICT resources was predicted. The last column of Table 8.17 shows that the tolerance values of the predictor variables included in the model are quite high (0.753 to 0.969) which means that the multicollinearity is met.

The multiple regression analysis results (Table 8.17), indicate that the strongest predictor of teachers' use of the ICT resources included in the 'underused ICT resources' factor was teachers' negative attitudes toward ICT training (β=0.495), which explained 15.4% (sr^2=0.154) of the variability in teachers' use of the specific ICT resources. At the same time, teachers' positive attitudes toward ICT training (β= -0.149) was the third strongest predictor in the model, explaining 3.7% (sr^2=0.037) of the variability. In the light of these results, it is indicated that the teachers who frequently use the specific ICT resources, tend to have negative attitudes toward ICT training. This is probably due to the fact that they feel that they are adequately trained and that the provided ICT training opportunities are insufficient and not in line with their actual needs. Altogether, the two variables explained 19.1% of the variability in teachers' use of the resources included in the 'underused ICT resources' factor. Moreover, the second most significant predictor was their use of audiovisual aids (β=0.236), which explained 7.1% (sr^2=0.071) of the variability. The teachers, who tend to use audiovisual aids in their teaching, also tend to use the specific ICT resources more. Teachers' perceived ICT competence in teaching was appeared to be the forth strongest predictor of teachers' use of the specific group of ICT resources: the teachers who perceive that their ICT use competence in teaching is high, use the specific ICT resources more frequently. Finally, the teachers who do not believe that their efforts to successfully integrate ICT in their teaching are hinder by ICT use barriers, tend to use the specific resources more.

In this context, the model of predicting teachers' use of the ICT resources included in the 'underused ICT resources' factor, is the following: Use of the 'underused ICT resources' = -0.512 + (0.501 negative attitudes toward ICT training) + (0.254 audiovisual aids use) – (0.16 positive attitudes toward ICT training) + (0.119 perceived ICT competence in teaching) – (0.120 ICT use barriers).

Predictors	**B**	**β**	**sr^2**	**t-value**	**Sig**	**Tolerance**
(Constant)	-0.512			-2.496	0.013	
Negative attitudes toward ICT training	0.501	0.495	0.154	8.360	0.000	0.753
Audiovisual aids use	0.254	0.236	0.071	4.532	0.004	0.969
Positive attitudes toward ICT training	-0.161	-0.149	0.037	-2.796	0.006	0.935
Perceived ICT competence in teaching	0.119	0.135	0.018	2.423	0.016	0.851
ICT use barriers	-0.120	-0.117	0.011	-2.007	0.046	0.777
$F(5, 269) = 22.042$ $p=0.000$ $R = 0.539$ $R^2 = 0.291$						

Table 8.17: Regression analysis for teachers' use of the 'underused ICT resources'

8.3.4.1 Factors that predict teachers' use of the underused ICT resources (SEM)

Further examination of the model for predicting teachers' use of the ICT resources included in the underused ICT resources' factor was undertaken through SEM. Figure 8.4 presents the path diagram of the model to predict teachers' use of the ICT resources included in the factor 'underused ICT resources' from the variables 'negative attitudes toward ICT training', 'audiovisual aids use', 'positive attitudes toward ICT training', 'ICT competence in teaching', and 'ICT use barriers'.

The correlations (double-headed arrows) between the predictor variables are shown in Figure 8.4. There is a positive correlation between negative attitudes toward ICT training and ICT use barriers and a negative correlation between negative attitudes toward ICT training and perceived ICT competence in teaching. It is indicated therefore that the teachers who tend to hold negative attitudes toward ICT training also tend to believe that their efforts to integrate ICT resources in their teaching are hindered by various barriers and believe that their competence in the use of ICT during teaching is not adequate.

Although the estimated structural model confirms the results of multiple regression analysis (Section 8.3.4) the path diagram (Figure 8.4) shows that 'ICT use barriers' variable is not a significant predictor to teachers' use of the resources included in the 'underused ICT resources' factor. Table 8.18 shows that ICT use barriers' unstandardised regression weight (B) is -0.046 which is not significant. The model indicates that the teachers who hold negative attitudes toward ICT training (β=0.468), who tend to use audiovisual aids (β=0.225) during teaching, and who perceive themselves as competent in the use of ICT in the context of their work (β=0.120), will probably make frequent use of the ICT resources included in the 'underused ICT resources' factor. The model shows that 26.5% (R^2=0.265) of the variance in teachers' use of the specific ICT resources use was accounted, explained and predicted by the independent variables included in the model (excluding ICT use barriers).

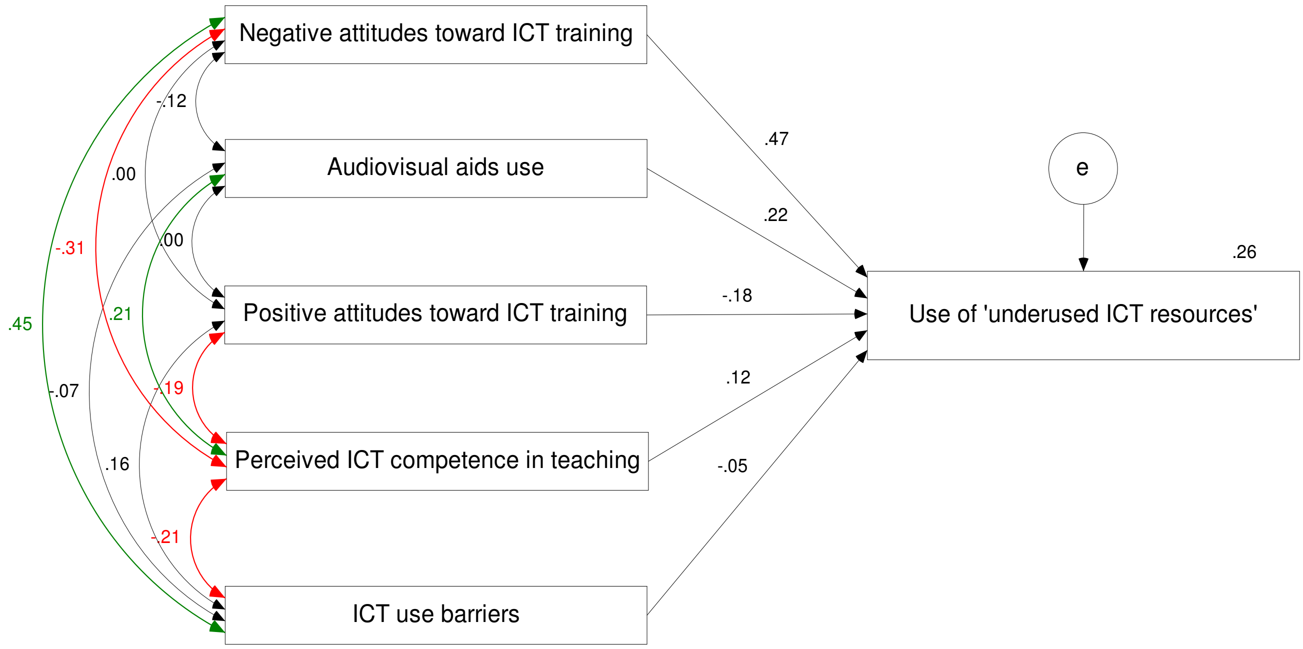

Figure 8.4: Multiple regression model of teachers' use of the underused ICT resources (path diagram)

Predictors	B	β	Sig
Intercept	-0.402		0.014
Negative attitudes toward ICT training	0.461	0.468	0.000
Audiovisual aids use	0.224	0.225	0.000
Positive attitudes toward ICT training	-0.180	-0.180	0.000
Perceived ICT competence in teaching	0.099	0.120	0.013
ICT use barriers	-0.046	-0.046	0.383
R^2 = 0.265			

Table 8.18: Regression analysis for teachers' use of the underused ICT resources (SEM)

8.3.5 Factors that predict teachers' overall use of ICT and audiovisual resources

Multiple regression analysis and structural equation modelling showed that the use of audiovisual aids is a significant predictor of teachers' use of ICT in the context of their work. The specific finding denotes that the teachers who have the tendency to include audiovisual aids while teaching may also have the tendency to integrate ICT resources to support their teaching. It can be therefore suggested that the technology using teachers are those who would likely take advantage of the various tools available to them, either technological or not, to underpin their teaching, to support students' learning and understanding, and to enhance students' learning experiences. At the same time, the examination of the correlations between the various variables that predict teachers' use of ICT in the previous sections showed that audiovisual aids use is positively related with teachers' positive attitudes toward ICT and with perceived ICT use competence in teaching, which were found to be good predictors of teachers' use of ICT. Based on these, it was deemed as useful to examine teachers' tendency to use ICT and audiovisual resources as a common characteristic.

In this context, the factors that predict teachers' use of ICT and audiovisual resources were examined with the use of multiple regression. It must be noted that these ICT and audiovisual resources are included in scale B.5 of the questionnaire. Stepwise multiple regression analysis was performed between teachers' use of ICT and audiovisual resources and their demographic/personal characteristics, their attitudes toward ICT, their views regarding the factors that facilitate (enablers) or hinder (barriers) ICT use, their participation in ICT training, their ICT training needs, and their pedagogical beliefs and philosophies.

The results of multiple regression analysis are shown in Table 8.19. It is indicated that R for regression was significantly different from zero, since $F(8, 279)$ was 28.663 which is significant at $p<0.001$, showing that the model results in a significantly good degree of prediction of teachers' overall use of ICT and audiovisual resources. The independent variables included in the model contributed adequately to the prediction of teachers' use of ICT and audiovisual resources. It is shown that 45.1% ($R^2=0.451$) of the variability in teachers' use of ICT and audiovisual resources was predicted. The tolerance column in Table 8.19 shows that the tolerance values of the predictor variables are quite high (0.783 to 0.964) which means that multicollinearity is not likely.

The results of multiple regression analysis (Table 8.21) show that the strongest predictor of teachers' use of ICT and audiovisual resources was perceived ICT competence in teaching ($\beta=0.314$), which explained 25.8% ($sr^2=0.258$) of the variability in teachers' overall use of ICT and audiovisual resources. The teachers who perceive themselves as competent in the use of ICT during teaching, tend to use ICT and audiovisual resources more frequently. Moreover, positive attitudes toward ICT ($\beta=0.292$) and negative attitudes toward ICT ($\beta=-0.155$) are predictors, indicating that the teachers who hold positive (and not negative) attitudes toward ICT tend to use ICT and audiovisual resources more. Both variables explained 8.5% of the variability in the dependent variable. Also, teacher as 'delegator' ($\beta=0.166$) and teacher as 'formal authority' ($\beta=-0.126$) are appeared to be predictors, explaining altogether 6.3% of the variability in teachers' overall use of ICT and audiovisual resources. This result denotes that the teachers, who during their teaching assume the role of 'delegator' and not the role of 'formal authority', tend to use ICT and audiovisual aids more.

Regression analysis showed that teachers' gender ($\beta=0.137$) was also a predictor. It is shown that male teachers tend to use ICT and audiovisual resources more frequently than their female colleagues. Teachers attitudes toward ICT training is a predictor variable ($\beta=-0.177$), indicating that the teachers' who use ICT and audiovisual resources tend to hold negative attitudes toward ICT training. A final predictor to the dependent variable was training needs for theoretical issues

(β=0.126), indicating that the teachers who frequently use ICT and audiovisual resources tend to rate their ICT training needs for theoretical issues as more considerable.

In this context, the model of predicting teachers' use of ICT and audiovisual resources is the following: Use of ICT and audiovisual resources = -1.156 + (0.273 perceived ICT competence in teaching) + (0.290 positive attitudes toward ICT) + (0.168 teacher as 'delegator') – (0.126 teacher as 'formal authority') – (0.152 negative attitudes toward ICT) - (0.184 positive attitudes toward ICT training) + (0.351 gender) + (0.127 training needs for theoretical issues).

Predictors	**B**	**β**	**sr^2**	**t-value**	**Sig**	**Tolerance**
(Constant)	-1.156			-6.447	0.000	
Perceived ICT competence in teaching	0.273	0.314	0.258	6.263	0.000	0.783
Positive attitudes toward ICT	0.290	0.292	0.067	6.142	0.000	0.868
Teacher as 'delegator'	0.168	0.166	0.039	3.572	0.000	0.914
Teacher as 'formal authority'	-0.126	-0.126	0.024	-2.789	0.006	0.964
Negative attitudes toward ICT	-0.152	-0.155	0.018	-3.295	0.001	0.892
Positive attitudes toward ICT training	-0.184	-0.177	0.017	-3.627	0.000	0.827
Gender	0.351	0.137	0.014	3.003	0.003	0.941
Training needs for theoretical issues	0.127	0.126	0.014	2.655	0.008	0.871
$F(8, 279) = 28.663$ $p=0.000$ $R = 0.671$ $R^2 = 0.451$						

Table 8.19: Regression analysis for teachers' overall use of ICT and audiovisual aids resources

8.3.5.1 Factors that predict teachers' overall use of ICT and audiovisual resources (SEM)

SEM was used to examine the results produced by multiple regression. Figure 8.5 presents the path diagram of the model to predict teachers' use of ICT and audiovisual resources from the variables 'perceived ICT competence in teaching', 'positive attitudes toward ICT', 'teacher as delegator', 'teacher as formal authority', 'negative attitudes toward ICT', 'positive attitudes toward ICT training', 'gender', and 'training needs for theoretical issues'.

Figure 8.5 presents a positive correlation (double-headed arrow) between teacher as 'delegator' and positive attitudes toward ICT. The teachers who during their teaching assume the role of a delegator also tend to hold positive attitudes toward ICT. Also, a positive correlation exists between positive attitudes toward ICT training and training needs for theoretical issues. This means that the teachers who hold positive attitudes toward ICT training tend to assess their ICT training needs for theoretical issues as more considerable. In addition, there are negative correlations between perceived ICT competence in teaching and negative attitudes toward ICT and positive attitudes toward ICT training. This finding denotes that the teachers who perceive themselves as competent in the use of ICT in the context of their work tend not to hold negative attitudes toward ICT, but also, not to hold positive attitudes toward ICT training.

The structural model confirms the results of multiple regression. The illustrated model shows that the teachers who perceive themselves as competent in the use of ICT during teaching ($\beta=0.271$), who hold positive attitudes toward ICT ($\beta=0.291$) and not negative attitudes toward ICT ($\beta=-0.141$), who during teaching assume the role of 'delegator' ($\beta=0.166$) and not the role of 'formal authority' ($\beta=-0.121$), will probably be frequent user of the ICT and audiovisual resources. These teachers, who would probably be males ($\beta=0.132$), tend not to hold positive attitudes toward ICT training ($\beta=-0.162$) and rate their ICT training needs for theoretical issues as quite considerable ($\beta=0.148$). The model shows that 41.1% ($R^2=0.411$) of the variance in teachers' use of ICT and audiovisual resources, explained and predicted by the independent variables.

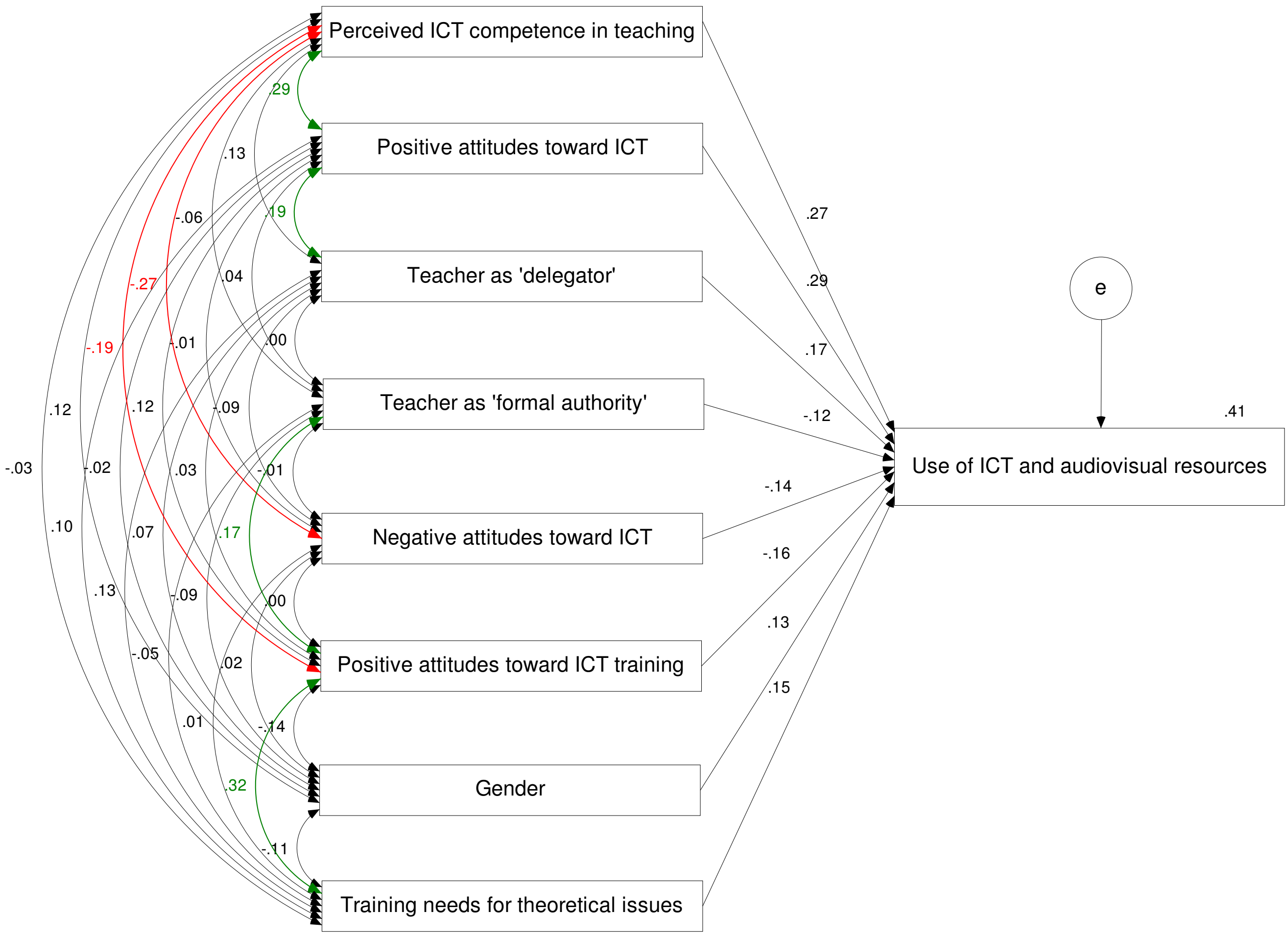

Figure 8.5: Multiple regression model of teachers' use of ICT and audiovisual resources (path diagram)

Predictors	**B**	**β**	**Sig**
Intercept	-0.951		0.000
Perceived ICT competence in teaching	0.224	0.271	0.000
Positive attitudes toward ICT	0.292	0.291	0.000
Teacher as 'delegator'	0.167	0.166	0.000
Teacher as 'formal authority'	-0.121	-0.121	0.006
Negative attitudes toward ICT	-0.142	-0.141	0.001
Positive attitudes toward ICT training	-0.163	-0.162	0.000
Gender	0.367	0.132	0.002
Training needs for theoretical issues	0.149	0.148	0.000
R^2 = 0.411			

Table 8.20: Regression analysis for teachers' use of ICT and audiovisual resources (SEM)

8.4 Summary

This chapter included the third and last part of the analysis of the data collected by the questionnaire and the interview for this study's purposes. Its aim was to answer the third research question of the study which is about the factors that affect teachers' use of ICT as well as the factors that can predict teachers' use of ICT. The following chapter will included a discussion about the study's findings. It will also include a number of recommendations, based on the study's findings, which will help the improvement of the process of integrating ICTs in Cyprus primary education.

Chapter 9: Findings, implications, and recommendations

9.1 Introduction

In Chapter 7 and Chapter 8 the analysis of the data collected for this study's purposes was presented and discussed. The effort to provide answers to the study's research questions revealed interesting and significant findings, which could be used to inform and enlighten the process of infusing and integrating ICT in schools' core processes of teaching and learning. The chapter begins with an assemblage of the study's findings, indicating at the same time a number of implications for ICT integration and implementation in education. Based on the study's results, some recommendations regarding the sound integration of ICT in schools are made out which concern primarily the context of Cyprus primary education. Finally, the chapter ends with some ideas for further research as well as with some concluding remarks for the process of ICT integration in Cyprus primary schools.

9.2 The study's findings and implications

This study set out to examine various issues related to the successful introduction and meaningful integration of ICT in education core processes of teaching and learning. Cyprus primary education was the central context wherein the study's objectives were developed. The aim was to examine teachers' use of ICT, to investigate their views on a diversity of factors that appear to be influencing their ICT use, and to explore their perspectives on their professional development opportunities in ICT. In view of these, in this section the study's results are concentrated as they were derived by the study's three main research questions. At the same time, some implications emerging by the study's results are noted.

9.2.1 What is the current situation with respect to ICT integration in Cyprus primary education?

The study's first research question intended to seek out a detailed description of the current situation regarding the process of ICT integration in Cyprus primary schools. More analytically, it aimed to delineate the extent of teachers' use of ICT, not only in terms of frequency of use, but also in terms of the ways in which ICT is being used. Also, in the context of this research question, teachers' perceived ICT competence and attitudes toward ICT were explored. Finally, teachers' perspectives on what hinders or facilitates their use of ICT were examined.

9.2.1.1 Teachers' use of ICT

The study has found (Section 7.5.1.1) that teachers' overall use of ICT, but also their use of more conventional audiovisual aids, is uneven and quite limited. It has also revealed that the use of ICT and audiovisual resources by teachers is to a large extent diverse, since a number of resources are being used frequently while others are completely underused. Specifically, on average more than 70% of the teachers reported making no, rare, or infrequent use of the available ICT and audiovisual resources in schools. The interview sessions confirm these findings showing at the same time that teachers had little awareness of the audiovisual and ICT resources available to them. Specific examination of teachers' use of ICT resources (without taking into account the conventional audiovisual aids) showed that the teachers tend to regularly use only a small number of ICT resources. The most frequently used ICT resources are word processing, printer, the Internet, and email. These results are quite similar to results of older studies conducted in Cyprus and concern the earlier attempts of ICT integration in Cyprus primary schools (Karagiorgi 2003; Karagiorgi and Charalambous 2004; Eteokleous 2008). The comparison of these studies' conclusions with this study's results indicate that teachers' use of ICT has not progressed significantly over the years and since its initial introduction in primary schools in the early 1990s.

The study has shown (Section 7.5.1.2) that teachers' use of ICT is primarily for teaching preparation and secondarily to support their teaching and to organise classroom management activities. Additionally, the majority of teachers indicate that the area of the professional responsibility that is affected the most by ICT is their teaching preparation. The teachers who support that ICT has impacted their actual teaching and the activities in their classroom are considerably fewer. Based on these results, and also on results produced by teachers' interview responses, it can be concluded that teachers are primarily taking advantage of the Internet for information enquiry in their effort to prepare lesson plans. Word processing is used for editing and preparation of teaching materials, which are then printed out to be used in the classroom as add-on activities or as attractive audiovisual materials. Also, these teaching materials are sometimes shown in the classroom using computer-based presentations. These results support the argument by different researchers and authors discussed in the study's literature review that teachers have the tendency to adapt innovations like ICT to support customary traditional and teacher-centred teaching approaches (Cuban 2001; Peck et al, 2002; Fox 2003; Gura and Percy 2005; Hennessy et al, 2005). The study has also shown that teachers' use of ICT for other professional responsibilities like their professional development, for communication in the context of their work, and student assessment, is very low, while its impact on these responsibilities is very restricted.

Based on these results, it can be concluded that the integration of ICT in primary schools is patchy and has not significantly developed and progressed since the 1990's. Teachers' use and integration of ICT in their classroom activities appears to be low and restricted only to a small array of resources, which are merely used for finding information to be used for teaching preparation and for production of teaching materials, which are eventually used in the classroom. It appears that ICT has not yet permeated all aspects of teachers' professional responsibilities since ICT's presence in schools has not yet significantly impacted teachers work, with the exception of their teaching preparation. Teachers appear to be unaware, not only of the available ICT resources, but also of the ways in which these resources can be exploited in the context of their work. These results are fairly consistent with the results of other studies (Williams et al, 1998; O'Dwyer et al, 2004; Vannatta and Fordham 2004; Wozney et al, 2006) discussed in Chapters 4 and 7. It appears that Cypriot teachers' ICT implementation follows a similar pattern with what is generally argued and highlighted in the respective literature: the use of ICT by teachers is quite low and peripheral to school's core processes of teaching and learning (Becker 2000; Becker and Ravitz 2001; Cuban 2001; Peck et al, 2002).

Moreover, the study revealed (Section 7.5.1.3) that teachers generally perceive themselves as competent in the use of ICT. However, it seems that they are feeling more competent in the use of ICT for carrying out personal tasks than for tasks related to their work and their professional responsibilities. This result indicates that teachers are uncertain of how to successfully integrate ICT in their daily teaching practices and how ICT can benefit their work. It is obvious that many of them are unable to transfer their ICT use skills to their classroom to support their work (Demetriades et al, 2003; Willis and Cifuentes 2005). Nevertheless, the fact that they are generally feeling competent in the use of ICT holds the promise that they will eventually – and with the help of proper support, facilitating conditions, and targeted professional development opportunities – discover the ways of successful and meaningful integration of ICT in their work.

9.2.1.2 Teachers' attitudes toward ICT

The study has shown (Section 7.5.2) that the great majority of teachers hold positive attitudes toward ICT. The results indicated that teachers' positive stances are mostly based on the convenience that ICT tools provide to them for finding and better managing information for their teaching, making in this way their work easier. Secondarily, teachers believe that ICT motivates students, helps them acquire new knowledge effectively and promotes collaboration among them. These views are also expressed through teachers' interview responses. These results make clear that there is a good starting ground for promoting ICT use in schools. It appears that teachers appreciate the benefits that ICT could offer in education, although it is obvious that they need to understand and value more its use in schools' core processes of teaching and learning.

Even though the great majority of teachers are clearly holding positive attitudes toward ICT, there is a considerable 30% of them who hold negative ICT attitudes, while approximately 20% of them show low ICT confidence. These negative stances are mostly based on teachers' beliefs that ICT use demands time: almost 60% of the teachers who participated in this research pinpoint that ICT use during teaching is time consuming, while more than half of them indicate that they do not have the time to prepare teachings that include ICT resources. Similar views were expressed by a number of teachers during the interviews. Teachers' negative attitudes are also due to their uncertainty of how to successfully employ ICT when teaching. More than half of the teachers indicated that they use ICTs effectively for personal affairs but they are not sure of how to include them in their work. In addition, approximately a quarter of teachers appear to be uncertain about the level of their ICT use skills. These areas of concern need to be taken into account and addressed so as to allow teachers take advantage of the benefits that ICT could offer.

These findings were compared with conclusions of older studies conducted in Cyprus and concerned the initial introduction of computer technology in primary schools (Michaelidou-Evripidou 1995; Karagiorgi 2003; Eteokleous 2008). The comparison showed that over the years, Cypriot teachers' attitudes toward ICT have become more positive and their confidence in the use of ICT has increased. This is probably due to the fact that ICT is constantly permeating every aspect of everyday life – including education – with numerous useful and facilitating applications. Teachers' experiences with these applications help them realise that ICT could definitely benefit their professional responsibilities as well.

9.2.1.3 Barriers and enablers to teachers' use of ICT

The study has indicated that teachers' effort to successfully and meaningfully integrate ICTs in their teaching is affected by a number of hindering (barriers) and facilitating (enablers) conditions (Section 7.5.3). The results revealed that teachers hold varied views about the barriers and enablers of ICT use, and for many of the under examination aspects there is not a clear communality in their responses.

Nevertheless, the majority of teachers identify as a significant ICT use barrier the lack of Greek educational software, although they agreed that the available software in schools is updated and current. In addition, it is revealed that more than half of teachers assess the current curriculum as inappropriate to include ICT resources and that there are not enough resources to guide them on how to integrate ICT in the specific curriculum. Also, the interviews with teachers revealed that the inappropriate curriculum is an important inhibiting factor to ICT use. A number of teachers note that the overloaded and inflexible curriculum leaves no time or space for ICT integration. This is a quite significant finding since as discussed in the theoretical part of this study the use of ICT use should be tightly connected to pedagogical objectives (Roblyer and Edwards 2000; Downes et al, 2001; Anderson and Weert 2002; Siraj-Blatchford and Whitebread 2003; Semenov 2005; Yelland 2007). Nonetheless, as discussed in Chapter 2, the current curriculum in Cyprus is completely outdated and in the context of the recently launched reform of the educational system, there is planning for a modernised, more compatible curriculum to meet current society's demands.

Teachers' views on issues related to the available resources in schools are not explicit. Teachers appear not to be in total agreement about the adequacy of equipment in schools, the suitability of their classrooms for the use of ICT, the way in which ICT resources are disseminated in their schools, and the ease of access to the available equipment. However, the majority of them tend to agree that the available equipment in schools is not obsolescent. Even though teachers' perspectives on the issues regarding resources are not clear cut, it is noteworthy that approximately half of them believe that their access to ICT resources is problematic. It is self-evident and also boldly highlighted in the literature (Pelgrum 2001; Granger et al, 2002; Tearle 2004; Brinkerhoff 2006; Hew and Brush 2007) that if teachers are to use and integrate ICT in their teaching the availability and access to equipment and resources should be easy and unhindered. Difficulties in these issues will eventually discourage teachers from including ICT resources to support their work (BECTA 2004; Tearle 2004).

Furthermore, a large number of teachers (40.6%) indicate that every time they use a piece of equipment they encounter technical problems. More worryingly, the great majority of them (71.2%) note that technical problems are not timely fixed, although they tend to agree that there is someone to turn to when they have technical problems and that they can easily find advice when they use ICT. As with the case of availability and access to resources, the issue of technical support, that is readily available in schools, is equally important for the successful integration of ICT (Rogers 2000; BECTA 2003; 2004; Hew and Brush 2007). Frequent technical troubles, which are not immediately fixed, will also discourage teachers from attempting to include ICT resources in their teaching (BECTA 2003).

9.2.2 What is the current situation with respect to teachers' ICT professional development opportunities?

The study's second research question intended to examine issues related to teachers' professional development in ICT. The aim was to determine teachers' participation in the officially provided ICT training, to explore their training needs with respect to ICT, and to examine their attitudes toward ICT training.

9.2.2.1 Teachers' participation in the officially provided ICT training

As noted in Chapter 2, the Cypriot teachers can receive ICT training by participating in ICT seminars in the context of the training scheme offered by the Pedagogical Institute. At the same time, the Ministry's district and local ICT coordinators provide support and training to teachers. Based on these, the great majority of the teachers indicated that they have received ICT training by either participating in the ICT seminars, or by the ICT coordinators, or both. Only 15% of the teachers indicated that they have never received training in ICT. Additionally, the study showed that more than half of the teachers have taken part in the ICT training seminars. This is quite encouraging since teachers' participation in these seminars is voluntary which suggests that teachers are truly interested in learning more about the use of ICT in the context of their work.

9.2.2.2 Teachers' ICT training needs

The examination of teachers' expectations when receiving ICT training revealed their ICT training needs (Section 7.6.2.1). The huge majority of teachers tend to provide high ratings for all aspects of ICT training expectations, acknowledging in this way that they need training in all areas described by the statements in the scale F.5 of the questionnaire. Teachers seem to recognising that ICT training is an essential component for successful and meaningful integration of ICT in their teaching.

Based on factor analysis, teachers' training needs in ICT are categorised in two broad categories: training needs for practical applications and training needs for theoretical issues. Although teachers provided high ratings for all training needs in both categories, the study's results show that training needs for practical applications are assessed as more considerable than training needs for theoretical issues. It is indicated therefore that teachers are more interested in learning about issues that are closely connected to their teaching and their actual practice in the classroom.

Teachers' priorities when rating their training needs have implications with respect to the officially provided ICT training. As discussed in Chapter 2, the training scheme provided to teachers by the Pedagogical Institute is merely concentrated on basic ICT use skills. Without underestimating the importance of these basic skills – which as supported in the theoretical part of the study are considered to be essential before teachers are in position to understand the potential of ICT for teaching and learning (Collins, 1998; Mouza 2003) – the study clearly indicates that teachers demand that their ICT training is elevated to a higher level. The study showed that the huge majority of them perceive themselves as competent in the use of ICT, not only for carrying out personal tasks, but also for their professional responsibilities. Therefore, teachers' ICT training should be organised and developed to serve their actual mission; namely, to become more efficient in their work. Based on that, it can be concluded that ICT training should be closely connected and related to teachers' actual teaching practices, which will underpin their effort to meaningfully infuse ICT in their professional responsibilities.

These findings are also confirmed by teachers' responses when they were asked to indicate what they perceive as the ideal way of receiving ICT training (Section 7.6.6.2). The majority of the teachers indicate that their ICT training should be focused on ICT applied across the curriculum, on pedagogical use of ICT resources, and on ICT applied specifically to a particular subject. Only 8.2% of the teachers chose basic ICT skills training, showing once more that they demand ICT training that is more related to their work.

The interview sessions revealed more aspects regarding teachers' perspectives on what they perceive as ideal way of receiving ICT training. The majority of teachers indicated that ICT training should be school-based, and based on their remarks, it is shown that they are more interested in ICT training that is contextualised, authentic and relevant to their work. Also, their willingness for more ICT training as well as their demand for quality professional development opportunities in ICT, were revealed. However, their views are limited to traditional approaches of professional development and within the spectrum of their existing experiences. Teachers appear not to be aware of the options they have with respect to the ways in which they can receive quality ICT training. Finally, the study has shown that teachers are reluctant to personally or collectively take responsibility for their ICT training through personal or collaborative training initiatives. At the same time, they appear to be unwilling to relinquish spare time for their professional development in ICT, preferring ICT training provided during school hours.

9.2.2.3 Teachers' attitudes toward ICT training

The study has shown (Section 7.6.3) that the great majority of teachers are holding positive attitudes toward ICT training. Teachers strongly support that they are interested in learning more about ICT, that they want to know more about developing their skills in ICT, and that they need to develop their ICT skills to benefit their students, for their professional development so as to keep up to date with developments in teaching. These results are quite encouraging since teachers appear to recognise the importance of training in their effort to make sense of the sound use of ICT in their work.

Nevertheless, the study has shown that a number of practical issues concerning ICT training make teachers hold negative attitudes toward it. For instance, almost 60% of the teachers indicate that they do not have the time to participate in ICT training. This is probably due to the fact that teachers are so pressed by other professional responsibilities derived from the curriculum, which as discussed was not designed to include ICTs, that they cannot spare time for ICT training. In this context, a BECTA's study (2004) on the ICT use barriers identified the lack of time, not only as a cause of problems of using ICT, but also as a cause of problems of teachers' ICT training. Moreover, teachers may feel this way because of inappropriate forms of ICT training which are not relevant to their work, are uninteresting, and time-consuming. This is also confirmed by the fact that almost a third of the teachers support that the available ICT training is inappropriate for their teaching. This is a significant finding since as Kanaya et al (2005) study showed teachers' perceptions on ICT training relevance is a significant predictor of whether the training's outcome is achieved. Additionally, almost 40% of the teachers indicate that they are interested in participating in ICT training but they believe that there are not available opportunities. At the same time, more than 35% of the teachers indicate that they do not have access to ICT training. These results show that teachers' ICT training opportunities are limited. It indicates that teachers are not provided with diverse choices to receive quality ICT training which is tailored according to their actually training needs, their level of expertise, their personal interests and concerns, and their personal convenience.

The study also shows that approximately 20% of the teachers think that ICT skills are not needed to progress in the profession, that ICT is not appropriate to their teaching and therefore it is not a priority for them. Moreover, approximately 10% of the teachers indicate that they do not see the need to learn about ICT, that it is not necessary to participate in ICT training, and that they do not need to use ICT in their teaching. These results suggest that these teachers' negative attitudes toward ICT training are based on their overall negative ICT attitudes. These teachers need to be provided with ICT training choices which will give them the opportunity to experience how ICT can actually benefit their work.

9.2.3 Which are the factors that affect teachers' use of ICT and which of these variables can predict teachers' use of ICT?

The study's third research question intended to examine the factors that affect teachers' use of ICT, and to explore which of them can predict teachers' use of ICT. Specifically, it was examined if teachers' background characteristics, as well as their personal attitudes and beliefs, (pedagogical beliers, ICT attitudes, perceived ICT competence, beliefs about the ICT use barriers and enablers), are factors that influence their use of ICT. Moreover, it was examined if teachers' participation in the officially provided ICT training can impact and affect their ICT use.

9.2.3.1 Teachers' background characteristics and ICT use

The study has shown (Section 8.2.1) that the only background characteristic that appears to be affecting teachers' use of ICT is gender. It is indicated that male teachers are using ICT more than their female colleagues. Also, male teachers are found to be using the ICT resources included in the 'underused ICT resources' factor more frequently than the female teachers. This result is in line with the results of several researches (Michaelidou-Evripidou 1995; Russell and Bradley 1997; BECTA 2004; Scrimshaw 2004; VanBraak, Tondeur et al. 2004) discussed in the literature review of the study and support the existence of a technological gender gap. This finding is quite important if it is taken into account that the great majority of the staff in Cyprus primary schools are female teachers (Section 7.3.1).

The study has shown that there are not any statistically significant differences in respect to ICT use between younger and older teachers or between teachers with more or less teaching experience. This is also a common conclusion of other studies (Becker 1999; Cuban et al. 2001; Granger et al. 2002; Russell et al. 2003; BECTA 2004) discussed in the literature review of this study. However, it would have been expected that younger teachers, who are presumably more techno-savvy, would use ICT more than their 'older' colleagues. This is probably due to the fact that younger teachers, with less teaching experience, need more time and effort to get accustomed with the challenges of the profession, and therefore, they are not taking the risk to experiment with innovative teaching that include ICT. Similarly, novice teachers need time to understand and realise the demands derived by the curriculum which prevents them from trying new teaching approaches, especially when the curriculum was not design to facilitate the use of ICTs.

9.2.3.2 Teachers' pedagogical beliefs and ICT use

The study has revealed (Section 7.4) that teachers tend to adopt several roles as well as diverse behaviours and instructional approaches when teaching. It is indicated that in their effort to fulfil their teaching goals they make decisions and choose from a wide spectrum of pedagogical teaching styles. In many cases, the roles, behaviours and teaching approaches they assume and adopt are complementary or conflicting with each other. As noted in Chapter 7, similar results were also found in other studies (Ravitz et al. 2000; Levin and Wadmany 2007)

Factor analysis of statements included in the pedagogical beliefs scale (Question C.1) revealed the existence of five factors that represent a different theme in this spectrum of pedagogical teaching styles: teacher as a 'facilitator', as an 'expert', as a 'formal authority', as a 'personal model', and as a 'delegator'. The five teaching styles were adopted from A. Grasha's (1996) 'Teaching Styles Inventory' which was adapted and used for this study's purposes (Section 6.3.2.1.1). The study has shown that the teachers tend to agree with all these factors in varying degrees. This suggests that teachers are holding student-centred and progressive, constructivist pedagogical beliefs when needed and when the conditions permit it; however, they appear to be feeling insecure to abolish teachers-centred, non-constructivist teaching approaches, which as it appears, they make them feel more comfortable and in control over the learning environments they set up when teaching. Teachers' difficulty to abolish teacher-centred pedagogical approaches was quite apparent during the interview sessions. Teachers' responses revealed that they are reluctant to relinquish responsibilities to their students in an effort to retain their traditional roles, their control, and their authoritarian profile over their students.

The study has shown (Section 8.2.2.1) that teachers' pedagogical beliers are related to their ICT use. The results show that the teachers who tend to assume the 'facilitator' and 'delegator' roles, namely the roles that represent student-centred, constructivist beliefs, tend to generally use ICT more in the context of their work. Contrarily, it is shown that the teachers who tend to assume the 'expert' and 'formal authority' roles, which represent teacher-centred views, tend to use ICT less. These results are consistent with the results of other studies (Becker and Ravitz 1999; Becker 2000; Ravitz et al. 2000; Totter et al. 2006; Levin and Wadmany 2007) discussed in Chapter 8, and highlight the relationship between teachers' use of ICT and their pedagogical beliefs as discussed in Chapter 4. It is shown that the teachers who hold student-centred, constructivist and progressive pedagogical beliefs are those teachers who frequently use ICT resources to underpin their work. Similarly, it can be suggested that the frequent use of ICT by the teachers encourages them to employ nonconventional student-centred teaching approaches.

These results have implications concerning the process of introduction and integration of ICT in schools. ICT should be introduced in schools with a clear pedagogical direction in mind. The broad objective should be the pedagogical sound use of the various technological tools so as to enhance the teaching and learning processes. ICT use should be connected with a clearly defined shift or reform toward student-centred, constructivist pedagogical approaches by teachers. It is therefore obvious, that teachers ICT training should be organised and based on pedagogical principles that reflect contemporary views in the educational field. It should definitely be a professional development opportunity for teachers to expand and develop their knowledge base both in ICT and pedagogy.

<u>9.2.3.3 Teachers' perceived ICT competence, attitudes toward ICT, and views on the barriers and enablers of ICT use and ICT use</u>

The study has shown (Section 8.2.2.3) that teachers' perceived competence in the use of ICT for both personal and professional tasks is related to their use of ICT. The study's results show that the teachers who perceive themselves as competent in the use of ICT tend to use ICT more for their professional responsibilities. The issue of teachers' self-efficacy and consequently ICT self-efficacy beliefs was discussed in the theoretical part of the study (Sections 3.4.1 and 4.3.1.4) and as indicated these beliefs are related to the decisions and actions that a teacher makes and takes when dealing the use of ICT resources (Compeau and Higgins 1995; Compeau et al. 1999; Gong et al. 2004). Therefore, in order to increase perceived ICT competence, teachers' need to be given the opportunity to experiment with technology, to feel confident in its use, and to improve their skills in general. These goals can be served through ICT training, which among others, should also focus on helping teachers acquire more hands on experience with the use of ICT.

Moreover, the study has shown (Section 8.2.2.3) that teachers' attitudes toward ICT are related to their ICT use. On the one hand, it is indicated that the teachers who hold positive attitudes toward ICT tend to use ICT more. On the other hand, the teachers with low confidence in the use of ICT as well as with negative attitudes toward ICT tend to use ICT more infrequently. These results denote that teachers' attitudes toward ICT need to be addressed and managed since, just like ICT self-efficacy beliefs, these beliefs can influence teachers' decision making with respect to whether they will use and how they will use ICT for their professional responsibilities (Mumtaz 2000; Rogers 2000).

Additionally, the study has indicated (Section 8.2.2.4) that teachers' views on the ICT use enablers and barriers are related to their ICT use. The teachers who believe that their ICT use is negatively affected by the existence of ICT use barriers tend to infrequently use ICTs to support their work. At the same time, the teachers who believe that the enabling conditions that facilitate their use of ICT are in place tend to use ICT more frequently. Teachers' concerns regarding the barriers that affect the unhindered use of ICT need to be taken into account when plans for ICT implantation in schools are designed and applied. Efforts should be made to eliminate any possible barrier that will affect teacher use of ICT, and at the same time, actions need to be taken to ensure that the facilitating conditions that will support teachers' use of ICT are in place.

As discussed in the theoretical part of the study (Section 4.3) teachers' views on the ICT use barriers could be related to their actual attitudes toward ICT (Ertmer 1999; Stallard and Cocker 2001). Namely, the teachers who hold negative attitudes toward ICT or feel unconfident in its use, use the existence of ICT use barriers as an excuse for not using ICT resources. The study's results confirm this argument. It appears that the teachers who hold negative and low confidence attitudes toward to ICT tend to believe that their ICT use is hindered by barriers. Nevertheless, it can also be argued that the reason why teachers hold negative and low confidence toward ICT is the existence of ICT use barriers.

9.2.3.4 The impact of teachers' participation in ICT training and ICT use

The study has shown (Section 8.2.3) that teachers' participation in the officially provided ICT training (training scheme offered by the Pedagogical Institute and ICT coordinators) has not impacted and affected their overall ICT use. Nevertheless, the results show that it has affected and impacted the use of the ICT resources included in the 'infrequently used ICT resources' factor: the teachers who have received ICT training tend to use these specific ICT resources more frequently than their colleagues who have not.

Furthermore, teachers' participation in the ICT seminars offered by the Pedagogical Institute in the context of its ICT training scheme was examined. The results show that there are not any differences in the use of ICT between the teachers who received the specific training and the teachers who did not. It is therefore indicated that the specific ICT training form has not impacted and affected teachers ICT use. As noted in Chapter 2 (Section 2.5.3.1), the specific ICT training form is mostly concentrated on basic ICT (computer) use skills, while the time spared for practical applications is quite limited. In this way, the specific training does not help teachers experience how ICT can effectively and authentically be integrated in their everyday practice.

Moreover, it was examined if teachers' ICT use was affected by the training offered by the local and district ICT coordinators. The results show that the teachers who have received the specific ICT training tend to use ICT more to support their professional responsibilities. Also, it is indicated that the teachers who received ICT training by the ICT coordinators tend to use more the ICT resources included in the 'infrequently used ICT resources' factor. As discussed in Chapter 2 (Section 2.5.3.2), the ICT coordinators provide support and training to teachers locally and in the context of the work. It is evident that the specific ICT training is more contextualised, authentic, and relevant to teachers' work, and therefore, it seems that it actually has an effect on their ICT use.

9.2.3.5 Factors that predict teachers' ICT use

The examination of the relationship between teachers' use of ICT and the factors that are assumed to be affecting it, led to the decision to carry out of multiple regression analysis to explore which of these factors can best predict the use of ICT (Section 8.3). Multiple regression analysis permitted not only the exploration of the relationship between teachers' ICT use (dependent variable) and the ICT use influencing factors (independent, predictor variables), but also the unique influence of each factor on teachers' ICT use. In addition, structural equation modelling (SEM) permitted the assessment of the resulting regression models, allowing, at the same time, the graphical representation of the multiple regression equations as well as the examination of the relationships (correlations) between the ICT use influencing factors (predictors). The examination included not only teachers' overall ICT use but also the ICT resources included in the three ICT use factors.

In this context, the results have shown that one of the strongest predictors of teachers' ICT use is the use of conventional audiovisual aids to support teaching. The use of traditional media was also found by Al-Majeeni's (2004) study in Omani basic education schools as a strong predictor to teachers' ICT use. This finding denotes that the teachers who have the tendency to include audiovisual aids in their teaching also have the tendency to integrate ICT resources to support their teaching. These teachers may have the tendency to generally take advantage of any tool available to them, either technological or not, to enrich their teaching and to facilitate the accomplishment of their teaching objectives. It can be therefore argued that these teachers have an inclination toward a specific teaching style that favours the use of teaching tools (ICT and audiovisual resources) to support their students' learning. This view is also supported by the results (correlations) produced by SEM which show that teachers' audiovisual aids use is positively correlated with positive attitudes toward ICT, indicating that the teachers who tend to use audiovisual aids to support their teaching tend to hold positive attitudes toward ICT.

Teachers' perceived ICT competence in teaching also appears to be one of the strongest predictor to teachers' ICT use. In line with other studies (Gong et al, 2004; Littrell et al, 2005) discussed in the literature review, the study has indicated that the teachers who believe that their ICT competence is high tend to use ICT more. It is therefore indicated that teachers' ICT self-efficacy beliefs drive the decisions they make regarding their ICT use to support their professional responsibilities. SEM results (correlations) indicate that the teachers who perceive themselves as competent in the use of ICT tend to use audiovisual aids more and hold positive attitudes toward ICT. Also, they believe that their efforts to include ICTs in their teaching are not hindered by ICT use barriers. Finally, these teachers tend to hold negative attitudes toward ICT training, indicating that they are adequately trained and that they consider the available training opportunities in ICT as inadequate to satisfy their specific ICT training needs.

Teachers' attitudes toward ICT (positive and negative) also appear to be ICT use predictors. This finding is consistent with similar results of other studies (Williams et al, 1998; Demetriades, Barbas et al. 2003; Al-Majeeni 2004; McGrail 2005; Eteokleous 2008) previously discussed in the thesis. It is indicated that the teachers who hold positive, and not negative, attitudes toward ICT are more likely to be frequent users of ICT. As noted before, teachers' attitudes toward ICT drive teachers' decision to whether use or not ICT as well as to the ways in which ICT will be used.

Furthermore, pedagogical beliefs appear to be predictors to teachers' use of ICT. This finding supports the alleged link between teachers' beliefs on pedagogy and their ICT use as discussed in theoretical part of the study (Becker and Ravitz 1999; 2001; Totter, Stutz et al. 2006; Levin and Wadmany 2007). It is indicated that the teachers who hold student-centred pedagogical beliefs, by assuming the role of 'facilitator', tend to use ICT more. In addition, SEM results (correlations) show that the teachers who assume the role of 'facilitator' hold positive attitudes toward ICT, perceive themselves as competent in the use of ICT when teaching, and use audiovisual aids to support their teaching. Contrarily, the teachers who hold teacher-centred pedagogical beliefs, by assuming the role of 'formal authority', use ICT less frequently. Moreover, the study has shown that the teachers who assume the role of 'personal model', tend to use more the ICT resources included in the 'frequently use ICT resources' factor. This means that these teachers, in their effort to support the specific teaching style which represents teacher-centred pedagogical beliefs, use the specific ICT resources (word processor, printer, e-mail, and Internet) which as indicated by the study (Section 9.2.1.1.1) are mostly used for teaching preparation and for production of conventional teaching materials.

Additionally, multiple regression analysis has shown that teachers' views on the ICT use barriers are a negative predictor to their ICT use. The teachers who believe that their effort to include ICTs to support their professional responsibilities is hindered by ICT use barriers tend to use ICT less frequently. Additionally, the results by SEM (correlations) indicate that these teachers tend to believe that their competence in the use of ICT in the context of their work is low. This finding provides further support to the argument discussed in sections 4.3 and 8.2.2.4, that in many cases teachers use the existence of barriers as an excuse for not using ICT while the real reason lays with their attitudes toward ICT as well as their low confidence with the use of ICT (Ertmer 1999; Stallard and Cocker 2001).

Teachers' attitudes toward ICT training also appear to be a predictor to their use of ICT. Multiple regression analysis results show that the teachers' who are not holding positive attitudes toward ICT training tend to use ICT more. This denotes that technology using teachers believe that the offered ICT training opportunities do not satisfy their actual training needs.

As noted before, teachers' use of the conventional audiovisual aids is one of the strongest predictor of teachers' use of ICT. Based on the results, it was decided to examine the factors that predict teachers' use of the ICT and audiovisual resources. The results has shown that the teachers who perceive themselves as competent in the use of ICT during teaching, who hold positive and not negative attitudes toward ICT, who during teaching assume the role of 'delegator' and not the role of 'formal authority', will probably be frequent user of the ICT and audiovisual resources. These teachers, who would probably be males, tend not to hold positive attitudes toward ICT training and rate their ICT training needs for theoretical issues as quite considerable.

9.3 Recommendations

The results of the study drive the emergence of a number of recommendations that can facilitate and underpin the meaningful and effective integration and implementation of ICT in Cyprus primary education. Nevertheless, as indicated in Chapters 7 and 8, the study's results are consistent and similar to other studies in the respective literature. It is indicated that teachers' ICT use and ICT implementation patterns, as well as the factors that are influencing teachers' attempts to integrate and infuse ICT resources in their teaching, are in many cases the same or similar to those of other studies. Therefore, some recommendations emerging by the study's results and implications, and concern the unique context of Cyprus (as presented in Chapter 2), could also have implications for international practice as well.

9.3.1 Curriculum

As noted in Chapter 2, the educational system of Cyprus is currently at a significant turning point. Considerable changes are taking place due to the ongoing educational reform, which as discussed, aims at the complete update and modernisation of the offered educational service on the island. One of the most considerable changes regards the generally admitted obsolete national curriculum (Spyrou 1999; Educational Reform Committee, 2004; International Bureau of Education, 2004; Gregoriou et al, 2005) which will be replaced by a novel one. As proclaimed by the policy-makers responsible for this endeavour (Ministry of Education and Culture, 2007), the new national curriculum will take into account contemporary trends in education and pedagogy, as well as the societal context of Cyprus. Therefore, this specific point of time provides a unique opportunity for the sound implementation and promotion of ICT in schools. It is a great opportunity to justify the reasons why ICT should be integrated in schools, to clarify its intended role in teaching and learning processes, and to provide teachers with a solid theoretical background that will underpin and support its use in the classroom. After all, the current curriculum was not designed to include ICTs, and as the study's results indicate (Section 7.5.3.1), teachers consider the curriculum's unsuitability as one of the most significant barrier to their effort to integrate ICT in their teaching.

Moreover, the study has shown (Section 8.2.2.1) that the use of ICT in schools is clearly related to teachers' pedagogical perspectives and beliefs. It is indicated that student-centred pedagogical orientation is associated with increased ICT use. The formulation of the new curriculum provides the opportunity to establish tight and reasonable connections between educational and pedagogical objectives with the use of ICT in the classroom. In this way, teachers will know and apprehend the reasons why ICT resources are to be infused into their teaching as well as the educational aims that need to be addressed with the support of ICTs. Nevertheless, these objectives need to be based on feasible grounds that take into account the schools' available technical infrastructure and teachers' ICT use skills.

The formulation of the new curriculum also provides a great opportunity to discharge teachers from the pressure, and therefore the time restrictions, to 'cover' the excessive curriculum material prescribed by the current, inelastic, content/book-oriented curriculum, which merely supports the information acquisition by the students (Section 2.4.2). As the study has indicated (Sections 7.5.2 and 7.5.3.1), teachers pose the lack of available time as a significant reason why they are prevented from integrating ICT into their teaching practices. The relief of pressure to deliver excessive and unnecessary teaching content to students, and therefore the release of valuable teaching time, will definitely allow teachers to try out new teaching approaches based on more 'time-consuming' pedagogical philosophies, which in turn, will encourage them experiment with technology to support their professional responsibilities.

9.3.2 Examples of good practice and hands on experience

The study has indicated (Section 7.5.1.) that the integration of ICT in Cyprus primary schools is patchy and underdeveloped. Teachers' ICT use is low and restricted only to a small number of basic resources which are being used for tasks that are peripheral to actual teaching and learning. In order to encourage the meaningful use of ICT, that effectively supports teaching and learning, teachers need to experience examples of good practice. At the same time, they should have the opportunity for hands on experimentation with technology and contemporary pedagogy, in the context of an authentic setting that is closely connected to their everyday professional responsibilities. This can be succeeded if schools are developed into active learning communities (Section 5.2.2) (Hargreaves, 1995), not only for students, but also for teachers. Schools, following guidelines by the Ministry and under the responsibility of each school's management, should produce a yearly action plan for the promotion of ICT use in the classroom. The action plan should be based on specific and achievable objectives and must include a diversity of activities which will be focused on the use of ICT. Through these activities, the teaching staff of each school should be given the opportunity to attend and observe exemplary teaching sessions offered by the ICT coordinators (Section 2.5.3.2), by other colleagues within the school, teachers visitors, and other experts. At the same time, each teacher should have the chance to plan and conduct teachings that incorporate ICT which will be presented to other colleagues for constructive reflection and professional discourse.

In this way, collective and collaborative organisational culture (Schoales, 1998; Siddiqui 2004) will be developed in each school which will promote the dissemination of good pedagogical practice, the production of collective experience, the sharing of efficient teaching strategies, and the fruitful cooperation between teachers. Additionally, teachers will have the opportunity to acquire more experience in the use of ICT, to improve their ICT use skills, to develop strategies for the effective and meaningful integration of ICT resources in their teaching, and to understand the benefits that ICT can offer to their teaching. As a result, teachers' ICT self-efficacy beliefs and perceived ICT competence (Sections 4.3.1.4) will be increased, since, as indicated by the study's results (Sections 7.5.1.3; 8.2.2.3; and 8.3), these beliefs are strongly related to teachers' ICT use. At the same time, teachers' increased exposure to ICT tools will help address their ICT attitudes, which as revealed by the study (Sections 7.5.2; 8.2.2.2; and 8.3), are also affecting teachers' ICT use.

The development of cooperative organisation cultures in schools can only be successful and has positive effects on teachers' use of ICT and on their teaching practice in general, if it is not faced by their teachers as an extra burden on their already overloaded professional responsibilities. Therefore, it is very important to allocate time to teachers for planning, preparation, and for critical reflection. The allocation of time to teachers for this can have an extra cost on schools' budgets. Nevertheless, the extra cost can be seen as an investment on teachers' continuous professional development and in-service training, not only for the improvement of their ICT use skills and integration strategies, but also for enhancing their teaching repertoire and methodological approaches.

9.3.3 Professional development

What was discussed in the previous section outlines only one form of professional development in ICT that can be offered to teachers. Nevertheless, as indicated in Chapter 5, teachers' professional development ought to be catered through a wide range of learning opportunities for teachers which should include a combination of training forms and models that takes advantage of their positive attributes (Guskey, 1995). The study's results (Section 7.6.3) indicate that teachers are clearly interested in receiving ICT training, in learning more about ICT, and in developing their skills for themselves, for their students, and for their overall professional growth. Teachers' positive stances toward ICT training and willingness for additional quality opportunities for ICT training, should provide the context for the development of a well-thought ICT training scheme. The scheme should be based on a clear vision of what is expected to be achieved from the meaningful and pedagogical sound integration of ICT in teaching and learning processes, and should be accompanied by realistic objectives. It should include a wide range of learning opportunities to teachers which will ensure ongoing and continuous professional development, taking into account teachers' diverse contexts and levels of expertise and experience.

In order to achieve these, the ICT training scheme should be flexible, while its content, objectives, and results should be continually assessed and updated.

The study has indicated (Section 7.6.3) that many teachers show interest in ICT training, but they believe that they do not have access to it, that training is not available, and that they do not have the time to attend it. Therefore, the proposed ICT training scheme should include a wide range of training opportunities that are easily accessible by teachers and convenient enough to meet their professional and personal schedules. Also, as discussed in Chapter 5, teachers' training and therefore their ICT training opportunities ought to be tailored, not only to meet and cater to the needs that the educational system necessitates, but also the diverse training needs of teachers (Guskey, 1995; Downes et al, 2001; Mouza 2003; Kanaya et al, 2005). Consequently, careful attention needs to be paid to ensure that the offered training opportunities are organised and developed after a detail examination of teachers' ICT training needs that takes into consideration their preferred training content as well as their preferred training forms and models. This means that teachers need to be allowed to get involved in the decision making process regarding their ICT training.

In this context, the study has indicated (Section 7.6.2) that teachers show particular preference in ICT training that concentrates on practical applications and on issues that are closely connected to their teaching and their actual practice in the classroom. At the same time, they indicate that their ICT training should not merely focus on basic ICT use skills, which is the primary focus of the training scheme currently offered by the Pedagogical Institute (Section 2.5.3.1). In any case, the study's results has shown (Section 8.2.3) that the specific ICT training scheme has not affected and impacted teachers' ICT use. Therefore, the proposed ICT training scheme should include training opportunities that can help teachers learn how to use ICT for educational purposes, understand how ICT can positively impact classroom teaching, and apprehend the relevance of ICT with what they do in their everyday practice. In this context, they should be built on teachers' existing professional knowledge, expertise, and experiences (Somekh, 1997; King 2002), taking into account current developments in pedagogy and in ICT.

As discussed in Chapter 3, meaningful and efficient ICT use in the classroom should be guided and supported by specific pedagogical directions toward contemporary trends in education like constructivism and progressive, student-centred pedagogical approaches. Additionally, as noted, one of the reasons why ICT is introduced into schools is to facilitate and underpin the emergence of these pedagogical philosophies and approaches (Becker and Ravitz 1999; Levin and Wadmany 2007). Moreover, the study has shown (Sections 8.2.2.1 and 8.3) that ICT use is related to teachers' pedagogical beliefs, since, more student-centred philosophies and practices lead to increased ICT use by teachers. Based on these, teachers' ICT training opportunities, in the context of the proposed ICT training scheme, need to be planned and organised based on clear pedagogical backgrounds which will encourage teachers modify existing traditional approaches that are not compatible with current demands of education and society. Therefore, ICT training should address teachers' pedagogical beliefs by urging them to examine and re-examine their existing beliefs and practices, and by helping them try out new challenging and ambitious teaching approaches.

The study's results have indicated (Section 7.6.2) that teachers are mostly interested in ICT training that is contextualised, authentic, and relevant to their work. What is more, as discussed in Chapter 5, ICT training should be situated in authentic contexts and must provide teachers with realistic experiences and skills which can be easily transferred to their actual practice (Willis and Cifuentes 2005). Within this context, the role of the Ministry's ICT coordinators (Section 2.5.3.2) is highlighted. As discussed, the ICT coordinators are assigned to provide teachers with ICT training and technical support. There are two types of ICT coordinators, the district and local ICT coordinators, which as shown by the study's results (Section 8.2.3), the training they offered to teachers is actually impacting their ICT use. Nevertheless, there are only few ICT coordinators, and therefore, they cannot provide ongoing training and readily available support to all teachers in all schools. In order to maximise the positive effects that the ICT coordinators can offer, a third type of coordinator is needed: the school-based ICT coordinator. The teachers who will be assigned with the specific role should be, in general, responsible for the promotion of ICT use in their schools. They should have reduced teaching responsibilities and increased time to serve the objectives of their role. A school-based ICT coordinator could provide ICT training to the rest of the teaching staff according to the school's ICT action plan, according to instructions and directions by the Ministry's ICT unit and the Pedagogical Institute, as well as when asked by anyone in the school. In this way, it would be ensured that teachers' ICT training is contextual and authentic, relevant to teachers' practices and actual training needs, in accordance to the curriculum's content, and very importantly, ongoing and continuous.

Furthermore, the study has shown (Section 7.6.2.2) that teachers' views on their ICT professional development are restricted only to traditional training approaches which are based on their existing experiences. Nevertheless, as discussed in Chapter 5, teachers' professional development and their training in ICT should include contemporary training models that depart from traditional training forms in which teachers are just passive recipients of information (Guskey 2000; Roblyer and Edwards 2000; Wiske et al, 2005). The technological developments allow the emergence of training forms that help teachers learn how to teach using ICT from working with these technologies (BECTA 2004; Wiske et al, 2005). However, the study has shown (Section 7.5.1.2) that only a small number of teachers employ ICT to support and facilitate their professional development. Based on these, and in the context of the proposed ICT training scheme, teachers could be given the opportunity to participate in networked professional learning communities which will allow them to interact and reflect with peers and other experts, as well as to share and disseminate teaching experiences, pedagogical practices, and ICT applications. The establishment of the digital portal DIA.S (Section 2.5.1) by the Pedagogical Institute of Cyprus provides the platform on which teachers' professional communities can be developed.

9.3.4 Technical infrastructure, software, and support

The study's results indicate (Sections 8.2.2.3 and 8.3) that teachers' beliefs about the barriers and enablers of ICT use are related to their ICT use. Specifically, the teachers who are using ICT more tend to disregard the existence of barriers and consider that the enabling conditions needed for successful ICT use are in place. In addition, the study indicates (Section 7.5.3.1) that several teachers have concerns regarding the quality and quantity of the technical equipment in their schools. Therefore, special attention ought to be given in providing teachers with a sufficient and updated technical infrastructure which will ensure their unhindered use of ICT. At the same time, the access to this equipment needs to be easy and not time-consuming as indicated by several teachers participating in the study. There is no point in having diverse ICT resources stored in schools but outside of the classroom where they would have been readily available for use by teachers and students.

Moreover, several teachers expressed concerns regarding the availability, quality, and relevance of the educational software in schools (Section 7.5.3.1). Nevertheless, the establishment of the new national curriculum and the preparation of the essential materials that will support its content and purposes, provide the opportunity for the production of software that is related and relevant to the curriculum's content. The curriculum development unit, which is responsible for the production of educational material for schools, should be appropriately upgraded and rightly staffed to become capable in undertaking the production of software packages relevant to the curriculum. The software should be based on current pedagogical trends to serve the philosophical direction of the new curriculum. Special attention needs to be given in producing software packages that are user-friendly and easy to learn so as to become useful tools in teachers' effort for quality teaching with the use of ICT.

Moreover, the study has indicated (Section 7.5.3.1) that teachers encounter frequent technical problems when using ICT resources which are not timely fixed. This is a significant barrier to ICT use since it can discourage teachers from attempting ICT facilitated teaching practices. Also, the study has shown (Section 8.2.2.4) that teachers' negative and low confidence attitudes toward ICT may be due to the barriers they face when teaching with ICTs. Therefore, it is very important that technical support is readily available to schools to help teachers deal with technical troubleshooting. The school-based ICT coordinator could be the person that teachers can turn to when faced with technical difficulties. Along with the rest of his/her roles, the ICT coordinator could be responsible for setting up equipment, for basic troubleshooting, and for providing advice for technical matters to teachers. For technical problems that cannot be fixed in schools then technical support from the private sector needs to be sought. However, schools should be allowed to collaborate with associates from the private sector without the need of time-consuming bureaucratic procedures that involve the Ministry and its approval. In this way, a solid technical support mechanism would be in place in each school which will permit teachers' work with ICT without worrying about failures due to technical problems.

9.4 Ideas for future research

The study has delineated the process of ICT integration in Cyprus primary education, taking into account teachers' ICT use and implementation practices, as well as their views and perspectives on some factors that affect and influence the use of ICT in schools. Additionally, issues regarding teachers' ICT training and professional development in ICT were examined. In general, the study's results indicate that the implementation of ICT in primary education is problematic since teachers' ICT use is infrequent, while the way that ICT is being used is peripheral to actual teaching and learning processes. Nevertheless, as noted, the Cypriot educational system is undergoing considerable changes, in all of its aspects, due to the ongoing educational reform that aims at updating and modernising the offered educational service on the island. Therefore, the study concerns a state that is at its dusk while new conditions are pending to be put into practice.

In this context, it would be very interesting to research how ICT integration and implementation in schools will be affected and influenced by the application of the considerable changes that are taking place and will supposedly restructure the educational system. Especially, the establishment of the new national curriculum is expected to bring about substantial changes, not only to the content of the offered educational service, but also to the pedagogical orientation of the educational system, to its philosophical direction, and to the way in which schools' timetable is organised. According to what is proposed by the policymakers and other educational stakeholders the new national curriculum will not be a catalogue of ready-made knowledge to be taught by teachers and learnt by students, as prescribed by the previous (current) curriculum. At the same time, it is expected to be less overloaded which will allow teachers to work with less pressure, to have more time to extend their teaching, and to work in substantially differentiated conditions. Therefore, a research on how ICT implementation will be impacted by these reforms would indicate if ICT use by teachers is actually progressing and if it actually has positive effects on their teaching practices and on students' learning outcome.

Furthermore, the study has shown that teachers' use of ICT is related to their pedagogical beliefs and philosophies. As indicated, the teachers who hold constructivist, student-centred pedagogical beliefs tend to use ICT more frequently to support their professional responsibilities. This is a very important finding since it defends the reasons why ICT should be integrated in schools and provides the necessary underpinnings to what is expected to be achieved by the integration of ICT in schools. Nevertheless, more research is needed so as to shed more light on the different aspects of this finding. For instance, it would very interesting to investigate how teachers' pedagogical philosophies – which reflect what they believe to be good practice – are actually materialised into teaching practices in the classroom and how ICT is integrated into these practices. The examination of this issue may demand for a study that includes classroom observations to confirm that teachers' beliefs correspond with what they actually practice during their teaching. In addition, it would be interesting to explore if ICT is the reason why these contemporary philosophies emerge or if these beliefs are the reason why teachers tend to use ICT more. In order to examine this issue a longitudinal study may be needed so as to investigate the changes in teachers' practices over the course of time.

9.5 Concluding remarks

The study has shown that although ICT was introduced in Cyprus primary education for some years now, its integration pace and progression is inadequate since teachers' ICT use is patchy, restricted only to a small number of resources, and not universally developed. At the same time, it is evident that the applications of ICT are predominately for tasks that are not directly concerned with actual teaching and learning processes. It appears that ICT did not manage to be smoothly interwoven into teachers' everyday instructional practices to support their teaching approaches and pedagogical objectives. Similarly, it did not manage to be naturally incorporated into students' learning environment as an integral part of their everyday learning experiences.

Additionally, the study has isolated and examined some of the most important factors which according to the respective literature seem to be affecting and influencing ICT use in schools, and therefore need to be addressed. Teachers' views were sought out so as to shed light on their beliefs and perspectives on these factors. This is due to fact that the process of integrating ICT in education entails above all the acceptance and adoption of a challenging innovation. This requires accepting considerable changes and redefinition of established practices by those involved, and specifically by teachers who understandably are key actors in the implementation process. Therefore, their voices need to be heard since their perspectives could provide useful details on the integration process, which in turn, could help better plan the ways in which to approach and facilitate the ICT integration process in schools.

ICT, and specifically computing, was abruptly introduced in Cyprus primary schools without clear educational agenda, without prior preparation, and without the prescription of specific objectives that should have accompanied ICT integration. Namely, it was introduced as an add-on tool into a system with already well established structures and practices, while the facilitating conditions for its unhindered infusion into the teaching and learning processes were not a priori ensured. Nevertheless, the recently launched overall reform of the Cypriot educational system holds the promise to set up the right conditions that will facilitate the sound integration of ICT in schools.

In this context, the present study's importance lies with the fact that its findings depict a detailed picture on several aspects of ICT use and implementation by teachers, which could support the defining and setting up of these conditions which will underpin the sound ICT integration.

In any case, the study has shown that there is a positive ground on which ICT can be successfully and meaningfully integrated in schools, like teachers' positive ICT attitudes, their willingness and demand for quality ICT training, and the positive impact that ICT seems to have on some of teachers' professional responsibilities, like their teaching preparation. Nevertheless, the right educational and pedagogical context needs to be determined and set up so as ICT will be infused in schools' everyday practice, which will eventually impact education's core processes of teaching and learning. ICT is rapidly permeating every aspect of life and society, and therefore, cannot be excluded from students' learning experiences. Students spend their everyday routines surrounded by numerous technological applications that affect the way in which they perceive and understand their world and reality. Their schools and education, through contemporary pedagogical approaches, need to remain relevant to their lives and to facilitate them to develop the necessary skills and potentials which will help them become productive, useful, and successful citizens of the future society.

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Appendix 1: Instruments of data collection

Questionnaire (English version)

Dear Colleague,

The following questionnaire is a part of a research project I conduct in the context of my Ph.D studies at the University of Hull, in the United Kingdom. I would be grateful if you devote some of your time for its completion, since your viewpoints and answers will determine the final results of the study.

Your responses will be much appreciated, will be confidential and will not be used for any cause other than this study's research objectives. It should be also noted that there are not right or wrong answers. Your sincere responses will help the production of rightful conclusions and the study's results will be more useful.

The study is related to the integration of Information and Communication Technologies in Cyprus Primary Education. It is underscored that the abbreviation **ICT** included in the questionnaire is referred to Information and Communication Technologies that are defined as "any technology based on Computer and/or communication, networked or not, including equipment and software, which can be used as teaching, learning and information tools".

Sincerely yours

Manolis Michaelides

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Primary school teachers' questionnaire

Part A:

A.1 Please, state your gender (Circle the appropriate):

Male	Female

A.2 Please state your date of birth: ____/____/19____

A.3 How many years teaching experience do you have? ________ year(s)

A.4 Which grade is under your responsibility at the moment (Circle the appropriate)?

First	Second	Third	Fourth	Fifth	Sixth	Not standard grade

A.5 How would you describe your position in the school (Circle the appropriate)?

Temporary	Permanent

Part B:

B.1 How do you use ICT for professional responsibilities as a teacher [use (√)]?

Teaching preparation (ie: preparing lesson plans, teaching tools)	
Teaching support (ie: presenting lesson plans, facilitating a project-based learning activity, or researching information)	
Classroom management activities (ie: tracking attendance or word processing worksheets)	
Professional Development (ie: skill training or reading articles about teaching with technology)	
Communications (ie: emails, newsletters, or class websites)	
Student assessment (ie: online testing or student portfolios)	

B.2 In which area of your professional responsibilities as a teacher has ICT had the biggest impact? [using (√), indicate only one choice]

Teaching preparation (ie: preparing lesson plans, teaching tools)	
Teaching support (ie: presenting lesson plans, facilitating a project-based learning activity, or researching information)	
Classroom management activities (ie: tracking attendance or word processing worksheets)	
Professional Development (ie: skill training or reading articles about teaching with ICT)	
Communications (ie: emails, newsletters, or class websites)	
Student assessment (ie: online testing or student portfolios)	

B.3 Please rate your own level of competence in using ICT on the scale below, where 6 is very competent and 1 is not at all competent (circle the respective number):

Not at all competent	1	2	3	4	5	6	Very competent

B.4 Please rate your own level of competence in using ICT in teaching on the scale below, where 6 is very competent and 1 is not at all competent (circle the respective number):

Not at all competent	1	2	3	4	5	6	Very competent

B.5 How often do you use the audiovisual aids which are included in the following table, <u>during your teachings</u>? Indicate the frequency using (√):

1:Never **2:Less than once in a month** **3:At least once in a month**
4:At least once in a fortnight **5:At least once a week** **6:Everyday**

Resource	1	2	3	4	5	6
Word Processor (Microsoft Word)	1	2	3	4	5	6
Spreadsheets (Microsoft Excel)	1	2	3	4	5	6
Real Objects	1	2	3	4	5	6
CD-Roms for Educational games	1	2	3	4	5	6
Overhead Projector	1	2	3	4	5	6
Data Projector	1	2	3	4	5	6
Video conferencing	1	2	3	4	5	6
Television (video or DVD)	1	2	3	4	5	6
Printer	1	2	3	4	5	6
E-mail	1	2	3	4	5	6
Digital Camera	1	2	3	4	5	6
Educational software	1	2	3	4	5	6
Internet	1	2	3	4	5	6
Graphic/Design Software (Paint)	1	2	3	4	5	6
Radio (Tape or CD player)	1	2	3	4	5	6
Maps	1	2	3	4	5	6
Scanner	1	2	3	4	5	6
Databases (Microsoft Access)]	1	2	3	4	5	6
CD-Roms Information Sources	1	2	3	4	5	6
Presentation Software (Microsoft PowerPoint)	1	2	3	4	5	6
Models	1	2	3	4	5	6

<u>Part C:</u>

C.1 Please indicate the strength of your agreement or disagreement with the following statements:

1:Strongly Disagree **2:Disagree** **3:Somewhat Disagree**
4:Somewhat Agree **5:Agree** **6:Strongly Agree**

Statements	1	2	3	4	5	6
Facts, concepts, and principles are the most important things that students should acquire.	1	2	3	4	5	6
I set high standards for my students.	1	2	3	4	5	6
What I say and do models appropriate ways of thinking for students with respect to issues in the content.	1	2	3	4	5	6
My teaching goals and methods address a variety of ways that the students learn (different learning styles of students).	1	2	3	4	5	6
Students typically work on course projects alone with little supervision from me.	1	2	3	4	5	6
Sharing my knowledge and expertise with students is very important to me.	1	2	3	4	5	6
I give students negative feedback when their performance is unsatisfactory.	1	2	3	4	5	6
Activities in my class encourage students to develop their own ideas about content issues.	1	2	3	4	5	6
I spend time consulting with students on how to improve their work on individual and/or group projects.	1	2	3	4	5	6
What I say are important for students in order to acquire a broader perspective on the under study issues.	1	2	3	4	5	6

Students would describe my standards and expectations as somewhat strict and rigid.	1	2	3	4	5	6
I typically show students how and what to do in order to master a lessons' content.	1	2	3	4	5	6
Small group discussions are employed to help students develop their ability to think	1	2	3	4	5	6
It is my responsibility to define what students must learn and how they should learn it.	1	2	3	4	5	6
Examples from my personal experiences often are used to illustrate points about the	1	2	3	4	5	6
I guide students' work on course projects by asking questions, exploring options, and suggesting alternative ways to do things.	1	2	3	4	5	6
Developing the ability of students to think and work independently is an important goal.	1	2	3	4	5	6
Lecturing takes part a significant part of my teachings.	1	2	3	4	5	6
I provide clear guidelines for how I want the tasks that I assign to be completed.	1	2	3	4	5	6
I often show students how they can apply the principles and pieces of information they	1	2	3	4	5	6
The activities that I organise encourage students to take initiative and responsibility for their learning.	1	2	3	4	5	6
My expertise is typically used to resolve disagreements about content issues.	1	2	3	4	5	6
My teachings have very specific goals and objectives that I want to accomplish.	1	2	3	4	5	6
Students receive frequent verbal and/or written comments on their performance.	1	2	3	4	5	6
I solicit student advice about how and what to teach in the context of a subject.	1	2	3	4	5	6
Students set their own pace for completing independent and/or group projects.	1	2	3	4	5	6
Students might describe me as a "storehouse of knowledge" who dispenses the fact, principles, and concepts they need.	1	2	3	4	5	6
My expectations for what I want students to do in the class are clearly defined in the	1	2	3	4	5	6
Eventually, many students begin to think like me about a teaching's content.	1	2	3	4	5	6
My students can make choices among many activities in the context of a teaching.	1	2	3	4	5	6
My approach to teaching is similar to a manager of a work group who delegates tasks and responsibilities to subordinates.	1	2	3	4	5	6
My standards and expectations help students develop the discipline the need to learn.	1	2	3	4	5	6
Students might describe me as a "coach" who works closely with someone to correct problems in how they think and behave.	1	2	3	4	5	6
I give students a lot of personal support and encouragement to do well in their assigned activities.	1	2	3	4	5	6
In the classroom, I assume the role of a resource person who is available to students whenever they need help.	1	2	3	4	5	6

Part D:

D.1 Please indicate the strength of your agreement or disagreement with the following

1:Strongly Disagree **2:Disagree** **3:Somewhat Disagree**
4:Somewhat Agree **5:Agree** **6:Strongly Agree**

Statements	1	2	3	4	5	6
ICT makes my work easier.	1	2	3	4	5	6
Computer scares me.	1	2	3	4	5	6
ICT helps me find heaps of relevant information for my teaching	1	2	3	4	5	6
I use ICT resources effectively myself but I'm not sure how to include them in my work.	1	2	3	4	5	6
I don't know what would I do without ICT.	1	2	3	4	5	6
I manage information more effectively because of ICT.	1	2	3	4	5	6
I wish that computer had never been invented.	1	2	3	4	5	6
I find it helpful for non-work related tasks.	1	2	3	4	5	6
ICT encourages pupils to work together collaboratively.	1	2	3	4	5	6
Some pupils are as scared as me when using ICT and its resources.	1	2	3	4	5	6
I find using ICT during teaching time consuming.	1	2	3	4	5	6
I feel lost in the Information Age.	1	2	3	4	5	6
I prefer using computer on my own when no-one is around to see me make mistakes.	1	2	3	4	5	6
ICT helps pupils acquire new knowledge effectively.	1	2	3	4	5	6
It's all moving too fast for me.	1	2	3	4	5	6
I find it easy to select appropriate ICT resources for my teaching.	1	2	3	4	5	6
I can't cope with all the ICT jargon.	1	2	3	4	5	6
Pupils can get distracted by all the technology.	1	2	3	4	5	6
I can never find anything relevant for my pupils when surfing to the web.	1	2	3	4	5	6
ICT seems to motivate the pupils to learn.	1	2	3	4	5	6
The pupils are way ahead of me in their use of ICT.	1	2	3	4	5	6
I don't have time to prepare teachings using ICT.	1	2	3	4	5	6
Systems are slow, I'd be quicker using a book.	1	2	3	4	5	6
I tried to include ICT resources to my teachings but it was unsuccessful.	1	2	3	4	5	6
I know the basics but that is all.	1	2	3	4	5	6
ICT swamps pupils with information.	1	2	3	4	5	6
I don't want to use ICT resources because I consider my established practices adequate.	1	2	3	4	5	6
I don't have the appropriate skills to use it effectively.	1	2	3	4	5	6
When teaching with ICT resources the classroom is transformed into a chaos.	1	2	3	4	5	6

Part E

E.1 Please indicate the strength of your agreement or disagreement with the following

1:Strongly Disagree **2:Disagree** **3:Somewhat Disagree**
4:Somewhat Agree **5:Agree** **6:Strongly Agree**

Statements	1	2	3	4	5	6
The school I work don't have adequate equipment so as to promote the use of ICT.	1	2	3	4	5	6
The dissemination of ICT resources in my school is well organised.	1	2	3	4	5	6
I'm willing to use ICT but the access to the equipment is difficult and time consuming.	1	2	3	4	5	6
The educational software available in my school is updated and current.	1	2	3	4	5	6
Although there is equipment in my school, it is obsolescent to be used efficiently.	1	2	3	4	5	6
Every time I use a piece of equipment, there are technical troubles.	1	2	3	4	5	6
The administration of my school is quite supportive with respect to ICT use.	1	2	3	4	5	6
There is nobody to turn to when I have a technical problem.	1	2	3	4	5	6
I can easily find advise when I use ICT during my teaching.	1	2	3	4	5	6
Nobody asks for my suggestions when a new ICT innovation is introduced to my school.	1	2	3	4	5	6
My classroom is suitable for the use of ICT resources.	1	2	3	4	5	6
There is not adequate number of software in Greek.	1	2	3	4	5	6
My effort to use ICT resources is prevented by pupils' inadequate technology skills.	1	2	3	4	5	6
There are enough resources that illustrate how to integrate ICT into the curriculum.	1	2	3	4	5	6
The proportion of pupils and the available equipment averts the use of ICT.	1	2	3	4	5	6
The availability and diversity of educational software is satisfactory.	1	2	3	4	5	6
The current curriculum is not suitable for ICT integration.	1	2	3	4	5	6
Devices with technical problems are immediately fixed.	1	2	3	4	5	6

PART F:

F.1 Have you attended the ICT seminars organised by the Pedagogical Institute of

Yes	No	If the answer is Yes, which programme? --------------

F.2 Have you ever received any in-service training by an ICT coordinator from the Ministry's ICT unit? (Please tick)

Yes	No	If the answer is Yes, how many times? --------------

F.3 Regardless the training you received on ICT, which of the following do you believe is the best way to deliver ICT training?

ICT skills training	
ICT applied generally across the curriculum	
ICT applied specifically to a particular subject	
ICT training for pedagogical usage of ICT resources	

F.4 Please indicate the strength of your agreement or disagreement with the following statements:

1:Strongly Disagree **2:Disagree** **3:Somewhat Disagree**
4:Somewhat Agree **5:Agree** **6:Strongly Agree**

Statements	1	2	3	4	5	6
I am interested in learning more about using ICT.	1	2	3	4	5	6
I feel ICT training is not appropriate to my teaching.	1	2	3	4	5	6
I find training courses in ICT useful.	1	2	3	4	5	6
I need to develop my skills and knowledge for professional development.	1	2	3	4	5	6
I feel I should develop my skills to keep up to date with developments in teaching.	1	2	3	4	5	6
I don't think I need ICT skills to progress in the profession.	1	2	3	4	5	6
I'm not that interested but I suppose I should be.	1	2	3	4	5	6
I need to develop my skills and knowledge for the pupils' benefit.	1	2	3	4	5	6
I don't see the need to learn about ICT.	1	2	3	4	5	6
I'm interested but I don't have the time.	1	2	3	4	5	6
I'm interested but I don't have the access.	1	2	3	4	5	6
I don't need to use ICT in my teaching.	1	2	3	4	5	6
I really want to know more about developing my skills in ICT.	1	2	3	4	5	6
I'm interested personally but developing my skills/knowledge in ICT isn't appropriate to my teaching	1	2	3	4	5	6
I'm interested but training doesn't seem to be available.	1	2	3	4	5	6
I don't think it's necessary, no-one else in the school is bothering.	1	2	3	4	5	6
I would like to develop my skills and knowledge in ICT as everyone else is.	1	2	3	4	5	6
I feel my skills and knowledge in ICT are adequate.	1	2	3	4	5	6
ICT is not a priority for me.	1	2	3	4	5	6

F.5 Please rate your need for ICT training in each area using the given scale:

	1	2	3	4	5	6	
No need							Great need

When I receive training on ICT, I expect that I will	1	2	3	4	5	6
understand and consider the advantages and disadvantages of using ICT for teaching and teaching preparation.	1	2	3	4	5	6
be capable to prepare lessons using ICT by selecting and preparing appropriate sources of information.	1	2	3	4	5	6
acquire the skills to select and use the most appropriate software and ICT resources for specific educational situations.	1	2	3	4	5	6
be capable to decide the most effective organisation of the classroom and pupils so as to fulfil my teaching goals.	1	2	3	4	5	6
learn how to extend pupils' learning in various subjects through the use of ICT.	1	2	3	4	5	6
be adequately competent so as to intervene and pose questions to stimulate, direct, monitor and assess the learning of pupils who are using ICT.	1	2	3	4	5	6
be skilled to employ the most appropriate technologies for whole class teaching.	1	2	3	4	5	6
be capable to combine the use of ICT with other resources and methods to achieve my teaching objectives.	1	2	3	4	5	6
acquire the competence to enable pupils to demonstrate their knowledge, understanding and skills in the different subjects while using ICT.	1	2	3	4	5	6
learn how to ensure that pupils' learning in the different subjects is not masked by the technology being used.	1	2	3	4	5	6
be capable to judge the effectiveness of using ICT in achieving teaching objectives.	1	2	3	4	5	6
obtain the competence to use generic and/or subject-specific hardware and software e.g. databases, internet, presentation tools, scanners, printers etc.	1	2	3	4	5	6
be skilled to use ICT to aid record-keeping, analysis of data, target-setting, reporting, transfer of information etc.	1	2	3	4	5	6
learn how to access and using resources, including resources from online communities, websites on education and from websites of the Ministry.	1	2	3	4	5	6
be capable to access research and inspection evidence.	1	2	3	4	5	6

Many thanks for participating.

Questionnaire (Greek version)

Αγαπητέ/ή Συνάδελφε,

Το ακόλουθο ερωτηματολόγιο αποτελεί μέρος της έρευνας που διεξάγω στα πλαίσια του Διδακτορικού μου στο Πανεπιστήμιο του Hull, στο Ηνωμένο Βασίλειο. Θα σας ήμουν ευγνώμων αν αφιερώνατε λίγο χρόνο για τη συμπλήρωσή του, αφού οι απόψεις και οι απαντήσεις θα καθορίσουν και τα τελικά αποτελέσματα της έρευνας.

Οι απαντήσεις σας θα εκτιμηθούν ιδιαίτερα, θα είναι εμπιστευτικές και δε θα χρησιμοποιηθούν για οποιοδήποτε άλλο σκοπό πέρα από τους στόχους αυτής της έρευνας. Πρέπει επίσης να επισημανθεί ότι δεν υπάρχουν σωστές ή λάθος απαντήσεις. Οι ειλικρινείς απαντήσεις σας θα βοηθήσουν στην εξαγωγή ακριβέστερων συμπερασμάτων και τα αποτελέσματα της έρευνας θα είναι πιο χρήσιμα.

Η έρευνα είναι σχετική με την ενσωμάτωση των Τεχνολογιών Πληροφορίας και Επικοινωνίας στην κυπριακή Δημοτική Εκπαίδευση. Υπογραμμίζεται ότι στο ερωτηματολόγιο το ακρωνύμιο **Τ.Π.Ε** θα αναφέρεται στις Τεχνολογίες Πληροφορίας και Επικοινωνίας που ορίζονται ως «οποιαδήποτε τεχνολογία βασισμένη στον Ηλεκτρονικό Υπολογιστή ή/και στην επικοινωνία, διαδικτυωμένη ή αυτόνομη, περιλαμβανομένων συσκευών και λογισμικού, που μπορεί να χρησιμοποιηθεί ως μέσο διδασκαλίας, μάθησης και πληροφόρησης».

Με εκτίμηση

Μανώλης Μιχαηλίδης

Ηλ. Ταχυδρομείο: M.Michaelides@2004.hull.ac.uk

Ερωτηματολόγιο εκπαιδευτικών Δημοτικής

Μέρος Α:

Α.1 Παρακαλώ δηλώστε το φύλο σας (κυκλώστε το ισχύον):

Άνδρας	Γυναίκα

Α.2 Παρακαλώ δηλώστε την ημερομηνία γεννήσεώς σας: ____/____/19____

Α.3 Πόσα χρόνια εκπαιδευτικής υπηρεσίας έχετε; ________ χρόνια

Α.4 Σε ποια τάξη είστε υπεύθυνος/η αυτή τη σχολική χρονιά; (κυκλώστε το ισχύον)

Α' τάξη	Β' Τάξη	Γ' Τάξη	Δ' Τάξη	Ε' Τάξη	ΣΤ' Τάξη	Καμιά τάξη

Α.5 Ποια είναι η θέση σας στο σχολείο; (κυκλώστε το ισχύον)

Συμβασιούχος	Μόνιμος/η

Μέρος Β:

Β.1 Πως χρησιμοποιείτε τις Τεχνολογίες Πληροφορίας και Επικοινωνίας (Τ.Π.Ε) για επαγγελματικά σας καθήκοντα ως δάσκαλος; [βάλτε (√)]

Προετοιμασία διδασκαλιών (πχ: δημιουργία σχεδίων μαθήματος, διδακτικών εργαλείων)	
Διδακτική υποστήριξη (πχ: παρουσίαση σχεδίων μαθήματος, διευκόλυνση μαθησιακών δραστηριοτήτων στα πλαίσια κάποιου project, ή στην αναζήτηση πληροφοριών)	
Δραστηριότητες διαχείρισης της τάξης (πχ: πρόκληση μαθησιακού ενδιαφέροντος μέσω των	
Επαγγελματική Ανάπτυξη (πχ: εκπαίδευση σε δεξιότητες χρήσης των Τ.Π.Ε ή αναζήτηση επιστημονικών άρθρων σχετικά με την εισαγωγή των Τ.Π.Ε στη διδακτική πράξη)	
Επικοινωνία (πχ: ηλεκτρονικό ταχυδρομείο, ηλεκτρονικά δελτία ενημέρωσης ή ιστοσελίδες	
Αξιολόγηση μαθητών (πχ: online διαγωνίσματα ή μαθητικά portfolios)	

Β.2 Σε ποιο χώρο των επαγγελματικών σας καθηκόντων οι Τ.Π.Ε είχαν τη μεγαλύτερη επίδραση; [χρησιμοποιώντας (√), σημειώστε μια μόνο επιλογή]

Προετοιμασία διδασκαλιών (πχ: δημιουργία σχεδίων μαθήματος, διδακτικών εργαλείων)	
Διδακτική υποστήριξη (πχ: παρουσίαση σχεδίων μαθήματος, διευκόλυνση μαθησιακών δραστηριοτήτων στα πλαίσια κάποιου project, ή στην αναζήτηση πληροφοριών)	
Δραστηριότητες διαχείρισης της τάξης (πχ: πρόκληση μαθησιακού ενδιαφέροντος μέσω των	
Επαγγελματική Ανάπτυξη (πχ: εκπαίδευση σε δεξιότητες χρήσης των Τ.Π.Ε ή αναζήτηση επιστημονικών άρθρων σχετικά με την εισαγωγή των Τ.Π.Ε στη διδακτική πράξη)	
Επικοινωνία (πχ: ηλεκτρονικό ταχυδρομείο, ηλεκτρονικά δελτία ενημέρωσης ή ιστοσελίδες	
Αξιολόγηση μαθητών (πχ: online διαγωνίσματα ή μαθητικά portfolios)	

Β.3 Παρακαλώ, βαθμολογήστε το επίπεδο της ικανότητάς σας στη χρήση των Τ.Π.Ε στην πιο κάτω κλίμακα. Ο αριθμός 6 συμβολίζει μεγάλη ικανότητα ενώ αντίστοιχα ο αριθμός 1 μικρή ικανότητα (κυκλώστε ένα αριθμό):

Καθόλου	1	2	3	4	5	6	Πολύ ικανός/ή

Β.4 Παρακαλώ, βαθμολογήστε το επίπεδο της ικανότητάς σας στη χρήση των Τ.Π.Ε στη διδασκαλία, στην πιο κάτω κλίμακα. Ο αριθμός 6 συμβολίζει μεγάλη ικανότητα ενώ αντιστοιχα ο αριθμός 1 μικρή ικανότητα (κυκλώστε ένα αριθμό):

Καθόλου	1	2	3	4	5	6	Πολύ ικανός/ή

Β.5 Πόσο συχνά χρησιμοποιείτε τα εποπτικά μέσα που περιλαμβάνονται στον πιο κάτω πίνακα <u>κατά τη διδασκαλία</u>; Βάλτε (√) στο αντίστοιχο κουτί. Οι αριθμοί αντιστοιχούν με τα εξής:

1:Ποτέ 2:Λιγότερο από μια φορά το μήνα 3:Τουλάχιστον μια φορά
4:Τουλάχιστον μια φορά το δεκαπενθήμερο 5:Τουλάχιστον μια φορά την εβδομάδα 6:Καθη

Μέσα	1	2	3	4	5	6
Επεξεργαστή κειμένου (π.χ. Microsoft Word)	1	2	3	4	5	6
Λογιστικά Φύλλα [Spreadsheets (π.χ. Microsoft Excel)]	1	2	3	4	5	6
Πραγματικά αντικείμενα	1	2	3	4	5	6
Ψηφιακούς δίσκους υπολογιστή για εκπαιδευτικά παιχνίδια (CD-Roms Educational	1	2	3	4	5	6
Προβολέα Διαφανειών (Overhead Projector)	1	2	3	4	5	6
Βιντεοπροβολέα υπολογιστή (Data Projector)	1	2	3	4	5	6
Ηλεκτρονική Τηλεδιάσκεψη (Video conferencing)	1	2	3	4	5	6
Τηλεόραση (π.χ. Προβολή ταινιών με τη χρήση video ή DVD)	1	2	3	4	5	6
Εκτυπωτή (Printer)	1	2	3	4	5	6
Ηλεκτρονικό Ταχυδρομείο (E-mail)	1	2	3	4	5	6
Ψηφιακή φωτογραφική μηχανή	1	2	3	4	5	6
Εκπαιδευτικό λογισμικό (Educational software)	1	2	3	4	5	6
Διαδίκτυο (Internet)	1	2	3	4	5	6
Λογισμικό Ζωγραφικής/Σχεδίου (π.χ. Paint)	1	2	3	4	5	6
Ραδιόφωνο (Κασετόφωνο ή CD player)	1	2	3	4	5	6
Χάρτες	1	2	3	4	5	6
Σαρωτή Ειδώλου (Scanner)	1	2	3	4	5	6
Βάσεις Δεδομένων [Databases (π.χ. Microsoft Access)]	1	2	3	4	5	6
Ψηφιακούς δίσκους υπολογιστή ως πηγές πληροφόρησης (CD-Roms Information	1	2	3	4	5	6
Λογισμικό Παρουσιάσεων (π.χ. Microsoft PowerPoint)	1	2	3	4	5	6
Μοντέλα/ομοιώματα	1	2	3	4	5	6

<u>Μέρος Γ:</u>

Γ.1 Σε ποιο βαθμό συμφωνείτε ή διαφωνείτε με τις δηλώσεις που περιλαμβάνονται στον πιο κάτω πίνακα; Βάλτε (√) στο αντίστοιχο κουτί. Οι αριθμοί αντιστοιχούν με τα εξής:

1:Διαφωνώ απόλυτα 2:Διαφωνώ 3:Διαφωνώ μερικώς
4:Συμφωνώ μερικώς 5:Συμφωνώ 6:Συμφωνώ Απόλυτα

Δηλώσεις	1	2	3	4	5	6
Γεγονότα, έννοιες και αρχές είναι τα πιο σημαντικά πράγματα που θα πρέπει να αποχτήσουν οι μαθητές.	1	2	3	4	5	6
Θέτω ψηλά πρότυπα για τους μαθητές μου.	1	2	3	4	5	6
Ό,τι λέω και κάνω αποτελούν κατάλληλους τρόπους σκέψεις για τους μαθητές σε σχέση με τη διδακτέα ύλη.	1	2	3	4	5	6
Οι διδακτικοί μου στόχοι και μέθοδοι αντιστοιχούν σε ποικίλους τρόπους με τους οποίους μαθαίνουν οι μαθητές (διαφορετικά μαθησιακά στυλ των μαθητών).	1	2	3	4	5	6
Τυπικά οι μαθητές εργάζονται σε project μόνοι τους με μικρή εποπτεία από μένα.	1	2	3	4	5	6
Είναι σημαντικό για μένα να μοιράζομαι τη γνώση και την εμπειρία μου με τους	1	2	3	4	5	6
Δίνω αρνητική ανατροφοδότηση στους μαθητές όταν η απόδοσή τους δεν είναι ικανοποιητική.	1	2	3	4	5	6
Οι δραστηριότητες στην τάξη μου ενθαρρύνουν τους μαθητές ν'αναπτύξουν τις δικές τους ιδέες για το περιεχόμενο του μαθήματος.	1	2	3	4	5	6

Ξοδεύω χρόνο στο να συμβουλεύω τους μαθητές πως να βελτιώσουν τη δουλειά τους σε ατομικές και ομαδικές εργασίες.	1	2	3	4	5	6
Αυτά που λέω είναι σημαντικά για του μαθητές έτσι ώστε να αποχτήσουν ευρύτερη προοπτική για τα υπό μελέτη θέματα.	1	2	3	4	5	6
Οι μαθητές θα περιέγραφαν τα κριτήρια και τις προσδοκίες μου ως αυστηρά κι	1	2	3	4	5	6
Τυπικά δείχνω στους μαθητές πως και τι να κάνουν για να καταλάβουν καλά το	1	2	3	4	5	6
Οργανώνω μικρές ομάδες για να βοηθήσω τους μαθητές να αναπτύξουν την ικανότητα να σκέφτονται κριτικά.	1	2	3	4	5	6
Είναι υποχρέωσή μου να καθορίζω τι πρέπει οι μαθητές να μαθαίνουν και πως θα πρέπει να το μαθαίνουν.	1	2	3	4	5	6
Παραδείγματα από τις προσωπικές μου εμπειρίες χρησιμοποιούνται συχνά για να διευκρινίζονται σημεία του μαθήματος.	1	2	3	4	5	6
Καθοδηγώ τη δουλειά των μαθητών με το να κάνω ερωτήσεις, να εξετάζω απόψεις και να προτείνω εναλλακτικούς τρόπους.	1	2	3	4	5	6
Η ανάπτυξη της ικανότητας των μαθητών να σκέφτονται και να εργάζονται αυτόνομα είναι σημαντικός μου στόχος.	1	2	3	4	5	6
Η διάλεξη καταλαμβάνει σημαντικό μέρος των διδασκαλιών μου.	1	2	3	4	5	6
Παρέχω ξεκάθαρες οδηγίες στους μαθητές στο πως θέλω να διεξάγονται οι διάφορες δραστηριότητες που θέτω.	1	2	3	4	5	6
Συχνά δείχνω στους μαθητές πως να εφαρμόζουν τις αρχές και τις γνώσεις που	1	2	3	4	5	6
Οι δραστηριότητες που οργανώνω ενθαρρύνουν τους μαθητές να παίρνουν πρωτοβουλίες και ευθύνη για τη μάθησή τους.	1	2	3	4	5	6
Η 'αυθεντία' μου τυπικά επιστρατεύεται σε περιπτώσεις που οι μαθητές έχουν διαφωνίες σε θέματα του μαθήματος.	1	2	3	4	5	6
Οι διδασκαλίες μου έχουν συγκεκριμένους στόχους και επιδιώξεις που θέλω να	1	2	3	4	5	6
Οι μαθητές δέχονται συχνά λεκτικά και γραπτά σχόλια για την απόδοσή τους.	1	2	3	4	5	6
Επιζητώ συμβουλές από τους μαθητές για το πως και τι θα πρέπει να διδάξω.	1	2	3	4	5	6
Οι μαθητές καθορίζουν το ρυθμό ολοκλήρωσης ατομικών ή ομαδικών εργασιών.	1	2	3	4	5	6
Οι μαθητές θα με χαρακτήριζαν ως 'αποθήκη γνώσης' από την οποία διαχέονται τα γεγονότα, οι αρχές και οι ιδέες που χρειάζονται.	1	2	3	4	5	6
Οι προσδοκίες μου για το τι θέλω οι μαθητές να επιτύχουν είναι καθαρά διατυπωμένες στο αναλυτικό πρόγραμμα.	1	2	3	4	5	6
Εντέλει, ο τρόπος σκέψης μου για το περιεχόμενο των μαθημάτων θα υιοθετηθεί από αρκετούς μαθητές μου.	1	2	3	4	5	6
Οι μαθητές μου μπορούν να επιλέξουν μεταξύ πολλών δραστηριοτήτων στα πλαίσια του μαθήματος.	1	2	3	4	5	6
Η προσέγγισή μου στη διδακτική πράξη είναι παρόμοια με αυτή του επικεφαλή σε ομάδα εργασίας που διανέμει καθήκοντα και υποχρεώσεις σε υφιστάμενους.	1	2	3	4	5	6
Τα πρότυπα και οι προσδοκίες μου βοηθούν τους μαθητές να αναπτύξουν το αίσθημα της ανάγκης για μάθηση.	1	2	3	4	5	6
Οι μαθητές θα μπορούσαν να με παρομοιάσουν με 'προπονητή' που εργάζεται στενά μαζί τους για να διορθωθούν προβλήματα σε σχέση με τον τρόπο σκέψης και	1	2	3	4	5	6
Παρέχω στους μαθητές αρκετή προσωπική υποστήριξη και ενθάρρυνση προκειμένου να έχουν καλές επιδόσεις στα μαθήματα.	1	2	3	4	5	6
Στην τάξη, αναλαμβάνω το ρόλο του επινοητικού ανθρώπου που είναι διαθέσιμος στους μαθητές όποτε αυτοί τον έχουν ανάγκη.	1	2	3	4	5	6

Μέρος Δ:

Δ.1 Σε ποιο βαθμό συμφωνείτε ή διαφωνείτε με τις δηλώσεις που περιλαμβάνονται στον πιο κάτω πίνακα; Βάλτε (√) στο αντίστοιχο κουτί. Οι αριθμοί αντιστοιχούν με τα εξής:

1:Διαφωνώ απόλυτα **2:Διαφωνώ** **3:Διαφωνώ μερικώς**
4:Συμφωνώ μερικώς **5:Συμφωνώ** **6:Συμφωνώ Απόλυτα**

Δηλώσεις	1	2	3	4	5	6
Οι Τ.Π.Ε. κάνουν τη δουλειά μου ευκολότερη.	1	2	3	4	5	6
Ο υπολογιστής με φοβίζει.	1	2	3	4	5	6
Με τη βοήθεια των Τ.Π.Ε μπορώ να βρίσκω πολλές σχετικές πληροφορίες για τη διδασκαλία μου.	1	2	3	4	5	6
Χρησιμοποιώ αποτελεσματικά διάφορα τεχνολογικά μέσα για προσωπικούς λόγους, αλλά δεν είμαι σίγουρος/η πώς να τα συμπεριλάβω στη δουλειά μου.	1	2	3	4	5	6
Δεν ξέρω τι θα έκανα χωρίς τις Τ.Π.Ε.	1	2	3	4	5	6
Οι Τ.Π.Ε. με βοηθούν να διαχειρίζομαι πληροφορίες πιο αποτελεσματικά.	1	2	3	4	5	6
Εύχομαι να μη γινόταν ποτέ η ανακάλυψη του υπολογιστή.	1	2	3	4	5	6
Βρίσκω τις Τ.Π.Ε πιο χρήσιμες για ασχολίες που είναι άσχετες με τη δουλειά μου.	1	2	3	4	5	6
Οι Τ.Π.Ε. ενθαρρύνουν τους μαθητές να εργάζονται συνεργατικά.	1	2	3	4	5	6
Κάποιοι μαθητές είναι εξίσου φοβισμένοι με εμένα όταν χρησιμοποιούν τις Τ.Π.Ε.	1	2	3	4	5	6
Η χρήση των Τ.Π.Ε. κατά τη διδασκαλία είναι χρονοβόρα.	1	2	3	4	5	6
Νιώθω χαμένος/η στην "Εποχή της Πληροφορίας".	1	2	3	4	5	6
Προτιμώ να χρησιμοποιώ υπολογιστή μόνος/η μου, όταν κανένας δεν είναι παρών να με βλέπει να κάνω λάθη.	1	2	3	4	5	6
Οι Τ.Π.Ε. βοηθούν τους μαθητές να αποχτούν τη γνώση πιο αποτελεσματικά.	1	2	3	4	5	6
Όλα κινούνται με ραγδαίους ρυθμούς, σε ό,τι αφορά τις Τ.Π.Ε.	1	2	3	4	5	6
Μου είναι εύκολο να επιλέγω τα κατάλληλα τεχνολογικά μέσα για τη διδασκαλία μου.	1	2	3	4	5	6
Δεν τα βγάζω πέρα με την περίπλοκη γλώσσα της τεχνολογίας.	1	2	3	4	5	6
Η προσοχή των μαθητών μπορεί να αποσπαστεί από την ύπαρξη τόσης τεχνολογίας.	1	2	3	4	5	6
Ποτέ δε βρίσκω κάτι σχετικό για τους μαθητές μου στο διαδίκτυο.	1	2	3	4	5	6
Οι Τ.Π.Ε. φαίνεται να παρέχουν κίνητρα στους μαθητές για μάθηση.	1	2	3	4	5	6
Οι μαθητές μου είναι πιο προχωρημένοι από εμένα στη χρήση των Τ.Π.Ε.	1	2	3	4	5	6
Δεν έχω χρόνο να προετοιμάζω διδασκαλίες που να περιλαμβάνουν Τ.Π.Ε.	1	2	3	4	5	6
Τα συστήματα είναι αργά, θα ήμουν πιο γρήγορος/η αν χρησιμοποιούσα βιβλία.	1	2	3	4	5	6
Προσπάθησα να συμπεριλάβω τεχνολογικά μέσα στις διδασκαλίες μου, αλλά οι προσπάθειές μου δεν είχαν επιτυχία.	1	2	3	4	5	6
Ξέρω τα βασικά, αλλά αυτό μόνο.	1	2	3	4	5	6
Οι Τ.Π.Ε. τελματώνουν τους μαθητές με πληροφορίες.	1	2	3	4	5	6
Δεν θέλω να χρησιμοποιώ τεχνολογικά μέσα στις διδασκαλίες μου αφού θεωρώ τις ήδη υπάρχουσες πρακτικές μου επαρκείς.	1	2	3	4	5	6
Δεν έχω τα απαραίτητα προσόντα να χρησιμοποιήσω τις Τ.Π.Ε. αποτελεσματικά.	1	2	3	4	5	6
Όταν διδάσκω με τη χρήση τεχνολογικών μέσων η τάξη μετατρέπεται σε χάος.	1	2	3	4	5	6

Μέρος Ε:

Ε.1 Σε ποιο βαθμό συμφωνείτε ή διαφωνείτε με τις δηλώσεις που περιλαμβάνονται στον πιο κατω πίνακα; Βάλτε (√) στο αντίστοιχο κουτί. Οι αριθμοί αντιστοιχούν με τα εξής:

1:Διαφωνώ απόλυτα **2:Διαφωνώ** **3:Διαφωνώ μερικώς**
4:Συμφωνώ μερικώς **5:Συμφωνώ** **6:Συμφωνώ Απόλυτα**

Δηλώσεις	1	2	3	4	5	6
Το σχολείο που εργάζομαι δε διαθέτει ικανοποιητικό εξοπλισμό έτσι ώστε να προωθηθεί η χρήση των Τ.Π.Ε.	1	2	3	4	5	6
Η διανομή τεχνολογικών μέσων στο σχολείο μου είναι καλά οργανωμένη.	1	2	3	4	5	6
Είμαι πρόθυμος/η να χρησιμοποιήσω τις Τ.Π.Ε., αλλά η πρόσβαση στον εξοπλισμό είναι δύσκολη.	1	2	3	4	5	6
Το εκπαιδευτικό λογισμικό που διαθέτει το σχολείο μου είναι σύγχρονο και	1	2	3	4	5	6
Παρόλο που υπάρχει τεχνολογικός εξοπλισμός στο σχολείο μου, είναι αρκετά απαρχαιωμένος για να χρησιμοποιηθεί αποτελεσματικά.	1	2	3	4	5	6
Κάθε φορά που χρησιμοποιώ μια συσκευή αντιμετωπίζω τεχνικές δυσκολίες.	1	2	3	4	5	6
Η διεύθυνση του σχολείου μου υποστηρίζει τη χρήση των Τ.Π.Ε.	1	2	3	4	5	6
Όταν αντιμετωπίζω τεχνικές δυσκολίες δεν υπάρχει κανένας να με βοηθήσει να τις ξεπεράσω.	1	2	3	4	5	6
Όταν χρησιμοποιώ Τ.Π.Ε. στις διδασκαλίες μου, μπορώ εύκολα να βρω συμβουλές για αποτελεσματικότερη ενσωμάτωση.	1	2	3	4	5	6
Κανένας δεν επιζητά τη συμβουλή μου όταν μια καινοτομία που αφορά τις Τ.Π.Ε. εντάσσεται στο σχολείο μου.	1	2	3	4	5	6
Η τάξη μου είναι κατάλληλη για χρήση των Τ.Π.Ε.	1	2	3	4	5	6
Δεν υπάρχει ικανοποιητικός αριθμός εκπαιδευτικού λογισμικού στα Ελληνικά.	1	2	3	4	5	6
Η προσπάθειά μου να εντάξω τις Τ.Π.Ε. περιορίζεται από τις ανεπαρκείς ικανότητες των μαθητών να τις χρησιμοποιήσουν.	1	2	3	4	5	6
Υπάρχουν αρκετές πηγές πληροφόρησης που επιδεικνύουν πως οι Τ.Π.Ε. εντάσσονται στο αναλυτικό πρόγραμμα.	1	2	3	4	5	6
Η αναλογία του αριθμού των μαθητών με τον διαθέσιμο εξοπλισμό αποτρέπει τη χρήση των Τ.Π.Ε.	1	2	3	4	5	6
Ο διαθέσιμος αριθμός του εκπαιδευτικού λογισμικού είναι ικανοποιητικός.	1	2	3	4	5	6
Το αναλυτικό πρόγραμμα που ισχύει σήμερα είναι ακατάλληλο για ένταξη των Τ.Π.Ε.	1	2	3	4	5	6
Οι συσκευές με τεχνικά προβλήματα επιδιορθώνονται άμεσα.	1	2	3	4	5	6
Η ποικιλία του εκπαιδευτικού λογισμικού είναι ικανοποιητική.	1	2	3	4	5	6

Μέρος Στ:

Στ.1 Έχετε λάβει μέρος στα σεμινάρια Πληροφορικής που διοργανώνονται από το Παιδαγωγικό Ινστιτούτο Κύπρου? (κυκλώστε το ισχύον)

Ναι	Όχι	Αν Ναι, ποιο πρόγραμμα? _ _ _ _ _ _ _ _ _ _ _ _

Στ.2 Έχετε δεχτεί επίσκεψη από συντονιστές του κλιμακίου Πληροφορικής του Υπουργείου Παιδείας για παροχή επιμόρφωσης σε θέματα Πληροφορικής? (κυκλώστε το ισχύον)

Ναι	Όχι	Αν Ναι, πόσες φορές? _ _ _ _ _ _ _ _ _ _ _ _

Στ.3 Ανεξάρτητα από την εκπαίδευση που έχετε λάβει σε σχέση με την Πληροφορική στην εκπαίδευση, ποιον από τους πιο κάτω τρόπους θεωρείτε ως τον καλύτερο για λήψη επιμόρφωσης στην Πληροφορική στην εκπαίδευση; [Επιλέξτε ένα βάζοντας (√)]

Λήψη επιμόρφωσης:	
για βασικές δεξιότητες χρήσης των Τ.Π.Ε.	
για ενσωμάτωση των Τ.Π.Ε στο αναλυτικό πρόγραμμα	
για διδακτική συγκεκριμένου μαθησιακού αντικειμένου με χρήση των Τ.Π.Ε.	
για την παιδαγωγική χρήση των Τ.Π.Ε.	

Στ.4 Σε ποιο βαθμό συμφωνείτε ή διαφωνείτε με τις δηλώσεις που περιλαμβάνονται στον πιο κάτω πίνακα; Βάλτε (√) στο αντίστοιχο κουτί. Οι αριθμοί αντιστοιχούν με τα εξής:

1:Διαφωνώ απόλυτα **2:Διαφωνώ** **3:Διαφωνώ μερικώς**
4:Συμφωνώ μερικώς **5:Συμφωνώ** **6:Συμφωνώ Απόλυτα**

Δηλώσεις	**1**	**2**	**3**	**4**	**5**	**6**
Ενδιαφέρομαι να μάθω περισσότερα για τη χρήση των Τ.Π.Ε. στην εκπαίδευση.	1	2	3	4	5	6
Νιώθω ότι η επιμόρφωση στις Τ.Π.Ε. είναι ακατάλληλη σε σχέση με τη διδασκαλία	1	2	3	4	5	6
Θεωρώ την επιμόρφωση στις Τ.Π.Ε. χρήσιμη.	1	2	3	4	5	6
Χρειάζομαι να βελτιώσω τις ικανότητες και τις γνώσεις μου στη χρήση των Τ.Π.Ε. στα πλαίσια της επαγγελματικής μου ανάπτυξης.	1	2	3	4	5	6
Νιώθω ότι πρέπει να αναπτύξω τις ικανότητές μου για συμβαδίζουν με τις εξελίξεις της διδακτικής πράξης.	1	2	3	4	5	6
Δε νομίζω ότι χρειάζομαι δεξιότητες στη χρήση των Τ.Π.Ε. για να έχω επαγγελματική πρόοδο.	1	2	3	4	5	6
Δε με ενδιαφέρει και τόσο αλλά υποθέτω ότι θα έπρεπε.	1	2	3	4	5	6
Χρειάζεται να αναπτύξω τις ικανότητες και τις γνώσεις μου στις Τ.Π.Ε. για το συμφέρον των μαθητών μου.	1	2	3	4	5	6
Δεν βλέπω να υπάρχει ανάγκη να μάθω για τις Τ.Π.Ε.	1	2	3	4	5	6
Με ενδιαφέρει να μάθω περισσότερα για τις Τ.Π.Ε., αλλά δεν έχω το χρόνο.	1	2	3	4	5	6
Με ενδιαφέρει να μάθω περισσότερα για τις Τ.Π.Ε., αλλά δεν έχω πρόσβαση.	1	2	3	4	5	6
Δεν χρειάζεται να χρησιμοποιήσω τις Τ.Π.Ε. στις διδασκαλίες μου.	1	2	3	4	5	6
Θέλω πραγματικά να μάθω περισσότερα για την ανάπτυξη των δεξιοτήτων μου στις	1	2	3	4	5	6
Ενδιαφέρομαι να μάθω προσωπικά για τις Τ.Π.Ε., όχι όμως για να τις εντάξω στις διδασκαλίες μου.	1	2	3	4	5	6
Ενδιαφέρομαι για επιμόρφωση στις Τ.Π.Ε, αλλά δε φαίνεται να είναι διαθέσιμη.	1	2	3	4	5	6
Δε νομίζω να είναι απαραίτητη η επιμόρφωση στις Τ.Π.Ε. Κανένας στο σχολείο μου δε νοιάζεται ιδιαίτερα.	1	2	3	4	5	6
Πιστεύω ότι οι δεξιότητες και οι γνώσεις μου στις Τ.Π.Ε. είναι επαρκείς.	1	2	3	4	5	6
Οι Τ.Π.Ε. δεν είναι προτεραιότητα για μένα.	1	2	3	4	5	6

Στ.5 Χρησιμοποιώντας την πιο κάτω κλίμακα βαθμολογήστε την ανάγκη σας για επιμόρφωση στις Τ.Π.Ε. για τον κάθε τομέα: [βάλτε (√)]

	1	2	3	4	5	6	
Καμιά ανάγκη	←					→	**Μεγάλη ανάγκη**

Όταν επιμορφώνομαι στις Τ.Π.Ε., αναμένω ότι θα...	**1**	**2**	**3**	**4**	**5**	**6**
καταλάβω και θα κατανοήσω τα πλεονεκτήματα και τα μειονεκτήματα της χρήσης των Τ.Π.Ε. στη διδασκαλία και την προετοιμασία διδασκαλιών.	1	2	3	4	5	6
γίνω ικανός/ή στο να προετοιμάζω διδασκαλίες χρησιμοποιώντας τις Τ.Π.Ε. διαλέγοντας κατάλληλες πηγές πληροφοριών.	1	2	3	4	5	6
αποχτήσω ικανότητες να επιλέγω και να χρησιμοποιώ το καταλληλότερο λογισμικό και τενολογικά μέσα για συγκεκριμένες εκπαιδευτικές δραστηριότητες.	1	2	3	4	5	6
γίνω ικανός/ή να αποφασίζω για την πιο αποτελεσματική οργάνωση της τάξης και των μαθητών μου για επίτευξη των διδατικών μου στόχων.	1	2	3	4	5	6
μάθω πως να μεγιστοποιώ την μάθηση των μαθητών μου σε διάφορα διδακτικά αντικείμενα χρησιμοποιώντας τις Τ.Π.Ε.	1	2	3	4	5	6
γίνω ικανός/ή να επεμβαίνω και να θέτω ερωτήματα που υποκινούν, καθοδηγούν, ελέγχουν και αξιολογούν την μάθηση των μαθητών με τη χρήση των Τ.Π.Ε.	1	2	3	4	5	6
γίνω επιδέξιος/α στην αξιοποίηση των καταλληλότερων τεχνολογιών για διαδασκαλία όλης της τάξης.	1	2	3	4	5	6
γίνω ικανός/ή να συνδυάζω τη χρήση των Τ.Π.Ε. με άλλα μέσα και μεθόδους για να επιτύχω τους διδακτικούς μου στόχους.	1	2	3	4	5	6
αποχτήσω την ικανότητα να δραστηριοποιώ τους μαθητές να επιδεικνύουν τη γνώση τους, την κατανόησή τους και τις ικανότητες τους στα διάφορα διδακτικά αντικείμενα ενώ χρησιμοποιούν Τ.Π.Ε.	1	2	3	4	5	6
μάθω πώς να διασφαλίζω ότι η μάθηση των μαθητών δεν επισκιάζεται από την χρήση των Τ.Π.Ε. ως εργαλείο μάθησης.	1	2	3	4	5	6
αποχτήσω την ικανότητα να κρίνω την αποτελεσματικότητα της χρήσης των Τ.Π.Ε. για την επίτευξη διδακτικών στόχων.	1	2	3	4	5	6
αποχτήσω την ικανότητα να χρησιμοποιώ γενικό και/ή εξειδικευμένο για διαφορετικά μαθησιακά αντικείμενα τεχνικό εξοπλισμό και λογισμικό.	1	2	3	4	5	6
γίνω ικανός/ή να χρησιμοποιώ τις Τ.Π.Ε. για να διατηρώ αρχείο μαθητών, να αναλύω δεδομένα, να θέτω στόχους, να κάνω αναφορές, να μεταφέρω πληροφορίες	1	2	3	4	5	6
μάθω πώς να έχω πρόσβαση και να χρησιμοποιώ πηγές, συμπεριλαμβανομένου και πηγές από κοινότητες του διαδικτύου, ιστοσελίδες για εκπαιδευτικά θέματα και ιστοσελίδες του Υπουργείου και των υπηρεσιών του.	1	2	3	4	5	6
γίνω ικανός/ή να έχω πρόσβαση σε έρευνες και ερευνητικά αποτελέσματα / συμπεράσματα σε σχέση με την τεχνολογία, την παιδαγωγική και πιο ειδικά	1	2	3	4	5	6

Ευχαριστώ για τη συμμετοχή σας.

Interview guide (English version)

Section A: Background

A.1 Date of birth:

A.2 Length of teaching experience:

A.3 Grade responsibility:

A.4 Occupational status:

Section B: Pedagogical beliefs

B.1 What roles does the teacher need to assume during teaching?

B.2 Which are students' roles in the classroom?

B.3 How do you organise your classroom setting?

B.4 Why do you choose the particular organisation?

B.5 To what extend do you think that pupils should participate in decision making about the teaching's educational objectives, content, teaching procedures and assessment?

B.6 Can you describe the most common and frequent teaching approaches that you use?

Section C: Teacher's attitudes toward ICT – Factors affecting teacher's ICT use in the classroom

C.1 What role do you think that ICT plays in education?

C.2 According to your opinion and experience, which are the most important advantages of ICT use during teaching?

C.3 According to your opinion and experience, which are the most important disadvantages of ICT use during teaching?

C.4 What does encourage you to use ICT resources to support your teaching?

C.5 Which are the most common challenges or obstacles of ICT integration in you teaching?

Section D: Teacher's ICT training needs and attitudes towards ICT training

D.1 How would you describe the ideal way of receiving ICT training?

D.2 According to your opinion, where does ICT training should be focused on?

D.3 What ICT needs do you expect to satisfy, when receiving ICT training?

Interview guide (Greek version)

Μέρος Α: Βιογραφικά

Α.1 Ημερομηνία γέννησης:

Α.2 Εκπαιδευτική υπηρεσία:

Α.2 Υπεύθυνος/η τάξης:

Α.4 Θέση:

Μέρος Β: Παιδαγωγικές αντιλήψεις

Β.1 Ποιους ρόλους πρέπει ο δάσκαλος να αναλαμβάνει κατά τη διδασκαλία;

Β.2 Ποιοι είναι οι ρόλοι των μαθητών στην τάξη;

Β.3 Πώς οργανώνετε το μαθησιακό περιβάλλον της τάξης σας;

Β.4 Γιατί επιλέγετε τη συγκεκριμένη οργάνωση;

Β.5 Σε ποιο βαθμό πιστεύετε θα πρέπει οι μαθητές να λαμβάνουν μέρος στη λήψη αποφάσεων σχετικά με τους διδακτικούς στόχους της διδασκαλίας, το διδακτέο περιεχόμενο, τη διδακτική διαδικασία και την αξιολόγηση;

Β.6 Μπορείτε να περιγράψετε την πιο κοινή και συχνή διδακτική προσέγγιση που χρησιμοποιείτε;

Μέρος Γ: Στάσεις έναντι των ΤΠΕ – Παράγοντες που επηρεάζουν τη χρήση των ΤΠΕ στην τάξη

Γ.1 Ποιος πιστεύετε ότι είναι ο ρόλος των ΤΠΕ στην εκπαίδευση;

Γ.2 Σύμφωνα με την άποψη και την εμπειρία σας, ποια είναι τα πιο σημαντικά πλεονεκτήματα της χρήσης των ΤΠΕ κατά τη διδασκαλία;

Γ.3 Σύμφωνα με την άποψη και την εμπειρία σας, ποια είναι τα πιο σημαντικά μειονεκτήματα της χρήσης των ΤΠΕ κατά τη διδασκαλία;

Γ.4 Τί σας ενθαρρύνει να χρησιμοποιείτε τις ΤΠΕ για να στηρίξετε τη διδασκαλία σας;

Γ.5 Ποιες είναι οι πιο κοινές δυσκολίες και εμπόδια στην ενσωμάτωση των ΤΠΕ στη διδασκαλία;

Μέρος Δ: Ανάγκες επιμόρφωσης στις ΤΠΕ και στάσεις έναντι στην επιμόρφωση στις ΤΠΕ

Δ.1 Πώς θα περιέγραφες τον ιδανικό τρόπο λήψης επιμόρφωσης στις ΤΠΕ;

Δ.2 Σύμφωνα με την άποψή σας, πού θα έπρεπε να επικεντρώνεται η επιμόρφωση στις ΤΠΕ;

Δ.3 Ποιες εκπαιδευτικές σας ανάγκες αναμένετε να ικανοποιήσετε όταν λαμβάνετε επιμόρφωση στις ΤΠΕ;

Appendix 2: Scales' reliability

Resources	Item-Total Correlation	α if Item Deleted	Scale's reliability
1. Facts, concepts, and principles are the most important things that students should acquire.	0.166	0.829	0.815
2. I set high standards for my students.	0.417	0.808	
3. What I say and do models appropriate ways of thinking for students with respect to issues in the content.	0.417	0.807	
4. My teaching goals and methods address a variety of ways that the students learn (different learning styles of students).	0.339	0.810	
5. Students typically work on course projects alone with little supervision from me.	0.164	0.815	
6. Sharing my knowledge and expertise with students is very important to me.	0.378	0.809	
7. I give students negative feedback when their performance is unsatisfactory.	0.031	0.821	
8. Activities in my class encourage students to develop their own ideas about content issues.	0.412	0.808	
9. I spend time consulting with students on how to improve their work on individual and/or group projects.	0.398	0.808	
10. What I say are important for students in order to acquire a broader perspective on the under study issues.	0.548	0.805	
11. Students would describe my standards and expectations as somewhat strict and rigid.	0.228	0.813	
12. I typically show students how and what to do in order to master a lessons' content.	0.267	0.812	
13. Small group discussions are employed to help students develop their ability to think critically.	0.380	0.809	
14. It is my responsibility to define what students must learn and how they should learn it.	0.412	0.807	
15. Examples from my personal experiences often are used to illustrate points about the material.	0.426	0.807	
16. I guide students' work on course projects by asking questions, exploring options, and suggesting alternative ways to do things.	0.482	0.807	
17. Developing the ability of students to think and work independently is an important goal.	0.351	0.810	
18. Lecturing takes a significant part of my teachings.	0.223	0.813	
19. I provide clear guidelines for how I want the tasks that I assign to be completed.	0.398	0.809	
20. I often show students how they can apply the principles and pieces of information they learn.	0.479	0.807	
21. The activities that I organise encourage students to take initiative and responsibility for their learning.	0.418	0.808	
22. My expertise is typically used to resolve disagreements about content issues.	0.402	0.807	
23. My teachings have very specific goals and objectives that I want to accomplish.	0.366	0.810	
24. Students receive frequent verbal and/or written comments on their performance.	0.359	0.809	
25. I solicit student advice about how and what to teach in the context of a subject.	0.169	0.816	
26. Students set their own pace for completing independent and/or group projects.	0.190	0.815	
27. Students might describe me as a "storehouse of knowledge" who dispenses the fact, principles, and concepts they need.	0.364	0.809	
28. My expectations for what I want students to do in the class are clearly defined in the curriculum.	0.419	0.807	
29. Eventually, many students begin to think like me about a teaching's content.	0.426	0.807	
30. My students can make choices among many activities in the context of a teaching.	0.295	0.811	
31. My approach to teaching is similar to a manager of a work group who delegates tasks and responsibilities to subordinates.	0.279	0.812	
32. My standards and expectations help students develop the discipline the need to learn.	0.123	0.827	
33. Students might describe me as a "coach" who works closely with them to correct problems in how they think and behave.	0.461	0.807	
34. I give students a lot of personal support and encouragement to do well in their assigned activities.	0.416	0.808	
35. In the classroom, I assume the role of a resource person who is available to students whenever they need help.	0.402	0.808	

Table A2.1: Reliability of teachers' pedagogical beliefs (Question C.1)

Resources	**Item-Total Correlation**	**α if Item Deleted**	**Scale's reliability**
Word Processor (Microsoft Word)	0.531	0.890	
Spreadsheets (Microsoft Excel)	0.534	0.890	
Real Objects	0.163	0.900	
CD-Roms for Educational games	0.655	0.887	
Overhead Projector	0.437	0.893	
Data Projector	0.628	0.887	
Video conferencing	0.319	0.895	
Television (video or DVD)	0.493	0.891	
Printer	0.578	0.889	
E-mail	0.576	0.889	
Digital Camera	0.612	0.888	0.895
Educational software	0.689	0.885	
Internet	0.631	0.887	
Graphic/Design Software (Paint)	0.490	0.891	
Radio (Tape or CD player)	0.233	0.897	
Maps	0.253	0.898	
Scanner	0.638	0.887	
Databases (Microsoft Access)	0.520	0.891	
CD-Roms Information Sources	0.601	0.888	
Presentation Software (Microsoft PowerPoint)	0.721	0.885	
Models	0.388	0.894	

Table A2.2: Reliability of ICT and audiovisual resources use scale (Question B.5)

Statements	**Item-Total Correlation**	**α if item deleted**	**Scale's reliability**
1. ICT makes my work easier. (reversed)	0.473	0.913	
2. Computer scares me.	0.629	0.911	
3. ICT helps me find heaps of relevant information for my teaching. (reversed)	0.519	0.913	
4. I use ICT resources effectively myself but I'm not sure how to include them in my work.	0.353	0.915	
5. I don't know what I would do without ICT. (reversed)	0.354	0.916	
6. I manage information more effectively because of ICT. (reversed)	0.537	0.912	
7. I wish that computer had never been invented.	0.494	0.913	
8. I find it helpful for non-work related tasks.	0.355	0.915	
9. ICT encourages pupils to work together collaboratively. (reversed)	0.262	0.916	
10. Some pupils are as scared as me when using ICT and its resources.	0.549	0.912	
11. I find using ICT during teaching time consuming.	0.381	0.915	
12. I feel lost in the Information Age.	0.667	0.910	
13. I prefer using computer on my own when no-one is around to see me make mistakes.	0.690	0.909	
14. ICT helps pupils acquire new knowledge effectively. (reversed)	0.278	0.916	
15. It's all moving too fast regarding ICT.	-0.195	0.921	0.915
16. I find it easy to select appropriate ICT resources for my teaching. (reversed)	0.459	0.913	
17. I can't cope with all the ICT jargon.	0.645	0.910	
18. Pupils can get distracted by all the technology.	0.482	0.913	
19. I can never find anything relevant for my pupils when surfing to the web.	0.552	0.912	
20. ICT seems to motivate the pupils to learn. (reversed)	0.365	0.915	
21. The pupils are way ahead of me in their use of ICT.	0.482	0.913	
22. I don't have time to prepare teachings using ICT.	0.538	0.912	
23. Systems are slow, I'd be quicker using a book.	0.660	0.910	
24. I tried to include ICT resources to my teachings but it was unsuccessful.	0.626	0.911	
25. I know the basics but that is all.	0.732	0.908	
26. ICT swamps pupils with information.	0.512	0.912	
27. I don't want to use ICT resources because I consider my established practices adequate.	0.636	0.911	
28. I don't have the appropriate skills to use it effectively.	0.714	0.909	
29. When teaching with ICT resources the classroom is transformed into a chaos.	0.649	0.911	

Table A2.3: Reliability of teachers' ICT attitudes scale (Question D.1)

Statements	**Item-Total Correlation**	**α if item deleted**	**Scale's reliability**
1. The school I work don't have adequate equipment so as to promote the use of ICT.	0.484	0.787	0.803
2. The dissemination of ICT resources in my school is well organised. (reversed)	0.570	0.781	
3. I'm willing to use ICT but the access to the equipment is difficult and time consuming.	0.591	0.780	
4. The educational software available in my school is updated and current. (reversed)	0.537	0.786	
5. Although there is equipment in my school, it is obsolescent to be used efficiently.	0.521	0.785	
6. Every time I use a piece of equipment, there are technical troubles.	0.447	0.790	
7. The administration of my school is quite supportive with respect to ICT use. (reversed)	0.310	0.798	
8. There is nobody to turn to when I have a technical problem.	0.478	0.788	
9. I can easily find advice when I use ICT during my teaching. (reversed)	0.435	0.792	
10. Nobody asks for my suggestions when a new ICT innovation is introduced to my school.	0.349	0.796	
11. My classroom is suitable for the use of ICT resources. (reversed)	0.368	0.795	
12. There is not adequate number of software in Greek.	0.268	0.801	
13. My effort to use ICT resources is prevented by pupils' inadequate technology skills.	0.188	0.805	
14. There are enough resources that illustrate how to integrate ICT into the curriculum. (reversed)	0.341	0.797	
15. The proportion of pupils and the available equipment averts the use of ICT.	0.353	0.796	
16. The availability and diversity of educational software is satisfactory. (reversed)	0.268	0.801	
17. The current curriculum is not suitable for ICT integration.	0.078	0.813	
18. Devices with technical problems are immediately fixed. (reversed)	0.321	0.798	

Table A2.4: Reliability of factors affecting teachers' use scale (Question E.1)

When I receive training on ICT, I expect that I will:	**Item-Total Correlation**	**α if Item Deleted**	**Scale's reliability**
1. understand and consider the advantages and disadvantages of using ICT for teaching and teaching preparation.	0.560	0.932	0.932
2. be capable to prepare lessons using ICT by selecting and preparing appropriate sources of information.	0.706	0.927	
3. acquire the skills to select and use the most appropriate software and ICT resources for specific educational situations.	0.739	0.926	
4. be capable to decide the most effective organisation of the classroom and pupils so as to fulfil my teaching goals.	0.664	0.928	
5. learn how to extend pupils' learning in various subjects through the use of ICT.	0.694	0.927	
6. be adequately competent so as to intervene and pose questions to stimulate, direct, monitor and assess the learning of pupils who are using ICT.	0.720	0.926	
7. be skilled to employ the most appropriate technologies for whole class teaching.	0.683	0.927	
8. be capable to combine the use of ICT with other resources and methods to achieve my teaching objectives.	0.671	0.928	
9. acquire the competence to enable pupils to demonstrate their knowledge, understanding and skills in the different subjects while using ICT.	0.661	0.928	
10. learn how to ensure that pupils' learning in the different subjects is not masked by the technology being used.	0.661	0.928	
11. be capable to judge the effectiveness of using ICT in achieving teaching objectives.	0.743	0.926	
12. obtain the competence to use generic and/or subject-specific hardware and software e.g. databases, internet, presentation tools, scanners, printers etc.	0.672	0.928	
13. be skilled to use ICT to aid record-keeping, analysis of data, target-setting, reporting, transfer of information etc.	0.654	0.928	
14. learn how to access and use resources, including resources from online communities, websites on education and from websites of the Ministry.	0.672	0.928	
15. be capable to access research and inspection evidence.	0.644	0.929	

Table A2.5: Reliability of teachers' training needs scale (Question F.5)

Statements	**Item-Total Correlation**	**α if Item Deleted**	**Scale's reliability**
1. I am interested in learning more about using ICT.(reversed)	0.439	0.814	0.823
2. I feel ICT training is not appropriate to my teaching.	0.291	0.823	
3 I find training courses in ICT useful. (reversed)	0.493	0.812	
4. I need to develop my skills and knowledge for professional development. (reversed)	0.237	0.823	
5. I feel I should develop my skills to keep up to date with developments in teaching. (reversed)	0.251	0.822	
6. I don't think I need ICT skills to progress in the profession.	0.563	0.805	
7. I'm not that interested but I suppose I should be.	0.554	0.805	
8. I need to develop my skills and knowledge for the pupils' benefit. (reversed)	0.414	0.814	
9. I don't see the need to learn about ICT.	0.739	0.797	
10. I'm interested but I don't have the time.	0.190	0.828	
11. I'm interested but I don't have the access.	0.315	0.821	
12. I don't need to use ICT in my teaching.	0.678	0.800	
13. I really want to know more about developing my skills in ICT. (reversed)	0.380	0.816	
14. I'm interested personally but developing my skills/knowledge in ICT isn’t appropriate to my teaching	0.523	0.808	
15. I'm interested but training doesn't seem to be available.	0.243	0.825	
16. I don't think it's necessary, no-one else in the school is bothering.	0.677	0.800	
17. I feel my skills and knowledge in ICT are adequate.	0.060	0.833	
18. ICT is not a priority for me.	0.574	0.805	

Table A2.6: Reliability of teachers’ attitudes toward ICT training scale (Question F.4)

Appendix 3: Scales' frequencies

Statements	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)
Facts, concepts, and principles are the most important things that students should acquire.	2.6	9.3	17.0	36.6	24.2	10.0
I set high standards for my students.	0.2	1.4	5.9	21.4	51.5	19.5
What I say and do models appropriate ways of thinking for students with respect to issues in the content.	1.4	5.5	13.0	41.3	34.4	4.3
My teaching goals and methods address a variety of ways that the students learn (different learning styles of students).	0.5	0.0	6.0	26.0	52.0	15.5
Students typically work on course projects alone with little supervision from me.	4.1	12.3	27.5	35.7	18.6	1.9
Sharing my knowledge and expertise with students is very important to me.	0.2	1.4	2.4	16.9	48.2	30.8
Activities in my class encourage students to develop their own ideas about content issues.	0.5	1.2	6.4	26.5	51.4	14.0
I spend time consulting with students on how to improve their work on individual and/or group projects.	0.7	1.0	4.0	21.4	48.8	24.0
What I say are important for students in order to acquire a broader perspective on the under study issues.	0.0	0.7	6.0	34.5	46.0	12.7
Students would describe my standards and expectations as somewhat strict and rigid.	11.8	31.9	25.7	19.9	9.6	1.2
I typically show students how and what to do in order to master a lessons' content.	4.1	6.8	17.4	32.9	29.3	9.4
Small group discussions are employed to help students develop their ability to think critically.	0.5	1.9	6.7	27.3	48.2	15.4
It is my responsibility to define what students must learn and how they should learn it.	1.4	8.6	18.6	25.1	28.6	17.7
Examples from my personal experiences often are used to illustrate points about the material.	1.0	2.1	8.1	30.5	42.5	15.8
I guide students' work on course projects by asking questions, exploring options, and suggesting alternative ways to do things.	0.2	0.2	2.6	24.5	51.2	21.2
Developing the ability of students to think and work independently is an important goal.	0.2	0.5	1.9	11.6	44.7	41.1
Lecturing takes a significant part of my teachings.	5.7	19.5	36.0	26.2	9.8	2.9
I provide clear guidelines for how I want the tasks that I assign to be completed.	0.0	0.0	3.6	19.8	50.2	26.4
I often show students how they can apply the principles and pieces of information they learn.	0.2	1.0	3.6	26.7	52.7	15.8
The activities that I organise encourage students to take initiative and responsibility for their learning.	0.2	0.2	3.6	27.5	49.0	19.4
My expertise is typically used to resolve disagreements about content issues.	4.1	14.5	19.4	33.2	24.7	4.1
My teachings have very specific goals and objectives that I want to accomplish.	0.0	0.5	2.9	16.0	50.2	30.5
Students receive frequent verbal and/or written comments on their performance.	0.0	1.0	5.7	21.7	45.1	26.5
I solicit student advice about how and what to teach in the context of a subject.	8.0	18.4	28.7	30.0	11.4	3.6
Students set their own pace for completing independent and/or group projects.	3.1	10.8	21.6	34.5	23.3	6.7
Students might describe me as a "storehouse of knowledge" who dispenses the fact, principles, and concepts they need.	6.2	16.5	30.1	30.1	15.0	2.1
My expectations for what I want students to do in the class are clearly defined in the curriculum.	4.7	11.4	22.7	38.4	19.4	3.3
Eventually, many students begin to think like me about a teaching's content.	1.4	6.2	15.8	47.6	24.9	4.1
My students can make choices among many activities in the context of a teaching.	0.7	6.6	24.3	39.5	23.9	5.0
My approach to teaching is similar to a manager of a work group who delegates tasks and responsibilities to subordinates.	6.2	13.8	29.8	33.4	14.3	2.4
My standards and expectations help students develop the discipline the need to learn.	0.0	1.0	6.9	40.0	41.4	10.7
Students might describe me as a "coach" who works closely with them to correct problems in how they think and behave.	0.2	1.9	7.4	32.4	47.1	11.0
I give students a lot of personal support and encouragement to do well in their assigned activities.	0.0	0.7	2.9	18.5	50.6	27.3
In the classroom, I assume the role of a resource person who is available to students whenever they need help.	0.0	1.9	7.4	24.5	47.4	18.8

Table A3.1: Teachers' pedagogical beliefs (frequencies) (1=strongly disagree, 2=disagree, 3=somewhat disagree, 4=somewhat agree, 5=agree, and 6=strongly agree)

Resources	**1** (%)	**2** (%)	**3** (%)	**4** (%)	**5** (%)	**6** (%)
Word Processor (Microsoft Word)	11.2	11.0	10.5	16.8	25.1	25.4
Spreadsheets (Microsoft Excel)	38.7	31.4	14.6	7.3	7.5	0.5
Real Objects	6.0	5.0	6.7	13.6	26.1	42.7
CD-Roms for Educational games	16.1	20.5	19.0	20.5	17.6	6.3
Overhead Projector	28.4	21.8	18.7	15.0	12.1	3.9
Data Projector	30.9	21.4	17.3	14.1	12.2	4.1
Video conferencing	85.6	6.6	4.4	1.9	1.5	0
Television (video or DVD)	13.2	33.7	20.8	14.7	13.4	4.2
Printer	10.5	7.1	7.5	13.4	25.8	35.8
E-mail	36.5	12.7	7.5	6.6	13.1	23.6
Digital Camera	27.4	23.5	18.3	10.8	13.0	7.1
Educational software	21.1	19.9	17.4	15.2	19.1	7.4
Internet	14.1	14.1	10.9	13.4	22.6	24.8
Graphic/Design Software (Paint)	36.4	25.8	15.5	12.5	6.6	3.2
Radio (Tape or CD player)	4.2	9.3	12.5	22.2	30.3	21.5
Maps	10.5	14.6	11.7	19.0	27.8	16.3
Scanner	32.9	24.6	13.4	14.6	9.5	4.9
Databases (Microsoft Access)	54.3	24.2	11.2	6.1	2.7	1.5
CD-Roms Information Sources	21.9	26.3	18.0	15.8	12.9	5.1
Presentation Software (Microsoft PowerPoint)	14.1	23.4	17.8	17.3	20.9	6.6
Models	29.2	21.9	13.8	17.0	15.2	2.9

Table A3.2: Teachers' use of ICT and audiovisual resources (frequencies) (1=Never, 2=Less than once in a month, 3=At least once in a month, 4=At least once in a fortnight, 5=At least once a week, 6=Everyday)

Statements	Direction	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)
ICT makes my work easier.	+	0	2.1	5.5	25.4	35.8	31.3
Computer scares me.	-	47.5	20.4	12.8	11.6	5.0	2.6
ICT helps me find heaps of relevant information for my teaching	+	0.2	0.7	3.3	14.3	37.7	43.7
I use ICT resources effectively myself but I'm not sure how to include them in my work.	-	9.3	18.3	19.7	28.0	20.2	4.5
I don't know what I would do without ICT.	+	11.8	17.5	20.8	22.4	16.7	10.8
I manage information more effectively because of ICT.	+	2.6	3.1	8.8	23.3	42.3	20.0
I wish that computer had never been invented.	-	72.0	14.8	5.0	2.9	3.1	2.2
I find it helpful for non-work related tasks.	-	19.4	26.6	23.2	16.5	11.7	2.6
ICT encourages pupils to work together collaboratively.	+	2.2	6.7	15.4	37.5	28.4	9.9
Some pupils are as scared as me when using ICT and its resources.	-	25.1	25.6	17.9	18.1	11.4	1.9
I find using ICT during teaching time consuming.	-	11.5	13.4	17.7	31.1	20.3	6.0
I feel lost in the Information Age.	-	42.5	23.6	12	13.9	5.5	2.4
I prefer using computer on my own when no-one is around to see me make mistakes.	-	45.9	22.5	11.7	9.8	7.2	2.9
ICT helps pupils acquire new knowledge effectively.	+	1.0	4.6	9.4	39.8	32.9	12.5
I find it easy to select appropriate ICT resources for my teaching.	+	1.2	6.5	17.5	39.3	25.7	9.8
I can't cope with all the ICT jargon.	-	31.1	24.2	16.7	19.1	6.2	2.6
Pupils can get distracted by all the technology.	-	12.3	20.9	25.0	27.4	11.1	3.4
I can never find anything relevant for my pupils when surfing to the web.	-	50.5	30.3	9.9	5.0	3.4	1.0
ICT seems to motivate the pupils to learn.	+	1.7	2.6	7.7	31.3	39.0	17.7
The pupils are way ahead of me in their use of ICT.	-	28.8	24.8	19.0	15.0	10.2	2.1
I don't have time to prepare teachings using ICT.	-	10.0	19.4	20.3	34.4	12.2	3.6
Systems are slow, I'd be quicker using a book.	-	20.0	27.5	23.2	18.4	8.7	2.2
I tried to include ICT resources to my teachings but it was unsuccessful.	-	26.1	33.5	20.6	12.0	6.0	1.9
I know the basics but that is all.	-	34.6	25.8	11.8	13.7	11.1	2.8
ICT swamps pupils with information.	-	18.9	25.5	25.2	20.6	7.6	2.2
I don't want to use ICT resources because I consider my established practices adequate.	-	30.3	39.6	16.9	8.4	3.3	1.4
I don't have the appropriate skills to use it effectively.	-	31.3	30.3	13.0	12.8	9.2	3.3
When teaching with ICT resources the classroom is transformed into a chaos.	-	29.8	36.1	18.0	11.3	4.1	0.7

Table A3.3: Teachers' attitudes toward ICT (frequencies) (1=strongly disagree, 2=disagree, 3=somewhat disagree, 4= somewhat agree, 5=agree, 6=strongly agree)

Statements	**1** (%)	**2** (%)	**3** (%)	**4** (%)	**5** (%)	**6** (%)
The school I work don't have adequate equipment so as to promote the use of ICT.	14.6	22.7	12.9	20.0	19.3	10.5
The dissemination of ICT resources in my school is well organised.	9.5	18.1	18.1	21.7	23.8	8.8
I'm willing to use ICT but the access to the equipment is difficult and time consuming.	12.6	17.6	22.2	21.5	19.3	6.8
The educational software available in my school is updated and current.	4.3	8.4	15.3	36.7	26.4	8.9
Although there is equipment in my school, it is obsolescent to be used efficiently.	15.9	31.6	17.6	17.6	13.3	4.1
Every time I use a piece of equipment, there are technical troubles.	15.5	23.3	20.6	21.6	16.5	2.4
The administration of my school is quite supportive with respect to ICT use.	1.9	3.1	7.2	19.9	43.4	24.5
There is nobody to turn to when I have a technical problem.	17.5	25	23.6	18.8	10.3	4.8
I can easily find advice when I use ICT during my teaching.	3.9	13.1	24.0	32.7	20.8	5.6
Nobody asks for my suggestions when a new ICT innovation is introduced to my school.	10.8	19.6	26.7	21.5	13.9	7.6
My classroom is suitable for the use of ICT resources.	13.3	19.0	20.5	24.2	16.5	6.4
There is not adequate number of software in Greek.	5.0	14.1	21.3	27.0	25.0	7.7
My effort to use ICT resources is prevented by pupils' inadequate technology skills.	10.0	19.9	26.2	28.4	12.9	2.7
There are enough resources that illustrate how to integrate ICT into the curriculum.	5.6	19.9	23.0	31.9	14.2	5.4
The proportion of pupils and the available equipment averts the use of ICT.	3.6	9.2	10.2	21.1	31.3	24.5
The availability and diversity of educational software is satisfactory.	10.5	18.5	25.1	29.3	14.1	2.4
The current curriculum is not suitable for ICT integration.	5.9	16.2	21.6	26.5	19.2	10.6
Devices with technical problems are immediately fixed.	20.8	32.5	17.9	18.1	7.6	3.1

Table A3.4: Factors affecting teacher use of ICT (frequencies) (1=strongly disagree, 2=disagree, 3=somewhat disagree, 4= somewhat agree, 5=agree, 6=strongly agree)

When I receive training on ICT, I expect that I will:	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)
understand and consider the advantages and disadvantages of using ICT for teaching and teaching preparation.	5.3	6.6	10.4	25.5	32.8	19.4
be capable to prepare lessons using ICT by selecting and preparing appropriate sources of information.	0.7	1.7	5.1	15.0	40.5	36.9
acquire the skills to select and use the most appropriate software and ICT resources for specific educational situations.	0.5	1.0	3.9	18.1	42.8	33.7
be capable to decide the most effective organisation of the classroom and pupils so as to fulfil my teaching goals.	1.0	3.9	7.0	23.3	36.7	28.2
learn how to extend pupils' learning in various subjects through the use of ICT.	0.5	1.2	5.1	20.2	37.2	35.8
be adequately competent so as to intervene and pose questions to stimulate, direct, monitor and assess the learning of pupils who are using ICT.	0.7	2.2	10.7	25.9	37.1	23.4
be skilled to employ the most appropriate technologies for whole class teaching.	0.2	1.2	5.1	19.2	38.4	35.8
be capable to combine the use of ICT with other resources and methods to achieve my teaching objectives.	0.2	1.2	4.6	16.3	40.6	37.0
acquire the competence to enable pupils to demonstrate their knowledge, understanding and skills in the different subjects while using ICT.	0.5	1.2	6.6	29.3	35.6	26.8
learn how to ensure that pupils' learning in the different subjects is not masked by the technology being used.	1.7	2.9	12.3	26.3	33.2	23.6
be capable to judge the effectiveness of using ICT in achieving teaching objectives.	1.5	2.7	11.5	25.7	35.5	23.2
obtain the competence to use generic and/or subject-specific hardware and software e.g. databases, internet, presentation tools, scanners, printers etc.	1.0	1.7	5.4	21.5	41.7	28.8
be skilled to use ICT to aid record-keeping, analysis of data, target-setting, reporting, transfer of information etc.	2.9	5.1	12.7	22.7	32.5	24.0
learn how to access and use resources, including resources from online communities, websites on education and from websites of the Ministry.	3.4	4.4	9.8	20.0	30.3	32.0
be capable to access research and inspection evidence.	2.2	6.1	16.8	22.4	29.0	23.4

Table A3.5: Teachers' training needs in ICT (frequencies) (1=No need to 6=Great need)

Statements	Direction	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)
I am interested in learning more about using ICT.	+	0.5	0.7	2.7	15.5	35.0	45.6
I feel ICT training is not appropriate to my teaching.	-	23.8	28.4	15.9	14.2	12.3	5.4
I find training courses in ICT useful.	+	0.2	1.0	2.7	14.0	38.1	44.0
I need to develop my skills and knowledge for professional development.	+	1.2	2.2	6.8	27.4	36.7	25.7
I feel I should develop my skills to keep up to date with developments in teaching.	+	1.0	2.9	7.6	26.2	36.2	26.2
I don't think I need ICT skills to progress in the profession.	-	30.7	29.0	21.2	12.9	4.6	1.7
I'm not that interested but I suppose I should be.	-	35.5	29.6	14.8	11.1	6.7	2.5
I need to develop my skills and knowledge for the pupils' benefit.	+	1.2	2.2	6.1	26.3	37.1	27.0
I don't see the need to learn about ICT.	-	48.3	28.9	12.7	5.4	4.2	0.5
I'm interested but I don't have the time.	-	8.8	15.8	17.5	31.4	17.8	8.8
I'm interested but I don't have the access.	-	16.7	25.9	20.9	22.7	10.1	3.7
I don't need to use ICT in my teaching.	-	45.8	29.7	13.6	7.2	3.2	0.5
I really want to know more about developing my skills in ICT.	+	2.2	3.4	4.9	20.6	38.3	30.5
I'm interested personally but developing my skills/knowledge in ICT isn't appropriate to my teaching	-	27.3	34.4	19.4	9.6	6.6	2.5
I'm interested but training doesn't seem to be available.	-	13.2	24.9	22.9	20.1	14.2	4.7
I don't think it's necessary, no-one else in the school is bothering.	-	44.6	32.8	12.5	4.9	4.2	1.0
ICT is not a priority for me.	-	31.4	32.1	16.1	13.9	5.1	1.5

Table A3.6: Teachers' attitudes toward ICT training (frequencies) (1=strongly disagree, 2=disagree, 3=somewhat disagree, 4= somewhat agree, 5=agree, 6=strongly agree)

Appendix 4: Subscales' reliability

	Statements	Item-Total Correlation	α if Item Deleted	Subscale's reliability
Teacher as 'facilitator'	My teaching goals and methods address a variety of ways that the students learn (different learning styles of students).	0.532	0.734	0.769
	Activities in my class encourage students to develop their own ideas about content issues.	0.563	0.728	
	Small group discussions are employed to help students develop their ability to think critically.	0.500	0.739	
	The activities that I organise encourage students to take initiative and responsibility for their learning.	0.543	0.733	
	I spend time consulting with students on how to improve their work on individual and/or group projects.	0.491	0.740	
	I set high standards for my students.	0.440	0.749	
	Developing the ability of students to think and work independently is an important goal.	0.485	0.742	
	What I say are important for students in order to acquire a broader perspective on the under study issues.	0.245	0.787	
Teacher as 'expert'	Students might describe me as a "storehouse of knowledge" who dispenses the fact, principles, and concepts they need.	0.566	0.653	0.717
	Lecturing takes a significant part of my teachings.	0.424	0.686	
	My expectations for what I want students to do in the class are clearly defined in the curriculum.	0.452	0.679	
	Eventually, many students begin to think like me about a teaching's content.	0.502	0.672	
	My expertise is typically used to resolve disagreements about content issues.	0.411	0.689	
	What I say and do models appropriate ways of thinking for students with respect to issues in the content.	0.252	0.716	
	Students would describe my standards and expectations as somewhat strict and rigid.	0.327	0.708	
	My approach to teaching is similar to a manager of a work group who delegates tasks and responsibilities to subordinates.	0.341	0.703	
Teacher as 'formal authority'	My teachings have very specific goals and objectives that I want to accomplish.	0.582	0.651	0.731
	Students receive frequent verbal and/or written comments on their performance.	0.444	0.705	
	I give students a lot of personal support and encouragement to do well in their assigned activities.	0.550	0.662	
	I provide clear guidelines for how I want the tasks that I assign to be completed.	0.494	0.684	
	Students might describe me as a "coach" who works closely with them to correct problems in how they think and behave.	0.405	0.719	
Teacher as 'personal model'	Examples from my personal experiences often are used to illustrate points about the material.	0.461	0.620	0.679
	I guide students' work on course projects by asking questions, exploring options, and suggesting alternative ways to do things.	0.489	0.621	
	I often show students how they can apply the principles and pieces of information they learn.	0.492	0.619	
	It is my responsibility to define what students must learn and how they should learn it.	0.453	0.627	
	I typically show students how and what to do in order to master a lessons' content.	0.329	0.676	
	Sharing my knowledge and expertise with students is very important to me.	0.322	0.664	
Teacher as 'delegator'	I solicit student advice about how and what to teach in the context of a subject.	0.293	0.401	0.481
	My students can make choices among many activities in the context of a teaching.	0.362	0.362	
	Students typically work on course projects alone with little supervision from me.	0.226	0.448	
	Students set their own pace for completing independent and/or group projects.	0.256	0.429	
	In the classroom, I assume the role of a resource person who is available to students whenever they need help.	0.167	0.478	

Table A4.1: Reliability of the pedagogical beliefs subscales

Factors	**Resources**	**Item-Total Correlation**	**α if Item Deleted**	**Subscales' reliability**
Infrequently used ICT resources	Presentation Software	0.731	0.81	0.852
	CD-R Information Sources	0.618	0.831	
	Data Projector	0.620	0.831	
	Educational software	0.661	0.823	
	CD-R Educational games	0.620	0.831	
	Digital Camera	0.564	0.853	
	Scanner	0.576	0.839	
Frequently used ICT resources	Printer	0.636	0.752	0.806
	E-mail	0.639	0.754	
	Internet	0.671	0.733	
	Word Processor	0.558	0.786	
Underused ICT resources	Video conferencing	0.436	0.637	0.672
	Databases	0.582	0.517	
	Spreadsheets	0.458	0.603	
	Graphic/Design Software	0.407	0.654	

Table A4.2: Reliability of ICT use subscales

Factors	Statements	Item-Total Correlation	α if Item Deleted	Subscales' reliability
Low confidence in the use of ICT	I feel lost in the Information Age.	0.726	0.879	0.896
	I know the basics but that is all.	0.775	0.874	
	I prefer using computer on my own when no-one is around to see me make mistakes.	0.733	0.878	
	I can't cope with all the ICT jargon.	0.708	0.880	
	I don't have the appropriate skills to use it effectively.	0.732	0.878	
	The pupils are way ahead of me in their use of ICT.	0.580	0.892	
	I wish that computer had never been invented.	0.496	0.898	
	Computer scares me.	0.664	0.885	
Negative attitudes toward ICT	I don't want to use ICT resources because I consider my established practices adequate.	0.666	0.837	0.857
	When teaching with ICT resources the classroom is transformed into a chaos.	0.650	0.838	
	Systems are slow, I'd be quicker using a book.	0.652	0.837	
	I tried to include ICT resources to my teachings but it was unsuccessful.	0.631	0.839	
	Pupils can get distracted by all the technology.	0.514	0.847	
	I don't have time to prepare teachings using ICT.	0.550	0.844	
	I find it helpful for non-work related tasks.	0.525	0.846	
	ICT swamps pupils with information.	0.411	0.854	
	I can never find anything relevant for my pupils when surfing to the web.	0.550	0.845	
	I find using ICT during teaching time consuming.	0.416	0.854	
	I use ICT resources effectively myself but I'm not sure how to include them in my work.	0.383	0.856	
	Some pupils are as scared as me when using ICT and its resources.	0.499	0.848	
Positive attitudes toward ICT	ICT helps pupils acquire new knowledge effectively.	0.535	0.757	0.787
	I manage information more effectively because of ICT.	0.650	0.737	
	ICT makes my work easier.	0.586	0.751	
	I don't know what I would do without ICT.	0.487	0.772	
	ICT helps me find heaps of relevant information for my teaching	0.553	0.757	
	ICT seems to motivate the pupils to learn.	0.446	0.770	
	ICT encourages pupils to work together collaboratively.	0.395	0.779	
	I find it easy to select appropriate ICT resources for my teaching.	0.372	0.782	

Table A4.3: Reliability of ICT attitudes subscales

Factor	Statements	Item-Total Correlation	α if item deleted	Subscale's reliability
ICT use enablers	The dissemination of ICT resources in my school is well organised.	0.538	0.679	0.732
	The educational software available in my school is updated and current.	0.571	0.677	
	My classroom is suitable for the use of ICT resources.	0.427	0.705	
	There are enough resources that illustrate how to integrate ICT into the curriculum.	0.442	0.701	
	The availability and diversity of educational software is satisfactory.	0.356	0.718	
	The administration of my school is quite supportive with respect to ICT use.	0.348	0.719	
	I can easily find advice when I use ICT during my teaching.	0.429	0.704	
	Devices with technical problems are immediately fixed.	0.297	0.730	
ICT use barriers	Every time I use a piece of equipment, there are technical troubles.	0.512	0.677	0.722
	There is nobody to turn to when I have a technical problem.	0.497	0.679	
	Although there is equipment in my school, it is obsolescent to be used efficiently.	0.555	0.668	
	I'm willing to use ICT but the access to the equipment is difficult and time consuming.	0.537	0.671	
	My effort to use ICT resources is prevented by pupils' inadequate technology skills.	0.292	0.715	
	There is not adequate number of software in Greek.	0.306	0.713	
	The current curriculum is not suitable for ICT integration.	0.151	0.740	
	Nobody asks for my suggestions when a new ICT innovation is introduced to my school.	0.329	0.710	
	The school I work don't have adequate equipment so as to promote the use of ICT.	0.404	0.697	

Table A4.4: Reliability of factors affecting ICT use subscales

Factors	When I receive training on ICT, I expect that I will:	Item-Total Correlation	α if Item Deleted	Subscales' reliability
Training needs for practical applications	be capable to combine the use of ICT with other resources and methods to achieve my teaching objectives.	0.761	0.904	0.917
	learn how to extend pupils' learning in various subjects through the use of ICT.	0.722	0.907	
	be skilled to employ the most appropriate technologies for whole class teaching.	0.758	0.905	
	acquire the skills to select and use the most appropriate software and ICT resources for specific educational situations.	0.698	0.909	
	be capable to decide the most effective organisation of the classroom and pupils so as to fulfil my teaching goals.	0.728	0.906	
	be adequately competent so as to intervene and pose questions to stimulate, direct, monitor and assess the learning of pupils who are using ICT.	0.675	0.910	
	acquire the competence to enable pupils to demonstrate their knowledge, understanding and skills in the different subjects while using ICT.	0.684	0.909	
	be capable to prepare lessons using ICT by selecting and preparing appropriate sources of information.	0.641	0.912	
	obtain the competence to use generic and/or subject-specific hardware and software e.g. databases, internet, presentation tools, scanners, printers etc.	0.721	0.907	
Training needs for theoretical issues	be capable to access research and inspection evidence.	0.520	0.874	0.869
	be skilled to use ICT to aid record-keeping, analysis of data, target-setting, reporting, transfer of information etc.	0.613	0.855	
	learn how to access and use resources, including resources from online communities, websites on education and from websites of the Ministry.	0.710	0.840	
	be capable to judge the effectiveness of using ICT in achieving teaching objectives.	0.711	0.838	
	learn how to ensure that pupils' learning in the different subjects is not masked by the technology being used.	0.744	0.832	
	understand and consider the advantages and disadvantages of using ICT for teaching and teaching preparation.	0.723	0.836	

Table A4.5: Reliability of ICT training needs subscales

Factor	Statements	Item-Total Correlation	α if Item Deleted	Subscales' reliability
Negative attitudes toward ICT training	I don't see the need to learn about ICT.	0.683	0.818	0.842
	I don't think it's necessary, no-one else in the school is bothering.	0.667	0.819	
	I don't need to use ICT in my teaching.	0.651	0.821	
	I'm interested personally but developing my skills/knowledge in ICT isn't appropriate to my teaching	0.595	0.823	
	I'm not that interested but I suppose I should be.	0.597	0.823	
	ICT is not a priority for me.	0.593	0.824	
	I'm interested but I don't have the access.	0.480	0.833	
	I don't think I need ICT skills to progress in the profession.	0.522	0.829	
	I'm interested but I don't have the time.	0.363	0.843	
	I'm interested but training doesn't seem to be available.	0.359	0.843	
	I feel ICT training is not appropriate to my teaching.	0.363	0.845	
Positive attitudes toward ICT training	I need to develop my skills and knowledge for professional development.	0.652	0.771	0.817
	I feel I should develop my skills to keep up to date with developments in teaching.	0.642	0.773	
	I am interested in learning more about using ICT.	0.642	0.777	
	I need to develop my skills and knowledge for the pupils' benefit.	0.514	0.802	
	I find training courses in ICT useful.	0.575	0.790	
	I really want to know more about developing my skills in ICT.	0.494	0.810	

Table A4.6: Reliability of ICT training attitudes subscales