The 2013 ICT Census in Schools – Main Report

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Acronyms

ACT21S	Assessment and Teaching of 21st Century Skills
AUP	ICT Acceptable Use Policy
BYOD	Bring Your Own Device
CPD	Continuing Professional Development
CATE	Centre for Technological Support for Schools (Portugal)
CMOD	Centre for Management and Organisation Development, and e-government, Department of Public Expenditure and Reform
DES	Department for Education and Skills (previously, Department of Education and Science)
DEIS	Delivering Equality of Opportunity in Schools
DECNR	Department of Energy, Communications and Natural Resources
ESRI	Economic and Social Research Institute
ESSIE	European Survey of Schools: ICT in Education (2011)
ETB	Education and Training Board
EPV	Extra Personal Vacation
HEAnet	Higher Education Authority's National Education and Research Network
IaaS	Information as a Service
ICT	Information and Communications Technologies
ICT-CF	Information and Communications Technologies-Competence Framework
IEA	International Association for the Evaluation of Educational Achievement
IETA	International Experiences with Technology in Education (Study)
ISP	Innovative Schools Project
ISTE	International Society for Technology in Education
ITL	Innovative Teaching and Learning Project
LMS	Learning Management System
NCTE	National Centre for Technology in Education
OECD	Organisation for Economic Cooperation and Development
PaaS	Platform-as-a-Service
PDST-TIE	Professional Development Service for Teachers – Technology in Education (formerly, NCTE)
PIRLS	Progress in International Literacy Study
PISA	Programme for International Student Assessment
SaaS	Software-as-a-Service
SIP	Schools Integration Project
SITES	Second Information in Technology Study 2006
TIMSS	Trends in International Mathematics and Science Study
TKI	Te Kete Ipurangi (New Zealand Maori Internet Learning Tool)
VEC	Vocational Education Committee

Preface

The ICT Section of the Department of Education and Skills is currently preparing a Digital Strategy for Schools. In spring 2013, as part of this process, the PDST-TIE (Professional Support Service for Teachers – Technology in Education, formerly the National Centre for Technology in Education), undertook a census of ICT in primary, post-primary and special schools on behalf of the Department. School principals in all schools in each sector were asked to complete an on-line School Questionnaire while samples of class teachers in each sector were asked to complete an on-line Teacher Questionnaire. The questionnaires were designed to gather data relating to the following themes:

- The impact of ICT on teaching, learning and assessment.
- School-wide planning for integration of ICT in teaching and learning.
- The current ICT infrastructural base across schools.
- Continuing ICT-related professional development for teachers.
- Curriculum-relevant digital content and software resources.
- Access to:
    - ICT equipment.
    - Curriculum-relevant digital content and software resources generally and in specific contexts (special education needs, literacy, numeracy).
- Views on the opportunities presented by the integration of ICT into teaching, learning and assessment.
- Obstacles to ICT integration and how they could be overcome.
- Views and experience on the relevance of ICT in specific contexts (e.g., literacy and numeracy, special educational needs).
- Exploring current practice and views regarding a range of areas, including (but not limited to):
    - Use of ICT in formative and summative assessment.
    - Technical support in schools.
    - Integration of student devices for learning.
    - E-books.
    - Virtual learning environments and other collaborative platforms within or across schools.
    - E-portfolios.
- Pupils' access to ICT for learning outside the school context.

The Department of Education and Skills awarded a contract to a consortium comprising the Educational Research Centre and the Education Department, St Patrick's College to conduct analyses relating to the 2013 ICT Census. The contract required the consortium to:

- Review draft census questionnaires.
- Prepare a comprehensive analysis of all the survey data collected and present it in a report containing:
    - An executive summary.
    - A detailed analysis of the findings in relation to key themes and other parameters, involving the analysis of responses to individual questions and the identification of significant correlations emerging from cross-analysis between responses.

- Conduct an international comparison using existing published data, comprising two elements:
    - A quantitative assessment of the position of Ireland in relation to a selection of no more than 10 quantitative indicators (covered by survey questions) in OECD countries.
    - A qualitative comparison, reviewing major international trends in relation to key themes.

While the consortium was asked to analyse the census data, the actual census was conducted by the PDST Technology in Education (formerly NCTE).

Chapter 1 situates the 2013 Census in the context of current educational reform efforts as well as earlier audits of ICTs in schools. Chapter 2, a literature review, focuses on current international research and trends in three areas: infrastructure, learning, teaching and assessment through the use of ICT, and teacher professional learning. Chapter 3 describes administration of the 2013 Census. It summarises the content of the online questionnaires that were administered to schools and teachers and outlines response rates and the application of survey weights. It also outlines how quantitative and qualitative analyses of the data were conducted.

Chapter 4 is about ICT infrastructure in schools. Its focus is on the responses provided by school principals to a broad range of questions addressing themes such as availability of ICT devices, school websites, procurement frameworks, and provision of technical support. Comparisons with the 2005 ICT Census are drawn. Chapter 5 describes the views of school principals on ICTs in teaching and learning based on their responses to the School Questionnaire. Topics covered include ICT planning, the use of ICTs in schools, and perceived effects of ICTs on aspects of teaching and learning. Chapter 6 comprises an analysis of comments offered by school principals on the School Questionnaire.

The focus of Chapters 7 and 8 shifts from school-level issues related to ICT to classroom-level issues. Chapter 7 addresses key themes drawn from the questionnaire completed by teachers. These are: general characteristics of teachers in the survey, teaching beliefs and practices, teachers' confidence in using ICTs, teachers' access to and use of ICTs, teachers' perceived obstacles and priorities in using ICTs, teachers participation in and views on CPD in ICT, and teachers' use of ICTs. Chapter 8 summarises the comments provided by teachers on the Teacher Questionnaire.

Chapter 9 describes data on ICT and attitudes towards ICT drawn from three recent international studies of educational achievement – two at primary level (PIRLS 2011, TIMSS 2011) and one at post-primary level (PISA 2012). The position of Ireland relative to other countries participating in these studies is compared, drawing on data provided by school principals, teachers and pupils. Three broad themes that are explored are: students' access to and use of ICTs at school and at home, teachers' reports of ICT usage and confidence in using ICT, and ICT and school policy.

Chapter 10, the final chapter, comprises a set of conclusions drawn from the literature review in Chapter 2 and the analyses reported on in Chapters 4-9.

A book of Appendix Tables based on this report is available for download at http://www.erc.ie/publications. A summary report on the 2013 ICT Census of Schools can also be downloaded at this address.

Executive Summary

Context of the Census

As noted in the Preface, the 2013 ICT Census of Schools took place in a context in which a Digital Strategy for Schools covering the next five years is being prepared by the Department of Education and Skills. The census also took place in a context in which the integration of ICTs into teaching and learning is constantly changing; substantive improvements in technology have occurred in recent years and expectations for ICT use of primary and post-primary schools have heightened. The impetus for change has come from inside the educational system (the development of new curricula at primary level, implementation of Project Maths, and planned changes to the Junior Cycle), from Irish society more broadly (e.g., the *National Digital Strategy, DCENR, 2013)*, and from Europe (e.g., the *Digital Agenda for Europe,* European Commission, 2010, 2013). Internationally, some progress has been made in understanding how teachers can be best supported to integrate ICT into teaching and learning (e.g., UNESCO, 2008a, 2011). Student competence in the use of ICTs is now considered essential in its own right, as is the development of other '21st century skills' such as creativity, innovation, collaboration and problem solving, through the use of ICTs.

A number of key national reports and strategies have been published since the last ICT Census in 2005, though the most recent of these appeared in 2009. A report by the Inspectorate of the (then) Department of Education and Science, *ICT in Schools – Inspectorate Evaluation Studies* (DES, 2008), highlighted positive aspects of ICT usage in schools, but also pointed to deficiencies in infrastructure, technical support, and the integration of ICTs in teaching and learning, with particular gaps observed in ICT usage and in the range of ICT skills deployed by students in both primary and post-primary schools. Two policy-driven reports, *Investing Effectively in Information and Communications Technology in Schools* (Minister's Strategy Group, 2008) and *Smart Schools = Smart Economy* (ICT in Schools Joint Advisory Group to the Minister of Education, 2009), outlined strategies for improving ICT usage in schools. Both highlighted the key role of teacher professional learning, along with the need to provide appropriate, classroom-focused digital content, to develop broadband capacity, and to address maintenance and support issues.

Following extensive Government spending on ICTs as part of the *Schools IT 2000* (DES, 1997) and *Blueprint for the Future of ICT in Irish Schools* (DES, 2001) initiatives, direct funding to schools has continued, albeit at a slower pace. The ICT in Schools Programme provided schools with equipment grants at a cost of €92 million, beginning in 2009/10. More recently, post-primary schools are being provided with 100 Mbps broadband at an estimated cost of €51 million in a joint initiative involving the Department of Communications, Energy and Natural Resources and the Department of Education and Skills. Currently, the Department for Education and Skills supports schools in meeting ongoing costs of broadband.

Several international studies published in recent years have drawn attention to low average levels of ICT usage by students in schools in Ireland. For example, the PISA 2012 study pointed to low levels of computer use by Irish 15-year olds at home for schoolwork, and at school for school-related tasks (Perkins et al., 2013). An EU Survey of Schools (the ESSIE study), which was conducted in Autumn 2011, drew attention to heavy usage of ICTs by teachers in Ireland to present lesson content,

coupled with low levels of ICT usage by students (European Schoolnet and the University of Liège, 2012). Consistent with PISA, students in Second and Fifth years in Ireland in the ESSIE study ranked 26th of 27 countries in their use of ICT-based activities during lessons, including searching on the Internet, posting homework on the school website and using computers to conduct experiments.

Review of the Literature

A review of international research focused on three broad areas: ICT infrastructure in schools; learning, teaching and assessment through the use of ICT; and teacher professional learning. Relating to infrastructure, the review noted that a school's broadband bandwidth increasingly determines online content, functionality and applications students and teachers will be able to use effectively in the classroom (Fox, Waters, Fletcher & Levin, 2012). Hence, all network applications and traffic, as well as technologies for more efficient use of bandwidth, should be factored into the architecture and design of school networks (CISCO, 2013). It was also noted that the trend in schools across the world has been towards the use of progressively smaller, more portable computers, including Bring Your Own Device (BYOD) products, which could free up school ICT funding for other purposes. The need for adequate technical support in schools and classrooms was emphasised, as was the link between the degree of support available to teachers when using ICT and level of ICT usage. It was concluded that access to a coordinated, integrated system-wide approach to technical support and maintenance at a national level is essential to ensuring a functioning and reliable technology in schools.

Given that the relationship between teaching, learning, and assessment through the use of ICTs is highly complex, one would not expect the introduction of ICT into a learning environment to bring about change in pedagogical practice in and of itself. Rather, we would expect the use of ICTs in education to be inextricably linked with teacher understandings of teaching and learning (Becker, 2000; Becker and Riel, 1999; Bransford, Brown & Cocking, 2000; Cuban, 1993, Jones & Mercer, 1993). Pedagogies associated with the effective use of ICT include those that emphasise high levels of understanding of key concepts within subject areas and the ability to apply these concepts to solve complex real-world problems (Bransford, Brown & Cocking, 2000). Most recently, curriculum development initiatives have emphasised "21st century skills" (often referred to as "Key Skills" or "Key Competencies", ETA, 2010; OECD, 2005; NCCA, 2008a, 2008b, 2009), qualities that prepare students to live and work in a digital society. These include skills such as critical thinking and problem solving, communication, collaboration, self-regulation and information management (Binkley et al., 2012, Partnership for the 21st Century, 2003, 2005). However, both internationally (ESSIE, 2013) and nationally (e.g., Conway & Brennan, 2009), it has been found that teachers first and foremost use ICT to prepare their teaching and for teacher presentation during lessons to explain information and concepts and consolidate learning. Few teachers use ICT to work with students during lessons and, when they do, student use of ICT is basic. The majority of students use ICT to find information on the Internet, practice routine skills, or take tests. In this sense, ICT has been used to reinforce or automate traditional methods of teaching and learning (e.g., Campuzano, Dynarski, Agodine & Rall, 2009; Plomp, Anderson, Law & Quale, 2009). This may reflect the fact that teachers' pedagogical orientations as well as the prevailing school, regional and national cultures, together with government current policy priorities, influence the shape and form of how digital tools are used in schools and classrooms. However, research suggests that, with careful planning, relevant teacher training, and buy-in from school leadership, teachers, students and parents can contribute

to improving student outcomes through the use of ICT (Stansbury, 2010). Similar to teaching, it is envisaged that assessment using technology will, over time, move beyond replicating traditional summative assessments in electronic format, towards assessing such skills as complex problem solving, communication, team work, creativity and innovation. In this scenario, assessments will include modelling, video data, data processing, simulation and utilisation (Binkley et al., 2012).

The most basic level of teacher understanding of technology has been called *technology literacy*. Teacher competences related to technological literacy include basic digital literacy skills, together with the ability to use off-the-shelf educational activities that are linked to standard curriculum objectives, assessment objectives and didactic teaching methods. UNESCO's (2008a, 2008b, 2011) ICT competency standards for teachers provides a framework designed to support teachers moving from technology literacy to *knowledge deepening* and finally to *knowledge creation*. Knowledge deepening implies change in curriculum policy that emphasises depth of understanding over coverage of content, as well as the application of understanding to real world problems. The teacher's role is to structure tasks, guide student understanding, and support students as they tackle collaborative projects. Knowledge creation involves the curriculum going beyond a focus on knowledge of school subjects to explicitly including knowledge society skills and competences that are needed to create new knowledge. Here, the teacher's role is to design a learning community which makes extensive use of technology to support students who are engaged in creating knowledge products, and in planning and managing their own learning goals and activities. There is an emphasis on problem solving, communication, collaboration, experimentation, critical thinking and creative expression. This framework points to a need for new teacher roles, new pedagogies and approaches to teacher education, and a reappraisal of the design of teacher professional learning.

Implementation of the 2013 ICT Census

Two questionnaires were implemented in the 2013 ICT Census of Schools – a School Questionnaire which was completed by school principals of participating schools, and a Teacher Questionnaire, which was completed by selected teachers in those schools. Parallel School and Teacher Questionnaires were developed for primary, post-primary and special schools. The content of the questionnaires was guided by policy priorities of the Department of Education and Skills (see Preface), the ICT in Schools Steering Group, and the project team. Key themes addressed in the School Questionnaire were ICT planning, ICT priorities, ICT infrastructure, use of ICT in general, and use of assistive technology. Questions were also asked about procurement frameworks, technical support and engagement with industry. Issues covered in the Teacher Questionnaire included general beliefs relating to teaching and learning, frequency of teaching and learning activities, access to ICT, use of ICT in teaching and learning, use of ICT in assessment, impact of ICT use, ICT planning and collaboration, ICT priorities, perceived level of ICT-related skills, and time spent on ICT-related CPD and ICT-related CPD content. Respondents to both School (principal) and Teacher Questionnaires also had the opportunity to offer comments at the end of the questionnaires. The 2013 Census was the first in which a Teacher Questionnaire was administered, and the first which was administered electronically.

The 2013 Census was implemented by PDST Technology in Education (formerly the NCTE) in spring 2013. All schools (primary, post-primary and special) were contacted in mid-April by the DES.

Principals were invited to complete the online principal survey and were also asked to select teachers in their school to complete a Teacher Questionnaire. At primary level, principals were asked to select one second class teacher and one fourth class teacher; at post-primary level, they were asked to select two second year and two fifth year teachers; and in special schools, they were asked to select one or two teachers. Guidelines for selecting teachers at random were included with the letters. In total, 2109 of 3120 principal questionnaires were returned from primary schools by the end of June, 2013, yielding a response rate of 67.6%. A total of 498 out of 721 principal questionnaires were returned from post-primary schools, yielding a post-primary principal response rate of 69.1%. Of the 140 special schools in the population, 90 returned a principal questionnaire, yielding a response rate of 64.3%. As response rates for teachers were low at the end of June 2013, a second opportunity for teachers to complete questionnaires was provided in October 2013. Overall, at primary level, 2838 Teacher Questionnaires were returned from 1986 schools, giving a response rate of 46.9%. A total of 1110 Teacher Questionnaires were returned from 417 of 721 post-primary schools (22 of which are senior colleges), yielding a response rate of 39.9%. Teacher Questionnaires were returned by 68 of 140 special schools (48.6%).

Sampling weights were constructed for the School Questionnaires for primary, post-primary and special schools, making it possible to generalise the outcomes to the population of schools in each of these sectors (based on the assumption that non-responding schools were similar to responding schools in terms of ICT-related characteristics). Because of low responses rates for the Teacher Questionnaires, and a lower likelihood of teachers in smaller schools to respond, weights were not constructed for the Teacher Questionnaire. Hence, outcomes from the Teacher Questionnaire can only be interpreted as indicative and cannot be generalised to the population of teachers. Both quantitative and qualitative analyses were conducted on the data.

ICT Infrastructure in Schools

In 2013, the average ratio of students to working computing devices (all devices in the school) was 4.6 to 1 at primary level, 3.7 to 1 at post-primary level, and 1.7 to 1 in special schools. At primary level, Band 1 DEIS urban schools (4.0:1) and DEIS Rural schools (3.1:1) had more favourable ratios than non-DEIS schools (4.8:1). At post-primary level, DEIS schools (2.9:1) also have a more favourable ratio than non-DEIS schools (4.0:1).

The ratios of students to computing devices for student use were 11.1 at primary level, 8.8 at post-primary level, and 3.3 in special schools. These higher ratios reflect the relatively large numbers of computing devices in schools that are designated for teacher use, or for use in school administration, and correspondingly fewer devices for student use.

Desktop computers accounted for 54% of working computers available to students in primary schools, 83% in post-primary schools, and 51% in special schools. Tablets accounted for 5% of devices in primary and post-primary schools, and one quarter of devices in special schools. The data indicate a shift in schools' purchasing practices, with schools at all levels tending to purchase more tablets and laptops in the two years prior to the census, than in earlier years. The move towards mobile devices is particularly apparent in special schools.

The ratios of students to computing devices (all devices in the school) were higher in all sectors in 2013 compared with 2005. At primary level, there has been an improvement from 9.8 to 4.6, at post-primary, from 8.2 to 3.7, and in special schools, from 3.2 to 1.7.

In 2013, almost all post-primary schools (99%) reported that they had a dedicated computer room. The corresponding estimates for primary schools and special schools are 33% and 28% respectively.

In general classrooms in primary schools, the average numbers of computing devices were 7.3 for teachers and 9.1 for students. At post-primary level, the corresponding estimates were 23.8 (teachers) and 15.7 (students). Hence, on average, there more computing devices for students than for teachers in general classrooms at primary level, and more computers for teachers than for students at post-primary level. The imbalance at post-primary is offset, at least in part, by the availability of computers for students in computer rooms.

On average, at primary level in 2013, 18% of all computing devices were under 2 years old, 33% were between 2 and 4 years old, 25% were between four and six years old, and 25% were more than 6 years old. At post-primary level, 27% of all computing devices were under 2 years old, 35% were between 2 and 4 years, 23% were between 4 and 6 years, and 15% were more than 6 years old.

Primary schools have an average of 6.6 interactive whiteboards, and average of 6.4 digital projectors. Post-primary schools have an average of 29.5 digital projectors and 7 interactive whiteboards. Both digital projectors (4.8 on average per school) and interactive whiteboards (4.4) are also found in special schools. Six percent of primary schools and one quarter of post-primary schools report that they have no interactive whiteboards.

On average across primary schools, 77% of computing devices in general classrooms and 90% in computer rooms (where such rooms exist) are connected to a fixed network, while 56% in general classrooms and 51% in computer rooms are linked to a wireless network. In post-primary schools, 87% of computing devices in general classrooms, and 97% in computer rooms are networked, while 61% in general classrooms and 62% in computer rooms are linked to a wireless network.

Ninety-seven percent of post-primary schools, 71% of primary schools and 65% of special schools reported that they had a website or blog. Among schools with a website/blog, 81% at primary level, 90% at post-primary level and 57% in the special sector, reported that they updated them regularly.

At primary level, one fifth of principals were unaware of the framework for purchasing PCs, available on the PDST-Technology website. The corresponding estimates for post-primary and special schools were 14% and 27% respectively. One third of all principals in primary schools, 56% in post-primary schools and 31% in special schools had used the PC framework and found it useful. Similar percentages had used and were satisfied with the frameworks for digital projectors and notebooks (laptops). One third of primary principals, one fifth of post-primary principals, and over one quarter of special school principals were aware of the PC framework, but had not used it.

School principals reported that responsibility for technical support in schools was shared by a number of persons. In one quarter of primary schools, 35% of post-primary schools and 27% of special schools, the ICT coordinating teacher was fully responsible or responsible to a large extent for support. In 47% of primary schools, 52% of post-primary schools and 55% of post-primary schools, an external IT company or contractor had these levels of responsibility. Almost 45% of

vocational schools were part of a group scheme that was fully responsible or responsible to a large extent for the provision of support.

ICTs in Teaching and Learning: Data from Principals

In addition to providing information on infrastructure, school principals responded to several items related to planning for the integration of ICT into teaching and learning. Most principals of primary (95%), post-primary (96%) and special school (97%) indicated that their schools promoted the sharing of good practice in ICT integration among teachers. Most principals also indicated that ICT planning is an integral (rather than separate) part of the overall school planning process (75-83%). Fifty-one percent of principals at primary level, 60% at post-primary level, and 46% in special schools indicated that they use the 'NCTE e-Learning Handbook' and 'Roadmap' in the context of overall school planning. Fifty-eight percent of primary principals, 74% of post-primary principals and 35% of principals of special schools indicated that their school had a designated ICT-coordinating teacher. Fewer primary, post-primary and special schools had designated ICT-coordinating teachers in 2013, compared with 2005, due to cut-backs at national level and changing priorities within schools.

Responding to questions on ICT usage throughout the school, over half of post-primary principals and over one-third of primary and special-school principals reported that their schools regularly used content and resources on the local school server to support teaching and learning, while approximately one quarter of primary-school principals, one fifth of post-primary principals and 12% of special-school principals indicated that their school used an external virtual learning environment to support teaching and learning. Just 10% of primary school principals, 6% in post-primary schools and 21% in special schools indicated that student-owned computing devices were being used in at least some classes or year groups.

School principals were generally positive about the effects of ICT usage on teaching and learning. Ninety-one percent of principals of primary schools, and 89% in post-primary schools and special schools observed an increase in student interest and engagement as arising from the use of ICT. Other areas where at least three-quarters of principals at one or more levels observed positive change included the range of methodologies used by teachers, the amount of planning and preparation by teachers, the depth of subject knowledge covered, the level of positive interaction among students during classes, improvements to literacy across the curriculum, improvements to numeracy across the curriculum, and the ability of the school to meet the needs of lower-achieving students. An area where the impact of ICT was perceived to be weaker was meeting the needs of students with special education needs. Fewer than half of principals at primary level observed an increase in performance on standardised tests, and fewer than half at post-primary observed an improvement in performance on State examinations.

Setting aside concerns about funding, school principals at all levels identified the following as among the most serious obstacles to the effective use of ICT to support teaching and learning: insufficient access to high-quality broadband, age of computing devices, insufficient time for planning and preparation, and insufficient levels of technical support. Primary principals indicated that pressure to cover the prescribed curriculum and insufficient access to ICT for students were significant obstacles. At post-primary level, principals also identified pressure to cover the curriculum, low levels of teacher knowledge of how to use ICT effectively in teaching and learning, and low levels of teacher

confidence regarding the use of ICT. Principals of special schools identified insufficient access to suitable ICT-related CPD opportunities.

Among the ICT-related activities to support improvements in teaching and learning that were identified by primary-level principals as high priority were high-quality broadband connectivity (58% of principals reported this as a high priority) and Internet safety and related issues (53%). Post-primary principals accorded the highest levels of priority to high-quality broadband Internet connectivity (63%), teacher access to ICT equipment to support teaching and learning (62%), Internet safety and related issues (54%), and a high-quality school-wide wireless network (50%). In the special schools sector, teacher access to ICT equipment (64%), high quality broadband (64%) and technical support (61%) were the issues most frequently reported as having very high priority.

The most frequently noted priorities for teachers' continuing professional development identified by primary school principals were use of ICT as a teaching and learning tool across the curriculum (47%), use of ICT to support the development of key skills such as literacy and numeracy (43%), and more advanced ICT skills (including blogging, website design, computer programming and other applications) (26%). The areas of highest priority at post-primary level were how to use ICT as a teaching and learning tool across the curriculum (including its application to specific subject areas) (66%), how to use ICT to support the development of key skills (e.g., literacy, numeracy) (37%), and use of ICT to support DES priorities (e.g., school self-evaluation and school improvement) (31%). In special schools, school principals highlighted how to use ICT as a teaching and learning tool across the curriculum (49%), how to use ICT to support special educational needs (48%), and how to use ICT to support the development of literacy and numeracy skills (36%). Interestingly, school principals at all levels tended to give low levels of priority to basic ICT skills, digital media skills, and the use of ICT to support assessment of learning and assessment for learning. School principals at all levels prioritised delivery of ICT-related CPD by external tutors. Other delivery methods, such as independent online CPD, online CDP with a school group, informal CPD provided on a peer-to-peer basis, and self-directed CPD, were less well supported.

Over 90% of schools in each sector reported having an active Internet Safety AUP policy that guided responsible use of the Internet. Most of these included Internet safety and advice guidelines, guidelines relating to online activities such as searching and browsing websites and uploading and downloading of material, and inappropriate, harmful and illegal use of online material. Topics covered less often in AUPs included copyright guidelines and publishing a school website. Across school types, the most common contexts in which students were provided with information on Internet safety were SPHE lessons, and lessons in which the Internet was used for teaching and learning purposes.

At primary and post-primary levels, the most commonly-used assistive technologies were software to support literacy, software to support numeracy and software applications to support students with disabilities or disorders. Special schools indicated use of a much broader range of technologies, including, for example, switches and computer control devices.

Schools reported limited use of ICT tools such as email and video to communicate with other schools in Ireland, with other schools internationally, or with students in another school (for example, sharing subjects).

Principals of 7% of primary schools, 25% of post-primary schools, and 11% of special schools reported that they collaborated with industry, with larger schools in each sector more likely to report collaboration.

Comments of School principals

In all, 660 primary principals (31% of all primary principals who completed the survey), 130 post-primary principals (26%) and 30 special school principals (33%) availed of the opportunity to provide additional comments on aspects of ICT use in schools. Overall, 1828 comments were made by responding principals. A content analysis was performed on the comments, with each comment allocated to one of 16 topics. Since principals could chose to include a comment, or not, the comments described here may or may not be representative of school principals in general.

The funding of ICT in schools was the most frequently commented-upon topic amongst primary and special schools principals, and the second most frequent at post-primary level. Of these, most made general calls for additional financial support for ICT in schools, or made reference to the perceived inadequacy of previous funding. Many respondents reported that a lack of funding was the most significant obstacle to the effective integration of ICT into school life. A large number of principals highlighted the inappropriateness of once-off grants for ICT, given the constantly evolving nature of technology. Several principals commented that, in the context of overall reduced funding to schools, improving ICT resources had become increasingly difficult.

Issues relating to technical support and the maintenance of ICT equipment comprised the second most frequently mentioned topic in the primary and special school categories, and the most frequent at post-primary level. Many principals argued that an ICT maintenance grant was required. Several described a lack of, or insufficient access to, technical support. A number of principals' comments called for the provision of centralised technical support for schools. Principals called for an IT technician to be assigned to individual schools or to clusters of schools. Principals of larger schools, in particular, argued that their schools needed dedicated on-site technical support.

The third most frequently mentioned topic in the primary and post-primary categories, and the fourth in special schools, concerned the Internet. The vast majority of comments made on this topic were expressions of dissatisfaction with current broadband service or arrangements. Inadequate broadband service was said to hinder ICT development in schools. Several principals argued that investment in ICT equipment, such as computing devices and interactive whiteboards, is only useful if there is sufficient Internet capacity to support their use. Some principals made direct pleas to the NCTE (now PDST Technology in Education) to improve the broadband service available to their schools. Numerous principals described their frustration, and the frustration of teachers and pupils, at the poor broadband service available to their schools. Small numbers of primary and post-primary principals expressed satisfaction with recent developments in broadband provision.

Teacher professional development was the fourth most frequently raised topic. Several principals commented that training on the actual equipment available in the school was essential. Others emphasised that a whole-school approach, whereby all teachers receive training together, was desirable. As well as variation in levels of ICT skills across teachers within schools, principals highlighted between-school variation in skills, which, they proposed, should be taken into account in

the delivery of ICT-related CPD. Some principals commented that there was insufficient time available for professional development in the area of ICT.

A fifth theme concerned teaching and learning. A frequent comment identified the need to integrate ICT into teaching and learning. Some principals reported a perceived need to evaluate the usefulness of ICT as a pedagogical tool, admitting that they were as yet unconvinced of its value for teaching and learning. Other principals, particularly primary principals, went further and expressed concern about the impact of ICT use on aspects of students' learning. A small number of principals suggested that ICT should be integrated further into assessment procedures.

School principals also addressed the issue of ICT coordinators. Typical comments described the impact which a lack or loss of an ICT coordinating teacher had on the use of ICT in schools. Many principals said that the ICT coordinator should be made a post of responsibility in all schools. A few called for better professional development for ICT coordinators.

ICTs in Teaching and Learning: Data on Teachers' Views

As noted above, the response rates of teachers, and patterns of respondents across schools, mean that care should be exercised in extrapolating the findings to populations of teachers in primary, post-primary and special schools. Teachers provided a mixed set of responses to a series of statements about the nature of teaching and learning. While over 95% of teachers at each level agreed or strongly agreed that their role as a teacher is to facilitate student enquiry, 71% at primary level, 74% at post-primary and 75% in special schools agreed or strongly agreed that instruction should be built around problems with clear, correct answers, and around ideas that most students can grasp quickly. Almost 10% of teachers at primary and post-primary levels, and 11% in special schools disagreed or strongly disagreed that thinking and reasoning processes are more important than specific curriculum content. Such views are not consistent with efforts to facilitate students' acquisition of 21st century skills, including the use of ICTs to solve complex problems. Teachers in different sectors also reported low usage of projects that take at least one week to complete, debates in which students argue for a point of view which may not be their own, and projects involving members of the community or peers outside the school.

Across all three categories of school, teachers reported high levels of skill with the more basic ICT activities, such as word processing, using email, using the Internet to find educational resources, downloading/editing curriculum resources, and organising files into folders. However, in general, teachers reported that they were much less familiar or less skilled with tasks associated with 'Web 2.0' tools and social networking. Teachers' levels of skills in working with spreadsheets and presentation software were noticeably lower than their skill levels in using word processing software, email, and the Internet – a finding that may have implications for using ICT in particular curriculum areas, such as mathematics and science

At each level, at least 90% of teachers reported that they always or often had access to a computing teaching device such as a desktop computer or laptop at school, with access at primary level almost universal. Access to a digital projector was somewhat greater among teachers at post-primary level (95%) than at primary level (81%) or in special schools (67%). In contrast, teachers in primary schools (87%) and special schools (67%) have greater access to interactive whiteboards than teachers in secondary schools (30%). Other equipment, such as visualisers, digital cameras and video cameras

were more accessible to teachers in primary schools and special schools, compared with their counterparts in secondary schools. Over 90% of teachers in each sector reported that they had access to online resources.

At all three levels, a large minority of students did not have regular access to individual computing devices (i.e., one-on-one access). At primary level, 12% of teachers reported that individual students in their classes often or always had access to a dedicated computing device, while 18% of teachers at post-primary level, and 25% in special schools reported likewise. At post-primary level, 32% of teachers reported that their students never had access to a shared computing device. Proportions at primary level (15%) and in special schools (8%) were considerably lower.

Just 3% of teachers at primary level, 14% at post-primary level, and 27% in special schools reported that students were allowed to use their own devices (such as tablets, smartphones and cameras) often or always.

Purposes for which teachers reported using ICTs most frequently are consistent with group-based didactic teaching approaches. They included presenting information or giving class instruction to pupils, using curriculum-related online resources for lesson preparation, using applications such as word processing and presentation software to prepare resources for class and using curriculum-relevant online resources to support teaching and learning. Activities in which teachers engaged less frequently included using e-books and creating podcasts using a range of media. Purposes for which ICTs were used infrequently included supporting the development of higher-order thinking skills in students, recording student work for assessment purposes, and using equipment such as digital cameras and digital video. Teachers in special schools reported using ICTs to support students' learning styles, and to differentiate their learning to support the development of literacy and numeracy. Teachers in post-primary and special schools tended to use ICTs more frequently for assessment purposes than their counterparts in primary schools, though overall usage levels were modest. For example, 22% of teacher at primary level, 33% at post-primary, and 31% in special schools reported using ICTs often or always to support assessment for learning.

In general, ICTs were not used widely for assessment purposes. Just 8% of teachers in primary schools, 18% in post-primary schools, and 16% in special schools reported that their students gathered evidence of learning using an e-Portfolio approach sometimes or more often. Similarly, 82% of teachers in primary schools, 79% in post-primary schools, and 70% in special schools reported that their students never took a test digitally, with feedback on their performance. Teachers of children in special schools reported greater use of ICTs for assessment.

Teachers in all school types reported extensive use of ICT by themselves in preparing lessons and in presenting content during class time. Student use of ICTs (as reported by teachers) was much less frequent, with over one-half of students in special schools, one-third in primary schools, and about one-quarter in post-primary schools using ICTs during class time always or often. Use of ICTs for homework as directed by the teacher was reported to be somewhat more frequent among students in post-primary schools than among students in primary and special schools, though usage levels were modest across all levels.

The three highest ranked ICT priorities for teachers in each sector, with 40-50% rating them as very high priority, were access to high-quality broadband via the school (fixed) network, access to high-

quality broadband via the school wireless network, and technical support to ensure that ICT equipment is always working. Between 20% and 30% of teachers in each sector allocated a very high priority to such activities as accessing curriculum-related online digital content/resources, accessing a wider range of online tools and applications, and accessing a dedicated computing device for lesson preparation and for use in class. Marginally fewer teachers in primary and post-primary schools (19%) than in special schools (27%) identified student access to mobile computing devices as a very high priority.

For teachers in primary schools, pressure to complete the curriculum was identified as the most serious obstacle to implementing ICTs to support teaching and learning. Insufficient time for planning and insufficient levels of technical support were the second and third highest-ranked obstacles, while blocked access to relevant websites, insufficient access to ICT for students, and age of computing devices also featured in the top six obstacles identified by teachers in primary schools.

The highest ranking obstacles identified by teachers in post-primary schools related to lack of time, including pressure relating to the State Examinations, insufficient time for planning and preparation, and timetabling arrangements. Other high-ranking obstacles at this level included difficulties in accessing the computer room, insufficient access to ICTs for students, and blocked access to websites. Insufficient levels of technical support ranked just seventh in this sector.

Teachers in special schools identified blocked access to relevant websites as the main obstacle to using ICTs to support teaching and learning. Insufficient time for planning and preparation, and insufficient levels of technical support ranked second and third, respectively. Teachers in special schools also raised age of computing devices (fourth most serious obstacle), their own insufficient awareness of suitable digital content (fifth) and their own low levels of ICT skills. Hence, teachers in this sector are unique in pointing to personal as well as structural obstacles to use of ICTs to support teaching and learning.

Teachers' perceptions of the impact of ICTs were largely positive, though there is some variation across areas of teaching and learning, as well as across school levels. It should be noted that these are not objectively-informed impacts. The most marked increases were reported in the areas of student interest and engagement, range of teaching methodologies, and amount of lesson planning and preparation, while there were less marked increases in the performance of students on tests and on homework.

At primary level, up to two thirds of teachers had undertaken CPD in the areas of equipment use (66%), use of ICT as a tool across the curriculum (56%), and use of ICT to support the development of literacy and numeracy (54%) in the two years prior to the Census. At post-primary level, about half of teachers had undertaken CPD in the areas of equipment use and how to use ICT as a tool across the curriculum. CPD undertaken by teachers in special schools was most commonly reported in these same two areas (equipment: 60%; cross-curricular tool: 41%). Across all school levels, teachers reported less frequent participation in CPD involving assessment for and of learning, planning and implementing e-Learning, and more advanced ICT skills (such as blogging, web design and computer programming).

Among the priority areas for CPD identified by teachers were more advanced ICT skills (28-37%), using ICT as a tool across the curriculum (38-46%), using ICT to support the development of key skills (32-47%), and ICT skills needed to use the school's own equipment (24-33%).

Comments of Class Teachers

Overall, 1091 teachers made 2524 comments on aspects of ICT use in schools. At primary level, 1686 comments were made by 765 teachers from 677 schools on ICT-related issues in school. At post-primary level, 293 teachers from 202 schools made 669 comments. In the special schools category, 33 teachers from 24 schools made 69 comments. Teachers who provided comments may be different from those who did not.

The level of ICT resourcing in schools was the most frequent topic mentioned by primary school teachers. The most common comments on this topic related to teachers' reports of insufficient ICT resources in their classrooms and/or in their schools. Teachers referred to high pupil-computer ratios and to a lack of teacher access to ICT equipment. Teachers commented that they believed that they were expected to incorporate ICT use into their teaching, but that they did not have sufficient resources to do so. Several teachers noted that, in the context of limited ICT resources, use of ICT had become confined to very specific uses, rather than being widely integrated into the educational lives of pupils. Post-primary teachers' referred to difficulties in accessing ICT resources which schools actually have.

ICT as it relates to teaching and learning also attracted comments from relatively large percentages of teachers. Many teachers opened their responses with an acknowledgement of the benefits of ICT use to teaching and learning. Several reported that ICT had improved their teaching practice and had increased student engagement in lessons. Others commented that they believed that ICT use would improve their ability to plan and deliver lessons and would improve student outcomes, if they had the resources necessary to make this possible. Indeed, the majority of teachers who conveyed attitudes towards ICT use in schools were positively disposed towards it. A minority expressed doubts of the value of ICT in teaching and learning, while others noted that a lack of digital resources hampered their ability to integrate ICT into teaching and learning. A shortage of resources in Gaeilge was raised.

A third key theme was teachers' attitudes, skills and practices. Frequently, comments made reference to teachers' own limited proficiency in ICTs, with a number of teachers recognising that their students may miss out due to the teachers' own limited skills. Teachers also referred to low motivation in relation to incorporating ICT into teaching and learning, and/or low teacher morale impacting on teachers' willingness to do so.

Several teachers across all levels made general appeals for greater opportunities to engage in ICT-related CPD. A need for training on the ICT equipment in classrooms was identified, with some teachers observing that ICT resources were underutilised due to lack of appropriate training. Teachers in special schools called for training in the use of ICTs to address the needs of children with special needs. Teachers across school types argued that, as technologies are constantly and rapidly evolving, training for teachers must be regular to enable them to keep pace with these developments. While some teachers believed that upskilling in relation to ICT was their own

personal responsibility, others expressed dissatisfaction with the idea of training in their personal time and at their own personal expense.

Teachers pointed to a lack of time available to plan lessons or prepare resources involving the use of ICTs. Reference was made to time pressures arising from large class sizes and, at primary level, multi-grade classes, as well as time pressure to cover an overloaded curriculum.

A large majority of comments in the Internet category were related to dissatisfaction with current service provision in schools, with many teachers arguing that poor Internet service is the single greatest barrier to increasing ICT use in schools. A number of teachers indicated their schools were now paying privately for Internet provision, as what had originally been provided for their schools was inadequate. A smaller number raised concerns about Internet usage, including cyberbullying and child safety.

Other issues raised by teachers included technical support and maintenance, funding of ICT resources, and the work of ICT coordinators.

International Data on Use of ICTs by Teachers and Students

Ireland has participated in three major international studies in recent years: the OECD-organised Programme for International Student Assessment (PISA), which has been administered to representative national samples of 15-year olds in Ireland on five occasions since 2000 (most recently in 2012); the Progress in International Reading Literacy Study (PIRLS), organised by the International Association for the Evaluation of Educational Achievement (IEA), which was administered to students in fourth class in Ireland in 2011; and the Trends in International Mathematics and Science Study (TIMSS), also sponsored by the IEA, which was administered to the same students in as in PIRLS 2011. Data from the three studies were drawn on to provide a broader context for interpreting ICT usage in classrooms in Ireland.

Findings from PISA 2012, based on a questionnaire about ICT usage administered to students who sat the paper- and computer-based tests, show that there is significant underuse of ICTs in post-primary schools in Ireland. Over one-third of 15-year olds reported that, although a computer was available at school, they did not use it. The corresponding average for OECD countries is 23 percent. Internet usage in post-primary schools was below OECD average levels, with 45% of 15-year olds in Ireland reporting that they never make use of it. The corresponding OECD average is 36 percent.

Among 15-year-olds in Ireland, use of ICTs at school in general, in maths lessons, and at home for school-related tasks were all below the corresponding OECD average levels. While Finland, which performed consistently well in all achievement domains assessed, had a higher mean score than Ireland on general use of ICTs at school, it had a lower score on use of ICT use at home for school-related tasks such as homework. Students in another high-scoring country, Korea, reported low ICT usage on each of the three indicators.

Fifteen-year olds in Ireland were less likely than on average across OECD countries to report engaging in higher level ICT tasks at home, such as reading news on the Internet, obtaining practical information from the Internet, or using email.

PIRLS 2011 provide data on the proportions of pupils in each country whose teachers reported that at least one computer was available for pupil use during reading lessons. In Ireland, just 56% of pupils were in classes where pupils had access to a computer during reading lessons. In contrast, at least 85% of pupils in countries such as Norway, Denmark, New Zealand and the Netherlands had access.

In PIRLS 2011, computer use by pupils in classes in Ireland in which there was at least one computer available for pupil use was less frequent for such activities as using instructional software to develop reading skills and strategies, and using the computer to write stories, than on average across PIRLS 2011 countries. Likewise, TIMSS 2011 data for pupils in Fourth class show that only limited use is made of computers in mathematics classes in schools in Ireland and very limited use in science classes.

While teachers of pupils in fourth class in Ireland were more comfortable in using computers in their teaching than their counterparts on average across PIRLS 2011 countries, teachers in Ireland reported more limited access to computer staff in schools to address technical problems, and lower availability of support for integrating computers into teaching and learning.

Conclusions

The ICT Census and related research lead to conclusions in four broad areas (see Chapter 10):

- ICT Infrastructure, including Internet connectivity, access to computing devices and other technologies, technical support and maintenance and purchasing and procurement
- Learning, teaching and assessment using ICT, including use of ICT in teaching and learning, developing 2st century skills using ICT, and assessment and ICT
- Teacher professional learning, including specifying teacher professional knowledge and supporting teacher professional learning, and
- Research, policy and leadership, including research as a driver of policy and practice, and school leadership and planning.

Key points which relate to the development of the Digital Strategy for Schools in each area are noted below.

In relation to ICT *Infrastructure*, the Strategy should. . .

- Seek to estimate the broadband needs of schools of varying size and location, including primary and special schools, with a view to ensuring that all schools will have adequate broadband speeds to meet their current and future needs.
- Deal with how schools can be supported in distributing available bandwidth to maximum effect in a context in which greater numbers of teacher and student devices will be in use, access to cloud computing will increase, and networks may have to accommodate increased broadband speeds over time.
- Set national targets for the ratio of students to computing devices that are in line with best international practice, with an overall aim of achieving one-to-one computing.
- Ensure that all teachers have access to computing devices that will support their professional activities, both at school and at home.

- Put forward clear specific proposals with targets for an integrated, system-wide approach to technical support and maintenance.
- Consider recent advances in cloud computing, and their relevance for schools, since schools could save on procurement and maintenance of local servers by sourcing software and web applications that are cloud-based.
- Examine how procurement frameworks could be modified or broadened so that teacher professional learning and technology management are linked to investment in infrastructure, whether at national or school level.

In relation to *Learning, Teaching and Assessment* Using ICTs, the Strategy should. . .

- Emphasise how ICTs can be incorporated into each curriculum area, and how they can serve to establish links across aspects of the curriculum.
- Address how approaches to developing literacy and numeracy across the curriculum, in line with the *National Strategy to Improve Literacy and Numeracy Among Children and Young People 2011-2020* (DES, 2011), can be supported through the use of ICTs in revised curricula at both primary and post-primary levels.
- Provide a clear outline of how ICT can promote the achievement of goals relating to 21st century learning skills, both within curriculum/subject areas and across the curriculum.
- Provide guidance on the range of electronic assessments that are already available, with particular attention to formative assessments that provide teachers and students with feedback that can guide learning in their classes, while also informing instructional decisions at school level.
- Highlight the potential of ICT for self-assessment, peer assessment, and adaptive comparative judgement, as well as integrated teaching, learning and assessment systems that focus on relevant 21st century skills.

In relation to *Teaching Professional Learning*, the Strategy should. . .

- Seek, within its lifetime, to support teachers to move towards the knowledge deepening and knowledge creation approaches.
- Serve as an important reference source for those involved in curriculum development and the preparation and development of teachers ahead of implementing new curricula and syllabi.
- Promote a view of teacher professional learning that reinforces the concept of a continuum of professional learning, extending from preservice through induction, mid-career, and beyond, and enable teachers to engage in planning their own ICT-related professional development and evaluating their own competencies in using ICTs in teaching, learning and assessment.
- Support the establishment of ICT standards for teachers.
- Support the development of online learning modules that address the needs of individual teachers and groups of teachers, with differing sets of competencies.
- Ensure that professional learning is an integrated component of all new ICT initiatives, such as the provision of high-speed broadband to schools.

In relation to *Research, Policy and Leadership*, the Digital Strategy for Schools should:

- Emphasise the value of conducting pilot studies prior to full-scale implementation of new initiatives, so that potential problems in implementation can be identified in advance and addressed.
- Emphasise a rigorous research-based approach to implementing all publicly-funded initiatives and disseminate and act on findings
- Support the provision of competitive grants for implementation of innovative and evidence-based programmes that are not initiated centrally, but meet ICT policy priorities, and ensure that such programmes are carefully evaluated, with a view to upscaling the most successful ones.
- Ensure that project evaluations examine the effects of innovations on teacher knowledge and teacher professional learning, as well as on student learning
- Support colleges of education and professional development support services in establishing an orientation towards research among school leaders and teachers
- Highlight the key role of the principal and other school leaders in formulating and implementing ICT policy at school level, and in supporting teachers and students in their use of ICT
- Provide specifically-focused CPD for principals on how ICT can enhance teaching, learning and assessment at school level, ensuring a good balance between providing and maintaining infrastructure, while supporting teaching and learning.
- Encourage principals to explore non-traditional approaches to providing opportunities for teacher professional learning in a context in which teachers are expected to take greater responsibility for their own professional learning.
- Outline how school co-ordinators can support teachers and students in using ICT in teaching, learning and assessment.
- Ensure that school principals and ICT co-ordinators play a key role in implementing and evaluating the effects at school level of all new publicly-funded ICT initiatives, including those focusing on teaching, learning and assessment.

1: Context of the 2013 Census

The purpose of this chapter is to place the 2013 Census of ICT in schools in the context of broader developments relating to ICT in teaching and learning, both in Ireland and internationally. The chapter is divided into four sections. The first deals with policy initiatives and reports on ICT relating to schools that have been issued since the last ICT Census in 2005. The second provides a review of investment in ICT in Irish schools, with particular emphasis on the years since 2005. The third section examines international reports on the use of ICT in teaching and learning that have issued in recent years. The final section situates the Census in the context of current initiatives such as Junior Cycle reform and the implementation of Project Maths.

While the focus of the first section is on recent policy initiatives and reports, it should be noted that the context in which ICT is being integrated into teaching and learning is one that is constantly changing. Most recently, incentives for change have come from policy initiatives dealing with Digital Technology in general (e.g., *National Digital Strategy for Ireland*, DCENR, 2013), digital technology in industry (e.g., *ICT Action Plan: Meeting the High-level Skills Needs of Enterprise in Ireland,* DES, 2011a; *ICT Skills Action Plan, 2014-18*, DES/DJEI, 2014), and use of ICT in the education system (e.g., *A Framework for Junior Cycle*, DES, 2012a).

There is also impetus from European Commission, with a number of initiatives, including *Key Competences for Lifelong Learning* (EC, 2007), the *Digital Agenda for Europe* (EC, 2010), the *Strategic Framework for Education and Training 2020* (EC, 2013a), and *Opening up Education: Innovative teaching and learning for all through new Technologies and Open Educational Resources* (EC, 2013b). The *Key Competences* document, for example, defines digital competence for all citizens, and identifies the relevant knowledge, skills and attitudes that need to be acquired to live and work in the 21st century. The inclusion of ICT skills as one of just eight key competences is indicative of the importance attributed to it at European level.

1.1 Policy Initiatives and Reports on the Use of ICT in Teaching and Learning in Ireland

Since the launch of *Schools IT 2000: A Policy Framework for the New Millennium* (Ireland, 1997), a number of reports relating to the use of ICT in teaching and learning in Ireland have been produced. Table 1.1 provides a summary of these. While it can be seen that there was considerable activity in the period 1997 to 2008, there has been relatively less activity since that time, even though in recent years there have been significant technological developments that might be expected to impact on teaching and learning.

In their review of policy on ICT in education, Conway and Brennan-Freeman (2009) characterised policy development in Ireland in terms of five key phases:

1. A policy formulation phase leading to the launch of IT 2000 in 1997.
2. A policy rollout phase between 1997 and 2000.
3. A policy update phase, with publication in 2001 of *A Blueprint for the Future of ICT in Irish Education 2001-2003*.
4. A policy lull/initiative driven phase from 2003 to 2007.

5. A policy renewal phase, motivated by the National Development Plan 2007-2013.[1]

Two key reports were published in 2008. The report, *ICT in Schools*, published by the Inspectorate of the (then) Department of Education and Science (DES, 2008), focused on the extent to which ICT was used in primary and post-primary schools, and on the impact of ICT on teaching and learning. The second report, *Investing Effectively in Information and Communications Technology in Schools 2008-2013 (Minister's Strategy Group, 2008)*, was compiled by an ICT strategy group appointed by the Minister for Education and Science. A further report*, Smart Schools = Smart Economy*, (ICT in Schools Joint Advisory Group to the Minister for Education and Science, 2009) was compiled by a group comprising representatives of ICT Ireland and the then Department of Education and Science.

Table 1.1 Policy initiatives/Reports on ICT published in Ireland (1997-2013)

Year	Initiative / Report
1997	Publication of first government policy document on ICTs in schools: *Schools IT 2000: A Policy Framework for the New Millennium (Department of Education and Science, 1997)*
1998	Introduction of *Schools IT 2000 Initiative*. This contained three strands: the Technology Integration Initiative; the Teaching Skills initiative, and the Schools Support Initiative, including the Schools Integration Project (SIP) and Scoilnet.
1998	Establishment of the National Centre for Technology in Education (NCTE), with an initial brief to implement the Schools IT 2000 initiative, to develop ICT policy proposals and to provide ICT policy advice to the (then) Department of Education and Science.
1999	*Statistical report. The state of IT in Irish schools* (NCTE, 1999).
2001	*Report on the implementation of Schools IT 2000* (NPADC, 2001).
2001	*ICT in education – A Blueprint for the Future of ICT In Irish Education 2001-2003* (Ireland, 2001). I*CT 2000 survey: Statistical report (*NCTE, 2001).
2002	*ICT Planning and Advice for Schools (NCTE)* – planning pack to support schools in developing ICT plans to meet infrastructural and other ICT-related needs.
2003	*2002 ICT school census. Report.* (NCTE, 2003)
2004	*Information and Communications Technology (ICT) in the Primary School Curriculum. Guidelines for Teachers (NCCA, 2004)*.
2004	*Curriculum, Assessment and ICT in the Irish Context: A Discussion Paper* (NCCA)
2006	*NCTE 2005 Census on ICT Infrastructure in Schools. Statistical Report* (NCTE)
2007	ICT Framework: *A Structured Approach to ICT in Curriculum and Assessment* (NCCA)
2008	*ICT in Schools* (Inspectorate of the Department of Education and Science)
2008	*Investing Effectively in Information and Communications Technology in Schools: Report of the Minister's Strategy Group.* (Department of Education and Science)
2009	*Smart Schools = Smart Economy. Report of the ICT in Schools Joint Advisory Group to the Minster for Education and Science*.
2009	*Planning and Implementing e-Learning in Your School: A Handbook for Principals and Coordinating Teachers* (NCTE, 2009) (included E-learning Roadmap)
2012	Integration of NCTE into the Professional Development Service for Teachers (PDST) to form PDST Technology in Education
2012	*Educational Impact Evaluation Report on the Provision of 100 Mbit/s Broadband to 78 Post-primary Schools* (DES).

1.1.1 ICT in Schools – Report of the Inspectorate (2008)

[1] In January 2012, the National Development Plan was replaced by the Capital Investment Plan, which runs through 2014.

In addition to the views of inspectors, the study, which was conducted in 2005-06, also included direct input from principals, teachers and students. Key findings included:

- The student-computer ratio (based on the 2005 NCTE Census) was 9.1:1 in primary schools, and 7:1 in primary schools, though target ratios should be in the order of 5:1.
- The lack of technical support and maintenance was viewed as a significant impediment to the development of ICT in schools
- Although large primary schools typically had computer rooms, access to computers was found to be superior when computers were located in classrooms. At post-primary level, more computers were found in specialist computer rooms than in general classrooms.
- School ICT plans, where available, tended to concentrate more on infrastructure than on how ICT can be used to enhance teaching and learning.
- While the majority of teachers were found to make some use of ICT in lesson planning and preparation, fewer teachers were found to plan for the use of ICT in teaching and learning.
- At primary level, inspectors found evidence of the use of ICT to facilitate teaching and learning in 59% of classrooms visited, but observed ICT actually being used in just 22% of lessons.
- Only 18% of post-primary lessons observed by inspectors involved an ICT-related activity. Student interaction with technology was observed in only about one quarter of these instances. Inspectors judged that effective use of ICT was made in just 11% of observed lessons. Much of the ICT-related work completed by Fifth-year students in post-primary schools related to word processing and presentation tasks.
- Many fifth class students in primary schools reported a lack of competence in completing basic tasks on the computer such as creating a presentation or sending an attachment with an email message. Fifth-year students at post-primary level reported that they could complete basic tasks but needed support with tasks such as moving files, copying files to external storage devices, and writing and sending email. A relatively low proportion of these students was able to create a multimedia presentation.

In their recommendations, the inspectorate noted that

- Improvements in ICT infrastructure need to be supported by the introduction of a national ICT technical support and maintenance system for schools. Schools also need to be provided with the capacity to regularly upgrade their own ICT infrastructure.
- Additional guidance should be provided to schools and teachers of students with special educational needs so that the needs of learners may be matched more appropriately with the technology available.
- There needs to be an increased emphasis on the application of ICT in teaching and learning in teacher education at the pre-service, induction and continuing professional development stages.
- Schools should exploit the benefits to be had from ICT in their assessment procedures and in their administrative practices.

1.1.2 Investing Effectively in Information and Communications Technology in Schools (2008)

This report, compiled by a Ministerial Strategy Group, examined progress made in relation to the goals of *Schools IT 2000* and the *Blueprint for the Future of ICT in Irish Education*. It concluded that,

while much progress had been made, particularly in relation to the participation of teachers in professional development, and the integration of ICT into teaching and learning, progress was commensurate with the (low) level of ICT investment. According to the report:

> There has been a markedly successful ICT-related education change in many schools as a result of Government ICT investment programmes. But this progress has not been system-wide, and frequently lacked depth and resilience in the absence of recurrent development and financial support. There is a need to find way to deal more effectively with ICT-facilitated change and the challenges it brings (p. 8).

The report issued a number of objectives, in the context of a National Development Plan (2007-2013) that, at the time, was expected to invest €252 million on ICT in schools. The seven key objectives for the integration of ICTs into teaching and learning were:

1. *Continuing professional development* – ensure that teachers gain the capabilities to make meaningful use of ICT in their work.
2. *Software and digital content* – ensure that there is an adequate supply of innovative, high quality and Irish curriculum-related digital teaching and learning materials available to teachers and students at all levels.
3. *ICT equipment* – addition and replacement – ensure that adequately specified, up-to-date teaching and learning technology is available in sufficient quantity in all schools.
4. *Schools broadband and services* – ensure that every school has access to an appropriately-specified, cost-efficient broadband service that is delivered to all necessary learning areas within the school.
5. *Technical support and maintenance* – ensure that all schools can provide, with a high degree of certainty, a functioning and dependable infrastructure, and that they have access to appropriate technical support and maintenance to sustain this quality of service.
6. *Implementation structures and supports* – ensure that there is a well-resourced and responsive authority that can progress the initiative of transforming schools into e-learning environments with the seriousness of purpose and the vision required.
7. *Innovative practice and research* – ensure that our vision for digital learning becomes and remains vibrant, relevant, and at the forward edge internationally. (pp. 17-25)

Specific recommendations included the following:

- Put in place a national framework for ICT continuing professional development that:
    - integrates ICT in all in-service delivery and in all curriculum design and development
    - provides pathways for accreditation and academic reward
    - ensures that ICT is fully integrated in pre-service education – for both primary and post-primary teachers.
- Put in place a wide-ranging strategy for the specification, development and distribution of digital content for learning that enhances existing web portals (e.g., Scoilnet) for distributing classroom-focused digital content, supports the sharing and creation of content by teachers, and centralises licensing agreements and implements purchasing frameworks for software. Provision of online content should be balanced by provision of online content creation tools and learning platforms, especially those that support and encourage online content collaboration and sharing among teachers and students.
- Put in place national arrangements for the purchase and supply of school-ready equipment and a national plan for equipment renewal and countering obsolescence, though schools

would have the final say in deciding which equipment to purchase, depending on their needs.

- Develop the schools broadband network into a robust and truly high-speed nation-wide network that is equitably available to all schools, and provide all necessary ancillary infrastructure to assist schools to access and use the network.
- Seek out sustainable solutions to the challenge of maintaining and supporting schools' ICT infrastructure that include putting in place a national framework for technical support provision to facilitate country-wide services and establishing and resourcing a national support service desk. The extension of (then) VEC-provided technical support services to schools in their regions should be investigated.
- That the essentially social and economic nature of the challenge (to create e-learning environments) is recognised, and that necessary inter-departmental arrangements are put in place to address the transformation agenda, including a formally-coordinated approach to ensure inter-agency cooperation in driving the e-learning agenda forward.
- That the necessary role of effect-focused, leading-edge research is recognised and supported through, for example, funding research into models of best practice through innovative projects in schools, and, where appropriate, in collaboration with third-level institutions and the ICT industry.

The publication of *Investing Effectively in Information and Communications Technology in Schools* occurred at the beginning of the current economic crisis. Therefore, in outlining a year-by-year spending plan for each of its priority areas, it was not possible to predict that the funding required to implement the plan would be substantially less than anticipated. The *Smart Schools = Smart Economy* report (see below), which was published a year later, showed greater awareness of Ireland's changed economic circumstances. Nevertheless, it highlighted the critical importance of investing in ICT in primary and post-primary schools, in the context of developing a 'Smart Economy'.

1.1.3 Smart Schools = Smart Economy (2009)

This report represents the combined efforts of industry experts and representatives of the then Department of Education and Science to identify how the education system could best adapt to the challenge of contributing to the establishment of a smart economy in Ireland. The report issued recommendations covering the period 2009 to 2012 in five areas: Classroom and student infrastructure, technical support and virtual learning environments (VLEs), teacher professional development, ICT planning and multi-annual budgeting; digital content growth, and enhanced broadband for schools. The report emphasised the importance of digital learning and argued that this can be achieved through the provision of effective digital learning environments that include digitally-literate teachers, rich digital content, reliable technology, and an educational technology vision that is led from the top while owned and managed throughout the system.
Recommendations included:

- An ICT in Schools Steering Group should be established to provide advice on future policy directions and on the organisational approach to integrating ICT into teaching and learning.
- Teacher professional development (both at pre-service and at in-service) should be at the very core of an investment plan for ICT integration in schools; the potential to formally recognise teachers reaching certain standards in ICT-related courses should be explored; and ICT coordinators should be provided with relevant workshops and links to industry.

- Scoilnet should be significantly expanded as a key portal site for learning content for schools and a national virtual learning environment should be made available to schools and teachers to support the development and dissemination of digital content.
- The provision of broadband connectivity to schools should be regarded as an essential national infrastructure, and should take into account the fact that broadband requirements are increasing over time.
- An ICT framework, such as the NCCA's *A Structured Approach to ICT in Curriculum and Assessment*, could serve to guide teachers in embedding ICT in the curriculum by drawing attention to the different functions of ICT in teaching, learning and assessment.
- The DES should seek to reduce the variety of equipment deployed in schools by centralising expenditure of ICT funding, and providing strong guidelines and incentives for the expenditure of schools' own funds.
- An appropriate level of maintenance and service should be established in which teachers have confidence.
- ICT planning should become an intrinsic process for schools, and be integrated within overall school plans.
- A national Virtual Learning Environment should be established that facilitates teacher/student communication, provides access to dedicated learning resources, and enables home/school liaison.
- A computer for the teacher, linked to the Internet, a digital projector and a minimum of five computers for student use should be deployed in each classroom between 2010 and 2012, while consideration should be given to allowing schools to accommodate students' own devices.

1.1.4 Other Policy Reports and Guidelines

A number of additional reports and guidelines have been published since the 2005 Census. These include surveys (e.g., Cosgrove & Marshall, 2008), reviews of ICT policy and practice (e.g., Marshall & Anderson, 2008; Conway & Brennan-Freeman, 2009; Marshall, Butler, Leahy & Hallissy, in press), policy in Ireland in an international context (e.g., Austin & Hunger, 2013), and materials designed to support schools and teachers in implementing ICT (e.g., NCCA, 2009).

The conclusions and problems identified in these additional reports often overlap with those identified in reports initiated by the Department of Education and Skills. For example, Cosgrove and Marshall (2008) identified low levels of computer usage by students in classrooms, the engagement of students in a narrow range of ICT tasks (where they used computers), and a lack of basic ICT literacy skills among pupils in primary schools. The authors note the importance of evaluating any initiatives designed to improve resourcing of, and technical support for, ICT in schools. Cosgrove and Marshall also draw attention to 'second order' barriers to the integration of ICT in teaching and learning, including teachers' own value beliefs and attitudes towards teaching and learning, particularly with respect to classroom management and instructional practices. This seems to suggest that the instructional environments in some classrooms (including activities around the preparation for paper-based state examinations) may not easily lend themselves to the development of e-learning environments. They also noted and endorsed a move towards the specification of ICT competencies for students (see, for example, NCCA, 2007).

Marshall and Anderson (2008) contrasted the more centralised approach to the integration of ICTs into teaching and learning in Northern Ireland with the less centralised and more localised approach in Ireland. Specifically relating to Ireland, they cited the Schools Integration Projects (SIP), a central focus of the Schools IT 2000 Initiative, as examples where technical applications converge with practice, leading to significant learning outcomes (see Galvin, 2002). However, they noted that an important opportunity was missed when successful projects were not moved from the periphery to the mainstream.

The NCTE (2009) handbook, *Planning and Implementing e-Learning in Your School: A Handbook for Principals and ICT Co-ordinating Teachers*, recognises the important role of school leaders in promoting ICT in teaching and learning at school level, as well as the strong attention given to planning at whole-school level in recent years. It provides a definition of e-learning, and outlines how a school can develop e-learning under five headings: leadership and planning, ICT in the curriculum, professional development, e-learning culture and ICT infrastructure. The inclusion of these five elements, which are also found in the UNESCO ICT-CTF (2008a, 2008b, 2011), is significant in that each one must be addressed if schools are to be successful in establishing effective e-learning environments. An accompanying e-Learning Roadmap enables schools to rate their development on up to six sub-elements within each element, using a four-point rating scale: Initial, e-Enabled, e-Confident and e-Mature. This, in turn, facilitates planning and target setting at school level.

While earlier policy documents and initiatives tended not to focus on teacher professional development, this has now changed. Since 2005, reports have begun to refer more specifically to teacher professional development in their proposals for integrating ICT into teaching and learning. Consistent with this, the Teaching Council (2011b) has identified ICT as a priority issue for teacher professional development across the lifespan.

1.2 Investment in ICT in Primary and Post-primary Schools

Table 1.2 summarises investment in ICT in schools since 1998. Since the 2005 Census, two key programmes aimed at improving broadband access in schools have been implemented. The first, the Schools Broadband programme, involved an investment of €30 million between 2005 and 2008, and an annual investment to continue provision in schools thereafter. The second, the 100 Mbps to Post-primary schools, began with installation in 78 pilot schools in 2010, and is expected to be completed by late 2014.

A number of observations can be made about the spending profile in Table 1.2:

- Spending is uneven. For example, since the ICT equipment grants were distributed in 2009-2010, there has been no grant scheme for equipment for primary schools, and, while most post-primary schools now have 100 Mbps broadband, schools must allocate their own resources to the purchasing and replacement of equipment.
- With the exception of technical support provided to some Vocational Schools (now subsumed into the new Educational and Training Boards), schools do not have access to grants for the maintenance or replacement of ICT equipment purchased under earlier grant schemes.

- As noted in the *Smart Schools = Smart Economy* report, there has been no provision for the type of multi-year budgeting that would allow schools to plan for the purchase and replacement of equipment with some degree of confidence.
- A notable development in recent years has been the provision, by the NCTE and others, of frameworks for the purchase of equipment such as printers, PCs, and notebooks. These frameworks arise from arrangements with suppliers and may include on-site, next-day maintenance over a number of years following a purchase. The printer frameworks consider ongoing costs over the projected lifetime of the printer as well as actual purchasing costs. The frameworks appear to provide schools with the advantages of bulk purchase, while leaving the final decision regarding which piece of equipment to purchase in the hands of the schools themselves. In time, the framework could lead to some level of conformity in the equipment available in schools.

Table 1.2 National (central) investment in ICT in primary and post-primary schools (1998 – 2012)

Year Begun	Initiative	Amount (Million €)
1998	Schools IT 2000: A Policy Framework for the New Millennium	€52
2001	Blueprint for the Future of ICT in Irish Schools	€78
2004	Networking Schools	€23
2005	Schools Broadband Programme (2005-08)	€30
2009	100 Mbps Connectivity Demonstration Programme (78 post-primary schools)	
2009	ICT in Schools Programme (equipment grants) (2009-10)	*€92
2012 (ongoing)	100 Mbps to Post-primary Schools: National Rollout (jointly funded by the Department of Communications, Energy and Natural Resources and the Department of Education and Skills, with annual recurring costs to be paid by the DES)	**€41

* See http://www.education.ie/en/Schools-Colleges/Information/Information-Communications-Technology-ICT-in-Schools/FAQs.html (Feb 6, 2012)
**See http://www.ncte.ie/News/Mainbody,21510,en.html; estimate relates to the period 2012-15.

In 2012, the DES published a report on the effects of the 100 Mbit/s broadband initiative in 78 post-primary pilot schools. The report was generally positive about the effects of high-speed broadband on teaching and learning in the 78 schools, and noted:

- Strong evidence of whole-school engagement with ICT
- Integration of ICT in schools identified as a priority or major objective by all schools
- Removal of significant barriers to ICT use by teachers , including concerns about the reliability of Internet connections
- Greater awareness among teachers of the need for professional development on ICT-related courses
- Significant positive change in teacher attitudes to ICT integration
- Greater use of ICTs by teachers to engage in using ICT for collaboration, sharing resources, and engaging in inter-departmental planning for ICT integration
- Increased engagement and attentiveness among students in class
- Increased awareness among teachers of the potential of online resources
- Follow-up by students at home when ICT resources are recommended by the teacher in school.

While the report is very positive about the effects of 100Mbits broadband in the 78 pilot schools, and recommends the extension of the initiative to all post-primary schools, it should be noted that some difficulties with the effective use of high-speed broadband were identified, including the poor quality of within-school networks and technical support. School principals in the evaluation also noted a range of levels of preparedness for integrating ICTs in teaching and learning among teachers in their schools, including CPD needs among teachers in relation to basic ICT skills.

1.3 International Reports and Ireland

A number of international reports focusing on the issue of ICTs in schools have been published in recent years. These mainly come from international organisations, and deal with a range of issues related to ICT infrastructure, teacher professional development, and the use of ICTs in schools.

1.3.1 The OECD PISA Study

A key feature of the OECD Programme for International Student Assessment (PISA) has been the administration of an ICT Usage questionnaire to students as part of each assessment cycle. This has resulted in the accumulation of data on ICT usage by 15-year olds in post-primary schools. While an extensive report on ICT usage among 15-year olds was published following the 2003 survey (see OECD, 2005) and data relating to Ireland were reviewed in the report on the 2005 Census, more recently, information on ICT usage has been reported in conjunction with overall reporting on PISA. In PISA 2009, more students in Ireland reported that they had access to a computer (96%) and to the Internet (93%) than did students on average across OECD countries (94% and 89% respectively). However, students in Ireland reported below-average levels of computer use at home for leisure purposes, computer use at home for schoolwork, and self-confidence in performing higher-level ICT tasks. Students in Ireland did not differ significantly from the OECD average in their attitudes towards computers (Perkins, Moran, Shiel & Cosgrove, 2011). They also reported reading a less diverse range of online reading materials than their counterparts on average across OECD countries. Male students in Ireland were more likely than females to use an online dictionary or encyclopaedia, to read online news, or to search online for information about a topic, while females were more likely to read emails and chat online. The outcomes of PISA 2012, as they relate to ICT usage among 15-year olds, are reviewed in Chapter 9 of this report and provide an opportunity to examine whether usage levels have changed since 2003. Chapter 9 also provides data on usage of computers by pupils in Fourth class in primary schools, including pupils in Ireland. These data arise from international studies of reading literacy, mathematics and science at primary level.

Table 1.3 International reports on ICT published since 2005

Year	Report
2005	*Are Students Ready for a Technology-rich World? What PISA Tells Us (OECD)* (and ICT indicators based on subsequent PISA surveys in 2006, 2009 and 2012)
2006	*EU Survey on Use of Computers and the Internet in Schools in Europe.*
2007	*European Reference Framework on Key Competencies for Lifelong Learning* (including digital competence)
2008, 2011	*UNESCO ICT Competency Framework for Teachers* (see Chapter 2, this report)
2011	*Key Data on Learning and Innovation through ICT at School in Europe* (European Commission)
2012	*European Survey of Schools: ICT in Education (ESSIE). Country Profile: Ireland.*
2013	*European Survey of Schools: ICTs in Education (ESSIE). Benchmarking Access, Use and Attitudes to Technology in Europe's Schools.*

1.3.2 Eurydice Report: Key Data on Learning and Innovation through ICT (EACEA, 2011)

The 2011 report, *Key Data on Learning and Innovation through ICT at School in Europe* (EC, 2011), drew on data from a number of sources, including 'steering documents' (e.g., curriculum documents and related guidelines). Among the reported findings are the following:

- A number of EU countries (but not Ireland) provide subsidies or tax breaks to parents to purchase computers for educational purposes
- Ireland is identified as a country in which there are central monitoring mechanisms to evaluate ICT strategies (though the nature and quality of these mechanisms is not considered).
- Ireland is identified as a country in which the development of seven of the eight EU key competences is supported by use of ICT, though no specific evidence is provided for this. Learning to learn is identified as an area that is not supported by the use of ICT.
- Ireland is identified as being in a group of countries where learning and innovation skills (e.g., creativity, innovation, critical thinking, problem solving) are not formally assessed. The UK was identified as assessing all of these areas.
- Ireland is identified as specifying a range of cross-curricular (learning and innovation) skills in its steering documents that can be promoted using ICTs. These include creativity, innovation, critical thinking, problem solving, decision making, communication and research and inquiry. Three life and career skills (flexibility and adaptability, initiative and self-direction, and leadership and responsibility) are cited as being included, but a fourth, productivity, is identified as being absent. Estonia and Belgium (Dutch section) report that steering documents advocate the use of ICTs for a similar set of skills.
- Ireland is cited as including a range of ICT learning objectives in central steering documents for primary and general secondary education, including knowledge of the use of hardware and electronics, using a computer, using mobile devices, using office applications, searching for information, using multimedia, and using social media. One objective, developing programming skills, was not found at either primary or general secondary levels in Ireland. While several EU countries did not include programming at primary level, most did so for general secondary schooling.
- Ireland is identified as a country in which steering documents recommended the placement of computers in a variety of locations in schools, including separate computer labs, classrooms and common spaces. Interestingly, neither the Nordic countries nor the UK made recommendations on the location of computers in their documents.
- Ireland is identified as one of seven countries that did not assess ICT competencies in primary or secondary education, either through the use of theoretical tests, practical tests or project-based assessments. The UK (England and Northern Ireland) was identified as assessing ICT competencies using all three methods.
- Ireland was identified as one of 14 countries that did not evaluate teachers' ICT skills at primary or secondary levels, using either internal or external evaluation.

In reviewing these findings, it seems important to draw a distinction between what appears in 'steering' documents, and what is found in schools and classrooms, and why there might be a mismatch between the two. Reports, based on other research methods such as observation (see

DES, 2008) and surveys contribute to our understanding of how ICT is integrated into teaching and learning.

1.3.3 EU Survey of Schools: ICT in Education ('ESSIE' Study)

This study, carried out for the European Commission by European Schoolnet and the University of Liège, is based on a survey of schools that was carried out in autumn 2011 and covered 31 countries (the EU27, Croatia, Iceland, Norway and Turkey). The survey was designed to compare national progress on the Digital Agenda for Europe (DAE) and EU 2020 goals. It focused on Grades 4 (Fourth class in Ireland), 8 (Second year) and 11 (Fifth year)[2]. Key findings relating to infrastructure include:

- At Grade 8 (Second year), Ireland ranked in a middle group of countries, with 5 students per computer[3] – the same as the EU average[4]. 98% of students in Grade 8 in Ireland were in schools where at least 90% of computers worked.
- Ireland was among the best equipped countries in terms of the number of interactive whiteboards per 100 students at Grade 4 (3 per 100). The EU average was below 1 per 100. At Grade 8, Ireland had the lowest (best) ratio of students per data projector of any country in Europe (16:1), while ratios were also low at Grades 4 and 11.
- In Grade 4 in Ireland, just 6% of students were in schools with broadband speeds that were greater than 30 Mpbs, compared with an EU average of 13%. At Grade 8 in Ireland, 21% of students were in schools with broadband speeds that exceeded 30 Mpbs, compared with an EU average of 14%.[5] At Grade 11, 12% of students in Ireland, and 23% on average across EU countries, attended schools in which broadband speeds exceeded 30 Mpbs.
- At Grade 8 in Ireland, 55% of students attended schools with a virtual learning environment, compared with an EU average of 61%. At Grade 4, 23% of students were in schools with a VLE, compared with an EU average of 32%. At Grade 11, Ireland (61%) was close to the OECD average (63%).
- At Grade 4, just under 60% of students attend schools that are described as 'Type 1' (i.e., high levels of equipment, broadband > 10 Mpbs, and high levels of connectedness to the Internet), compared with an EU average of just under 40%. However, a cluster of countries (Norway, Sweden, Finland and Denmark) had 90% or more students attending such schools. At Grades 8 and 11, Ireland has fewer students attending Type 1 schools, compared with the corresponding EU averages. The situation is particularly acute at Grade 11, where Ireland has significantly fewer students attending Type 1 schools (just over 30%), compared with an EU average of almost 60%, and ranks 21st of 26 countries. Almost all students in Grade 11 in Norway, Sweden, Finland and Denmark attend Type 1 schools.
- While over 45% of students in Grade 8 in Ireland attended schools where equipment was mainly maintained by school staff (about the same as the OECD average), Ireland had one of the highest proportions of students attending schools that used commercial companies as the key resource in maintaining ICTs. Ireland was also among a group of countries where

[2] In the case of Ireland, 5th year data are provided for General education only. Some countries provided separate data for Vocational education.

[3] Includes desk-top computers, laptops, tablets and netbooks

[4] Does not include Germany, Iceland, the Netherlands and the UK, where response rates were low.

[5] These data were gathered before the 100 Mbps to Post-primary Schools initiative had been rolled out to all post-primary schools in Ireland.

very little maintenance or technical support was provided by regional educational authorities.

- At Grades 4, 8 and 11, fewer students in Ireland than on average across EU countries attended schools where the principal perceived insufficient or inoperative equipment as having a negative impact on the use of ICT for teaching and learning. Ireland's rankings were 24 of 27, 25 of 26 and 23 of 25 at Grades 4, 8 and 11, respectively.

The report provided the following data on teachers' and students' use of ICTs in class[6]:

- At Grade 4, Ireland (75%) ranks first in the proportion of students in schools where the teacher uses ICT in more than 25% of lessons. The corresponding EU average is 29%. The data for Ireland are consistent with the low ratio of students to interactive whiteboards. At Grade 8, 60% of students were in classes where ICTs were used in more than 25% of lessons, compared with an EU average of 32%. Ireland ranked second behind Portugal. At Grade 11, 47% of students in Ireland were in schools where teachers used ICTs, compared with an EU average of 32%. Here Ireland ranked 7th.
- In Ireland, 54% of students in Grade 8 reported using a school desktop or laptop computer for learning at school at least weekly, 7% reported using their own laptop, and 24% reported using their own mobile phone. The corresponding EU averages are 53%, 11% and 28% respectively. At Grade 11, 57% of Irish students reported using school desktops or laptops at least weekly, 0% reported using their own laptops, and 35% their own mobile phones. Corresponding EU averages were 51%, 11% and 35% respectively.
- On a measure of students' use of ICT-based activities during lessons, covering frequency of searching the Internet, chatting online, posting homework on the school website, and using computers to conduct experiments, students in Grade 8 in Ireland achieved a score that was significantly below the EU average, and ranked 26th of 27 countries. Frequency of usage was also below the EU average level at Grade 11, resulting in a ranking of 26th of 27 countries.

Findings in relation to teachers' and students' attitudes towards computers included:

- While students in Grades 4 and 8 in Ireland are taught by teachers with levels of confidence in their social media skills and in their operational skills with ICT that are above the corresponding EU average scores, students in Grade 11 are taught by teachers with below average levels of social media skills, and levels of ICT operational skills that are at the EU average. At Grade 8, Ireland ranks fourth in terms of teachers' confidence in their operational skills with ICT.

Findings in relation to teacher professional development in the two years prior to the survey include:

- In Ireland, 58% of students in Grade 4, 74% in Grade 8 and 75% in Grade 11 were taught by teachers who reported that they had received ICT training from school staff. These

[6] It should be noted that "use" does not indicate change of pedagogical practice or how ICT was used nor does it indicate how long ICT was used during the lesson.

percentages were above the corresponding EU average percentages (49%, 51% and 47% respectively). Ireland ranked 3rd at Grade 8 and 2nd at Grade 11 on this indicator.

- In Ireland, 71% of students in Grade 4, 76% in Grade 8 and 86% in Grade 11 were taught by teachers who reported that they engaged in personal learning about ICT in their own time. The corresponding EU averages were 74%, 71% and 71% respectively.
- Forty-three percent of students in Grade 4 in Ireland, 42% at Grade 8 and 41% at Grade 11 were taught by teachers who reported taking courses on the pedagogical use of ICT in teaching and learning. These estimates are below the corresponding EU averages at Grades 4 and 8 (47% and 53% respectively), and above the EU average at Grade 11 (42%).
- Twenty-seven percent of students in Grade 4 in Ireland, 47% in Grade 8 and 52% in Grade 11 were taught in classes whose teachers reported that they had engaged in subject-specific training to integrate ICT into their teaching. Corresponding EU averages were 22%, 33% and 28% respectively.

Some caution should be exercised in interpreting the outcomes of this EU-funded survey. Ireland was one of a number of countries with relatively low participation rates in the survey (29% of schools on average in Ireland across educational levels), especially at post-primary level (25% at Grade 8, and 23% at Grade 11). Participation rates were also low in Sweden (9% overall) and France (17%), while Germany, the Netherlands, Iceland and the UK had average response rates that were so low they could not be included in reports on the survey. Nevertheless, there are some interesting patterns in the data and these can be compared to the outcomes of the 2013 Census and well as outcomes from other international studies, which are reported in Chapter 9.

1.4 Current Reform Initiatives in Ireland

A number of reforms are currently being implemented in Ireland that have or will have significant implications for the use of ICTs in teaching, learning and assessment. These include the *National Strategy to Improve Literacy and Numeracy among Children and Young People 2011-2020* (DES, 2011b), Project Maths (PM) (the new mathematics curriculum at the Junior and Senior cycles at post-primary level) and Junior Cycle Reform.

The *National Strategy to Improve Literacy and Numeracy 2011-2020* outlined a number of strategies to improve students' literacy and numeracy skills at primary and post-primary levels. The *Strategy* included communication through digital media in its definition of literacy, and indicated that students' ability to read digital material should be assessed in the National Assessment of English Reading (currently carried out in a random sample of primary schools every five years), that parents and communities should become more aware of the role they can play in improving children's literacy through the use of online digital resources and tools, that initial teacher education programmes at primary and post-primary levels should include use of ICTs to strengthen literacy and numeracy, and that there should be an increased emphasis on digital media in redeveloped curricula in English and mathematics. Different aspects of the *Strategy* are currently being implemented, including the redevelopment of curricula in English and mathematics at primary level, and of English at Junior Cycle.

The use of software in each curriculum strand is identified as a key aspect of Project Maths (e.g., DES, 2011). Research conducted as part of PISA 2012 revealed that teachers in initial Project Maths schools made greater use of ICTs than did teachers in schools where the programme was introduced at a later stage (Cosgrove et al., 2012). Teachers who used five or six ICTs (PC or laptop, data projector, Internet sites, general software, mathematics-specific software, and spreadsheets) were categorised as high users of ICTs. Forty-three percent of maths teachers in initial PM schools were identified as 'high' users of ICT, while 29% of teachers in other schools were categorised in this way. The greatest differences between the two groups were in the use of general software, mathematics-specific software, and spreadsheets. It is unclear whether these differences arise from higher levels of training in ICT offered to teachers in initial schools, or their greater experience in implementing the syllabus more generally. In their report, Cosgrove et al. called for a careful examination of the use of ICT in mathematics lessons, with a view to identifying those tools and strategies that are most effective in achieving teaching and learning goals, and working them into the suite of resources available to all mathematics teachers. This research suggests that, while some progress has been made in integrating ICTs into the teaching and learning of mathematics at post-primary level, there is a need to better understand which ICTs are most effective in promoting students' learning.

Current proposals to reform the Junior Cycle (DES, 2012a) are also likely to have an impact on the use of ICT in classrooms. Among the innovations at Junior Cycle are:

- A statement of learning (one of 24) that specifically relates to technology: [the student] uses technology and digital media tools to learn, communicate, work and think collaboratively and creatively in a responsible and ethical manner.
- The inclusion of technology as an element in all six key learning skills. For example, under the skill of managing information and thinking, the following element is specified: Using digital technology to access, manage and share content.
- The development of short courses by the NCCA, schools and others which may include a focus on technology.
- The integration of ICT into all subject areas and courses, with key skills incorporated into each new subject and short course as it becomes available
- The possible use of technology in assessment (for example, e-portfolios).

If these proposals are implemented in full, ICT is likely to become a significant feature of teaching, learning and assessment at Junior Cycle level.

There is also an ambitious programme of reforms being implemented at primary level, including redeveloped curricula in English, Gaeilge and Mathematics over the next three years. It is likely that these redeveloped curricula will place a considerably stronger emphasis on ICT than has been the case in the past.

Work being undertaken by the Teaching Council in relation to the development of a Framework for Professional Learning (see Chapter 2, this report) should also provide an impetus for development.

1.5 Conclusion

The intention of the Department of Education and Skills to produce a new digital strategy to cover the next five years is timely. Several strategy documents were issued between 1997 and 2009. Since then, however, no new strategies have been published. With significant reforms in curriculum and assessment likely over the next few years, a new strategy can serve to bring disparate elements related to specific subjects together in a coherent way, and ensure that the integration of ICT into teaching and learning continues to be a central goal. A strong digital learning strategy could have significant impacts on upcoming developments in curriculum at primary and post-primary levels.

The economic slowdown has undoubtedly had a negative impact on the availability of public funds to support the use of ICT in schools. This makes it difficult for schools to plan ahead in strategic ways, to ensure that equipment is in working order, and that older equipment is replaced.

There is also evidence of gaps in the professional development available to teachers in Ireland, with relatively low proportions of teachers accessing courses on the integration of ICTs in teaching and learning, although there is some evidence that teachers in Ireland are more likely to attend courses that address subject-specific applications of ICTS, compared with their counterparts in other European countries. The theme of professional development is taken up in considerable detail in Chapter 2 of this report, in the context of recent work completed by UNESCO.

Although international studies such as PISA and ESSIE present some negative views on the use of ICTs in Irish classrooms, it should be acknowledged that such studies are not designed to identify examples of good practice in schools. While we can be fairly certain that there is effective use of ICTs in teaching and learning in many schools in Ireland, we know relatively little about them, because there is a dearth of research on what works effectively in our schools, and what may not represent effective use of ICTs.

2: Review of the Literature

At all levels, our education system needs to change to meet the challenges of a rapidly evolving digital society. The need to have a long-term vision for education that ensures all students experience success and have the knowledge, skills, abilities and competencies to be successful in the 21st century was never more important. Unquestionably, ICT has a key role to play in transforming education systems to meet the needs of the 21st century. However, it must be realised that ICT is only one part of a complex jigsaw and the use of ICT to support the type of learning envisioned in the 21st century is challenging. The design of a Digital Strategy for Schools accordingly demands an examination of all aspects of the education system as it currently exists. There is a need to carefully consider the implications that a vision of ICT may have for the other components of the education system. These includes pedagogy, teacher practice, professional development, curriculum, assessment, school organisation and administration. These components form an interrelated and interdependent learning ecosystem. If change is to occur and ICT successfully used to support learning, there is a need to consider the way components work together and reinforce each other as part of the ecology of learning.

The publication of the *National Digital Strategy* (DCENR, 2013) provides a foundation step towards planning what the future should be like in Ireland. The development of a Digital Strategy for Schools is a critical part of this planning if Ireland is to realise the potential of ICT in schools and prepare our young people to live, learn and work in the 21st century. The purpose of the literature review presented in this chapter is to contribute to the process of designing a Digital Strategy for Schools by identifying international practices, trends and priorities in relation to the use of ICT in schools. These are presented as three interrelated themes: 1) infrastructure, 2) teaching and learning through the use of ICT, and 3) teacher professional learning. These themes correspond to those examined in the 2013 ICT Census. They also encapsulate key aspects of a learning system as identified in the UNESCO framework referred to in Chapter One (2008a, 2008b, 2011), which include pedagogy, teacher practice and professional learning, curriculum and assessment.

The analysis of international trends focuses primarily on reports from large-scale, multinational evaluations of ICT in education. It includes reports from:

(i) International studies such as the U.S. Department of Education's International Experiences with Technology in Education (IETE) study (Bakia, Murphy, Anderson, & Trinidad, 2011), the Second Information Technology in Education Study (SITES) 2006 (Pelgrum, 2008), the International Association for the Evaluation of Educational Achievement's (IEA) Cross-National Information and Communications Technology: Policy and Practices in Education Study (Plomp et al., 2009), and the Microsoft Innovative Schools Program (ISP) (Shear et al., 2009, 2010a), as well as Innovative Teaching and Learning (ITL) Research (Shear et al., 2011a).

(ii) Surveys of European Union countries such as the Eurydice study (EACEA, 2011), and EU Survey of ICT in Schools (ESSIE) (European Schoolnet and University of Liège, 2013)

In addition, a number of international case studies, international and national research reviews, and evaluation reports of specific interventions and projects will be used to supplement information

from the multinational data collections, where appropriate. This is because there are no large-scale longitudinal studies on the impact of ICT in education. Current major international collections are not conducted on an annual basis, which limits their ability to contribute up-to-date information on international investments in ICT for education. They also tend not to reflect emerging trends such as the use of mobile and social networking technologies, the use of tablet devices and investments in online learning.

2.1 Infrastructure

The development of a robust infrastructure that provides teachers and students with the resources they need, when and where they are needed, is an essential component in the integration of ICT into schools. This includes resources such as computer hardware, data and networks, information resources, interoperable software and technical support. This section focuses on three important components of ICT infrastructure that affect the ways in which digital technologies are used in schools: Internet connectivity, hardware and technical support.

2.1.1. Internet Connectivity

Access to high-speed broadband is now a critical component of school infrastructure. If schools are to make the most of rich online curriculum resources, online assessment tools, web-based collaboration systems, digital textbooks and a host of Internet-based technologies such as online collaboration tools, Internet-enabled communication services (e.g. VoIP and videoconferencing) and cloud computing, it is essential that they have sufficient broadband bandwidth to facilitate the seamless use of these tools in schools. As a consequence, it is no longer sufficient to provide Internet connectivity in schools; rather, the substance and bandwidth of the connection must be taken into consideration to ensure consistently high-quality user experience. This is because a school's bandwidth increasingly determines the online content, functionality and applications students and teachers can use effectively in the classroom (Fox et al., 2012).

Given the rapidly increasing bandwidth needs of schools, it is not surprising that many countries report major efforts towards improving Internet connectivity in schools. In the USA, it is planned that the ConnectED initiative will, within five years, connect 99 percent of America's students, through both high-speed broadband and wireless within their schools and libraries[7]. Similarly, 20 of the 21 countries surveyed in the IETE study (Bakia et al., 2011) reported that improving school broadband access and adequate wireless connectivity were top priorities in national efforts to improve education. Many of these broadband access programmes are part of cross-sector, national-level initiatives that benefit the general population. For example, the Digital Education Revolution fund in Australia targets delivery of high-speed broadband connections in 93 percent of Australian schools, homes and workplaces (Bakia et al., 2011). Similarly, the SuperNet High Speed Network project in Alberta, Canada, provides broadband connections to the Internet for all public institutions, including schools. The province provides funding for a basic level of service and schools can opt for increased bandwidth at subsidised rates (ibid.).

Among the reasons cited as goals for improved connectivity in schools is the need to take advantage of the range of rich new Internet-based tools, resources and online assessments as well as to gain access to professional development opportunities for teachers (Fox et al., 2012). Other reasons

[7] http://www.whitehouse.gov/sites/default/files/broadband_report_final.pdf

include the desire to extend learning opportunities beyond traditional classroom boundaries and to meet the needs of underserved populations. As reported in the IETE study, countries such as Australia, Canada, Iceland and New Zealand explicitly target improving service to rural communities, while countries such as Belgium, Canada and the Netherlands address the specific needs of certain populations. Belgium's 'ICT Without Boundaries' programme provides access for students with disabilities and chronically-ill students; Canada is exploring ways to better serve students at risk of not completing high school; and the Netherlands is experimenting with an online platform to offer accelerated learning for gifted students (Bakia et al., 2011).

If recent trends are any indication, bandwidth requirements are set to further increase in schools over the next few years. The growth of online resources and facilities places increased demand on existing school networks. Internet-based learning resources, for example, make use of a range of media that include high-definition images, sound files and videos, all of which require substantial bandwidth to deliver quickly without loss of quality. E-textbooks incorporating online content and services such as tutorials, multimedia, simulations, social tools, and a wide range of web-based educational resources are also bandwidth heavy. In fact, even the simple activity of a number of classrooms in a school simultaneously accessing a video online demands adequate broadband coverage for all the classrooms to stream the video concurrently. In addition to student use, schools must consider bandwidth for data systems operations, administration and reporting as well as teacher professional development needs (Fox et al., 2012). What all of this implies is that there is a pressing need to set goals for current and future connectivity in school. This is imperative if we are to ensure that schools can meet present and future demands for Internet access and use.

Undoubtedly, broadband needs vary from school to school and the assessment of current and future broadband requirements is a complex process. One commonly used metric is bandwidth-per-student/teacher, which directly correlates with the quality of a student's online experience. It defines a framework for assessing bandwidth requirements based on what the users, both students and teachers, need in order to engage in the range of online activities. Using this metric, organisations such as the State Educational Technology Directors Association (SETDA) in the USA and technology companies such as CISCO have set out what they see as minimum broadband targets for schools over the next five years or so. A white paper produced by Cisco (2013) recommends that by 2014, all schools in America should have Internet access of 1 Gbps per 2,000 students (or 0.5 Mbps per student) and by 2018 should increase that number four-fold, to 4 Gbps per 2,000 students (or 2 Mbps per student). The targets recommended by SETDA are even more ambitious. It recommends that by the school year 2014-15, schools should have Internet access of at least 1 Gbps per 1,000 students/staff, with this figure increasing to 10 Gbps per 1,000 students/staff by the school year 2017-2018 (Fox et al. 2012). Although these sets of targets may seem high, CISCO argues that a high level of connectivity is required because the density of devices and users per square foot in a school is among the highest found in any work environment. Moreover, when one considers the typical broadband speeds required for the seamless use of a range of online activities in schools, the need for this level of connectivity is obvious. Table 2.1, taken from Fox et al. (2012), is useful in this regard. It identifies typical broadband speeds that are required per-user across a range of activities.

Table 2.1. Sample broadband requirements (download only) for various activities.

Activity	Recommended Download speeds
Email and Web Browsing	500 Kbps
Download a 1 MB digital book in 5.3 seconds	1.5 Mbps
Online Learning	250 Kbps
HD-quality Video Streaming	4 Mbps
Skype Group-Video Session, 7+ people	8 Mbps
Download a 6144 MB Movie in 8 minutes	100 Mbps
Multiple Choice Assessments	64 Kbps/student

Source: *Fox et al., (2012, p. 21)*

While these figures are useful, it is also necessary to stress that broadband speed is only one measure of how robust a network is. Because school buildings, wireless connections and the age of the users' computers vary, it is equally important to consider how much connectivity is reaching students and teachers in the classroom so that students and teachers can conduct online activities with minimal disruptions or lag time. In fact, Bakia et al. (2011) stress that the published connection and transmission speeds of networks can be a misleading indicator of true Internet connectivity. Depending on the quality of the "last mile" of the wired network, the quality of a wireless connection and the age of the user's computer, students and teachers may never experience a network's advertised speeds. For these reasons, a key recommendation in the CISCO white paper is that all network applications and traffic, as well as technologies for more efficient use of the bandwidth, should be factored into the architecture and design of school networks (CISCO, 2013).

According to the recent EU ESSIE study (European Schoolnet and University of Liège, 2013); broadband speeds in schools in Ireland are close to or exceed the EU average at post-primary level but are far below the EU average at primary level.[8] The survey reports that 21% of students in second and fifth years were in schools with broadband speeds exceeding 30 Mbps. This compares with an EU average of 14% of second year students and 23% of fifth year students. In contrast just 12% of students in Fourth class at primary level were reported to be in schools where speeds exceed 10 Mbps, compared with 33% across EU countries. Similar to many countries, efforts are underway to improve broadband access in schools in Ireland. In a joint DES/DECNR initiative, high-speed broadband (100Mbs) is currently being rolled out in all second-level schools in Ireland. While this initiative is welcomed, there is an urgent need not only to extend the initiative to the primary sector but to also consider broadband requirements on a per school basis. Currently, each post-primary school is being provided with Internet access of 100Mbs. In schools with 100 users, access is thus 1Mbs per user. However, in schools with 500 students, access is 0.2Mbs or 200kbs per student. What this implies is that the broadband speeds in these schools are already too slow. In addition, the broadband connection is brought as far as the school in Ireland. Schools are left to deal with issues arising in the "last mile" of the network – that is, from outside the school wall through where it is distributed across the building. For more efficient use of the bandwidth as well as to ensure the

[8] Care should be exercised in interpreting the outcomes of ESSIE, since response rates in Ireland and in other participating countries were low.

quality of learner experiences, it is essential that technical issues associated with how the broadband signal is deployed across the school are addressed.

2.1.2 Hardware

To take advantage of the content, functionality and applications provided by high-speed broadband, schools need computers that are powerful enough to support high-quality user. Not surprisingly, hardware investments are seen as a prerequisite to taking advantage of improved connections in many countries and providing access to computers is a priority shared by most countries worldwide.

2.1.2.1 Student-to-computer ratios

Even amongst those countries that report sufficient levels of hardware access, the improvement of student-to-computer ratios in schools continues to be prioritised. Although each of the 21 countries that participated in the US-led IETE study had relatively advanced ICT infrastructure in place, 19 of these countries prioritise improvements to existing ICT infrastructures. For example, Australia, Canada, Estonia, Israel, Japan, Korea and New Zealand reported large investment to improve student-to-computer ratios. Australia, Austria, Canada, Israel and Japan were aiming towards one-to-one computer ratio for a subset of students while South Korea was aiming for one-to-one computing for all students aged 6-18 by 2013[9] (Bakia et al., 2011). Similarly, among the recommendations in the National Education Technology Plan in the USA is that every student has access to at least one computing device (NETP, 010). In the EU, a number of countries have already either completed one-to-one pilots or have programmes in place to support the adoption of one-to-one computing. Balanskat and Garoia (2010) identified 33 one-to-one initiatives across 18 countries in the EU (Austria, the Czech Republic, Estonia, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Spain and the UK). Portugal for example, has provided 1.2 million laptops/netbooks to schools since 2007. Through initiatives such as "The Magellan Project" and the "Escola Project", laptops/netbooks were made available to all primary and post-primary students at discounted rates, with low-income families receiving a subsidy. The target ratio is one computer for every two students.

Despite the push towards improved student-to-computer ratios in schools, ratios remain some distance from one-to-one computing in most countries, including Ireland. According to PISA 2012, the average ratio of students per computing devices in post-primary schools across OECD countries was 6.8:1 (PISA 2012 database).[10] In Ireland, the ratio was 6.4 students per computing device. Similarly, the EU ESSIE Study reported between three and seven students per computer in the EU (European Schoolnet and University of Liège, 2013). Average ratios were 7:1 at primary level (Grade 4), 5:1 at lower secondary level (Grade 8) and 4:1 at upper secondary level (Grade 11). Student-to-computer ratios in schools in Ireland are in line with these figures – 7:1 at primary level, 5:1 at both lower and upper secondary.

[9] Reports documenting if these targets were met have not yet been published.

[10] This ratio is based on the number of grade 9 (third year) students divided by the total number of computing devices available for use by students in grade 9, so in practice, students at other grades may also use these computing devices (see Chapter 9).

2.1.2.2 Devices

In keeping with technological developments, the trend in schools across the world has been towards the use of progressively smaller, more portable computers. Over the past two decades, there has been a significant shift in the dynamics of computer purchase for schools – moving from desktop PCs to laptops and most recently to tablets and other mobile devices.

In the mid-1990s, schools were chiefly concerned with the provision of desktop PCs and these tended to be placed in computer rooms and/or in small numbers in classrooms. The strategy of placing a number of computers in a computer room was especially attractive to schools that were beginning to use technology as this enabled many students to access machines at the same time (Means, Olson & Singh, 1995). By the mid-2000s, laptop computers had begun to increase as a percentage of total school computer inventories (Warschauer, 2006). Recently published surveys including ESSIE (2013), IETE (Bakia et al., 2011) and Balanskat and Garoia (2010) highlight the increasing pervasiveness of laptops in schools, indicating that most hardware investments currently focus on laptops. While one-to-one initiatives tend to use laptops, the practice in many schools is to make sets of laptops available on mobile trollies which are shared across classrooms. These shared trollies, combined with wireless networks, can provide more flexible access to computers in school and enable teachers to provide greater numbers of students with simultaneous access to computers in the classroom (Strudler & Hearrington, 2008; Warschauer, 2006).

The increasing affordability and widespread penetration of mobile devices, including student-owned devices, is fuelling interest in netbooks, tablets and smartphones as tools for teaching and learning. The 2013 Horizon report on emerging technologies in education predicts tablet computing, along with other mobile devices and apps, will enter into the mainstream for schools within the next one to two years (Johnson et al., 2013). Perceived as an affordable solution and as ideal devices for one-to-one computing, mobile devices can present opportunities for learning that are simply not possible with other devices. Apart from placing web access and 'high-spec' functionality in the hands of more users than any other digital technology, mobile devices perform many of the functions of desktop or laptop computers, with the advantages of being easier to learn and use and being usable anywhere and anytime (Melhuish & Falloon, 2010). They are also lighter and more flexible in terms of mobility and orientation; they have a touch screen interface which allows a high degree of user interactivity, and have longer battery life (e.g. Ludwig & Mayrberger, 2012; Melhuish & Falloon, 2010; Warschauer, 2011). There is evidence of increased adoption of mobile devices in schools around the world (e.g. Hallissy et al., 2013; Heinrich, 2012; Henderson & Yeow, 2012; Hu, 2011; Johnson et al., 2013; Winsolow et al., 2012). A number of countries have recently implemented or are implementing pilot programmes involving mobile devices. For example, eight of 21 countries that took part in the IETE study (Bakia et al., 2011) reported that their countries were currently implementing pilot programmes (Austria, Canada, Chile, Israel, Japan, New Zealand, Singapore and South Korea).

A growing number of schools are also launching "Bring Your Own Device" (BYOD) programmes so that students can use the devices they already own in class. While BYOD makes one to-one easier by simply leveraging the devices that students already own, a key driver of this move is finance; it is happening partly because of how BYOD impacts on budgets. If students bring their own devices, schools can spend less money on hardware. Infrastructural efforts can then be focused on issues such as connectivity rather than on the continual upgrading and provision of hardware. Funds are

also freed to support students who cannot afford their own devices or to the purchase of other digital tools such as digital video (DV), robotic toys and micro-controllers.

2.1.3 Access to other technologies

2.1.3.1 Cloud Computing

In simple terms, cloud computing comprises services that are made available to clients from a third party service provider, via the Internet. It refers to both the applications delivered as services over the Internet as well as the hardware and systems software in the data centres that provide those services (Amhurst et al., 2009). The data centre hardware and software is what is known as the 'cloud'; the main services provided by cloud computing are: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS). It is widely considered to be a potentially cost-efficient model for providing processes, applications and services while making IT management simpler. To this end, services are sold on demand; customers simply pay for the services they use while providers bear the costs of hardware and software provision. Services are elastic – customers can decide what resources they wish to use and increase or decrease these without discussion with the provider. The services are also fully managed by the provider. In fact, the consumer needs nothing but a personal computer and Internet access (Mell & Grance, 2011; UNESCO, 2011).

Improved access to high-speed Internet in schools, economies of scale and other features of cloud computing has accelerated interest in its use in schools. Educational institutions are beginning to use cloud services for purposes such as student email provision, data storage and hosting learning management systems (LMSs) in the cloud (UNESCO, 2010). In addition, as schools develop their infrastructures to support one-to-one learning and BYOD deployments, they are using the cloud services to make it easy for students and teachers to access resources from any device (Johnson et al., 2013). According to the IETE study, countries that report a move to cloud computing include Austria, Denmark, Japan, and South Korea. Austria's standardised learning system was developed primarily to eliminate barriers to school-based integration of ICT in the classroom by reducing local investments in servers, maintenance, and training. South Korea is developing supercomputing facilities to be shared by all the country's research entities as a means of promoting collaboration across sectors and providing secure storage (Bakia et al., 2011).

While cloud computing offers a viable solution to the ongoing expense of procuring and maintaining a wide range of hardware and software in schools, there is need to consider the wider issues. In addition to the challenge of ensuring adequate broadband access, the use of cloud-based technologies presents ethical issues in terms of data ownership, private security, digital footprints and conglomerate monopolies. As schools adopt cloud-computing services and transfer increasing quantities of student information to third-party providers, privacy issues become more salient and contentious. A study by the Fordham University Law School's Center on Law and Information Policy notes serious lapses in school districts' protection of the privacy of student data. Deficits were found pertaining to schools' control of private student information under contracts with private companies storing data in the cloud, as well as in alerting parents and students about who has access to student data. This led the authors' to conclude that privacy implications for districts' use of cloud services are "poorly understood, non-transparent, and weakly governed" (Reidenberg et al., 2013, p.5).

2.1.3.2 Interactive whiteboards and data projectors

Although computers are the primary focus of policies and programmes concerning hardware, many countries report efforts to increase access to other technologies such as interactive whiteboards (IWBs) and data projectors (Bakia et al., 2011; European Schoolnet and University of Liège, 2013).

The recent proliferation of IWBs in classrooms around the world suggests that teachers and educational policymakers see this as a useful teaching tool. The British government, for example, invested over £50 million for the provision of IWBs in classrooms between 2003 and 2005 (Smith et al., 2005). Similarly, the ministry in Alberta, Canada dedicated 56 million US dollars between 2008 and 2010 to ensure every classroom had a working instructional computer with a projector or IWB[11]. Several countries participating in the IETE survey (Bakia et al., 2011) also reported efforts to increase access to IWBs. According to this survey, current ICT infrastructure plans in countries such as Australia, France and Denmark encourage the purchase of interactive whiteboards at local level. Likewise, Eurydice (2011) notes that Portugal planned to have one projector per classroom and an IWB in one out of every three classrooms by the end of 2010 while in Spain, the national ICT plan *Escuela 2.0* (2009) aimed to place an IWB in each fifth grade classroom[12].

In Europe, the ESSIE survey notes that IWBs are found at all levels of primary and post-primary schools. It records approximately one IWB per 100 students in Europe but notes a wide variation across and within countries (European Schoolnet and University of Liège, 2013). Overall, the highest numbers of interactive whiteboards are found at the lower end of post-primary school (Grade 8) in Europe. Countries with the lowest ratios are Denmark (3 IWBs per 100 students), Hungary, Malta, Finland, Czech Republic and Estonia (each of which have approximately 2 per 100 students). At the same time, 14 countries report less than one interactive whiteboard per 100 students at this level. In contrast, the lowest number of IWBs is found at the upper end of post-primary school (Grade 11). At this level there are 167 students per IWB. Again Denmark, Malta, Estonia and Finland report ratios of two or three IWBs per 100 students although there are less than one IWB per 100 students in 18 countries. At primary level, there is a ratio of 111 students per IWB. Highest numbers are reported in Malta (6 per 100 students), Denmark (4), Ireland (3), Norway (3) and Spain (2).

2.1.4 Technical Support and Maintenance

A necessary condition for sustainable integration of ICT is the existence of an adequate technical support structure. There is an undisputed need for technical support to be readily available to schools and teachers as they strive to integrate ICT in their learning environments. Despite this, the lack of technical support has been persistently cited as one of the main barriers to ICT use in schools (e.g. Cuban, 1999; Groff, & Mouza, 2008; Jones 2004; Korte & Husing, 2007; Liu & Szabo, 2009; Shan Fu, 2013). As stated in a report from BECTA (Jones, 2004), "if there is a lack of technical support in a school, it is likely that preventative technical maintenance will not be carried out regularly, resulting in a higher risk of technical breakdowns" (p.16). Many of the teachers participating in the BECTA survey indicated that the lack of available technical support discouraged them from using ICT because of the fear of equipment breaking down and lessons being unsuccessful as a result. The

[11] http://education.alberta.ca/admin/technology/classrooms.aspx

[12] Reports documenting if these targets were met have not yet been published.

report also refers to comments made about technical problems resulting in the "demotivation of students" and the removal of "time/resources from other important curriculum areas" (ibid).

The provision of appropriate, reliable and cost effective technical support solutions to geographically dispersed schools, varying in size and ICT provision, is a challenge faced by education systems across the world and a range of models of technical support are employed to meet this challenge. Large scale studies such as SITES (Pelgrum, 2008) and ESSIE (European Schoolnet and University of Liège, 2013) are useful in documenting the range of approaches adopted in different systems. Such studies have consistently found that schools bearing responsibility for their own support is by far the most common support model. The use of external companies hired by the ministry/education authority or by the school is also common; less common is the use of students to provide support; external volunteers are rarely used. For example,

- The SITES 2006 study (Pelgrum, 2008) found that technical support was provided by school staff to some extent in all schools. It was also provided by external companies hired by schools in almost 60% of cases and approximately 30% of schools have some technical maintenance provided by companies hired by the Ministry. Three of the participating countries/regions had students providing support and external volunteers were involved in one country.
- The ESSIE study (European Schoolnet and University of Liège, 2013) reports a similar range of approaches. Across schools in Europe, technical support is most commonly provided by school staff. Overall, 75% of primary schools and 94% of post-primary schools have some technical support provided by staff. The use of external companies is also a feature in all countries. At primary level, over 40% of schools have technical support provided by external companies hired by either the educational authority or the school.

Irrespective of the model of support provided, the *degree of support* available to teachers when using ICT was highlighted in SITES 2006 as critical towards sustained use. Not surprisingly, findings from SITES 2006 reported that the degree of support available to teachers when using ICT varied considerably across education systems. Neither is it surprising that those countries/regions that scored highest on this indicator were found to have high levels of ICT usage in their classrooms (e.g. Hong Kong, Singapore).

In addition, concerns relating to the ways staff members are deployed in schools for technical support have been raised in SITES 2006 (Pelgrum, 2008) as well as in a number of other studies. Typically, members of staff are appointed as ICT coordinators either in a full- or part-time capacity although, as noted by Pelgrum (2008), appointment of coordinators may be an affordable option for large schools but is usually beyond the reach of small schools. Standards for computer support in business and industry typically call for a fulltime technician for every 5- 70 computers (ISTE, 2007). At present, the role of ICT coordinators also includes staff development and instructional support and part-time ICT coordinators usually have teaching duties as well. It is noted by Struddler and Hearington (2008) that 45% of ICT coordinators in the USA had teaching duties in addition to their coordinator duties and that consequently, attending to basic support functions presented a major challenge. A school-based approach has also been adopted in Belgium whereby the ministry has designated half-time in-school ICT coordinators for every 100 full-time school staff members. Although the mandate does include pedagogical support, the majority of ICT coordinators in Belgium

report spending their time on technical issues such as cabling, maintenance and security (Bakia et al., 2011).

Finally, studies also drew attention to the ways technical support and maintenance are funded across countries. While it is accepted that most countries consider providing improved technical support a priority, Bakia et al. (2011) note that not all countries support this need with programmes. For example, they note that England provided national funding for hardware purchases but relied on schools to fund their own technical support services. ESSIE (European Schoolnet and University of Liège, 2013) reports a range of approaches to the provision of technical support across Europe. At both primary and post-primary levels, provision by the educational authority is highest in Sweden, Finland, Norway and Denmark where support is almost exclusively provided by the authority. In contrast, outsourcing to the private sector is reported to be highest in the Czech Republic and Ireland while countries such as Belgium, Bulgaria, Hungary Lithuania, and Slovakia rarely make use of either form of external provision. Schools bearing responsibility for their own support was also the most common technical support model found in SITES 2006 (Pelgrum, 2008).

2.1.4.1 Towards a coordinated, integrated system-wide approaches to the purchase and use of ICT in schools

In order to help ensure that the technology works as planned and that teachers and students know how to use it, several countries worldwide have developed and begun to use coordinated, integrated system-wide approaches towards the purchase and use of ICT in schools. As part of these approaches, they have linked infrastructure investments to explicit requirements for training and professional development, maintenance and technical support as well as technology management at national and/or programme level. The IETE study (Bakia et al., 2011) documents a number of examples of how training, professional development and support services are linked to ICT investments. In particular, it elaborates the experiences of Portugal, Israel and Chile.

- Portugal's Ministry of Education links large-scale ICT infrastructure investments with teacher training and technical support. Certification in basic ICT skills and in competencies for integrating ICTs into teaching and learning is mandatory for teachers, with the goal of having 90 percent of teachers certified by the end of 2010[13]. In addition, Portugal's Centre for Technological Support for Schools project (CATE) provides technical support for teachers. CATE integrates the support services (a helpdesk) of several technology suppliers for the Ministry to one point of contact. This creates a simplified process for schools to receive assistance which includes face-to-face support as well as phone-based and web-based resources.

- Similarly, Israel requires teacher training and provides technical support for new infrastructure investments. The "Laptop for Every Teacher" programme (www.athenafund.org) and the "Smart Classrooms" programme (www.kadimamada.org) both provide new infrastructure for classrooms, and the Ministry of Education supplements the technology provision with instruction and preparation for its use. Both programmes provide teachers with 120 hours of training to ensure their success.

[13] Reports documenting if these targets were met have not yet been published.

- In Chile, the Ministry of Education requires that before schools receive government-funded ICT infrastructure improvements, they must develop and sign two agreements; an "ICT Management Plan," committing to teacher training, maintenance and support, and an "ICT Use Plan," defining clear strategies and goals for teaching and learning. For the ministry, these user agreements help lay important groundwork for new infrastructure provisions by urging school staff to work together to develop a unified vision for how it will be used.

Another country mentioned in the report was Austria which has embedded training and technical support in a Ministry-developed, centrally run learning management system. The Austrian ministry holds the view that reducing the costs and logistical burden for schools would promote schools' adoption of the system. This view is shared the Education and Training Board (ETB) (formally the VEC) sector in Ireland.

In Ireland, a coordinated integrated approach to ICT adoption in its schools has been implemented in the Education and Training Board sector (formally the VEC). Louth and Meath and Kildare and Wicklow ETBs[14,15] have centrally-run learning management systems and also run a problem notification system called ticketing, where problems in software or administrative systems are flagged via email to the central provider. Many of the issues reported this way are remedied online. If not, each school in the districts has designated times each week where a technical support engineer is available on-site[16].

To conclude, it is apparent that the provision of appropriate, reliable and cost effective technical support solutions is challenging. It is also apparent that as cloud and mobile technologies become ubiquitous in schools and networks become more complex, schools will face even greater challenges. They will increasingly need a greater array of service offerings, ranging from basic maintenance to professional services, and support networks as they deal with issues relating to procuring and monitoring cloud services and relations with cloud computing providers and to procuring and supporting the use of mobile devices, as well as the issues of interoperability. Thus, as part of infrastructure investment in schools, it is critical to carefully consider and plan for ICT purchase, installation and training as well as for the provision of user support, technical support and maintenance (GeSCI, 2009). However, schools cannot be expected to deal with such complex issues individually and without guidance. In fact, it is unreasonable to expect that schools have a deep understanding or even awareness of the kinds and qualities of supports they need if they are to embrace new and complex technologies. Access to a coordinated, integrated system-wide approach to technical support and maintenance at a national level is therefore essential if we are to ensure a functioning and reliable technology infrastructure in schools in Ireland. This has previously been recommended by the Inspectorate in Ireland (DES, 2008), the Minister's Strategy Group (DES, 2008a) and by *Smart Schools = Smart Economy* report (ICT in Schools Joint Advisory Group to the Minister for Education and Science, 2009), which advised that investment in equipment will be less successful if such a support system is not put in place.

[14] http://www.meathvec.ie/ga/index.cfm/go/news_one/news_key/299
[15] http://www.kwetb.ie/
[16] http://www.meathvec.ie/uploads/Annual%20Report%202012.pdf

2.1.5 Conclusion

Although countries worldwide continue to prioritise infrastructural improvements, simply investing in the procurement of more technology for schools does not by itself lead to the transformation of education. In fact, there is evidence to suggest that, at times, the emphasis on hardware can draw the focus away from potential learning opportunities, and that it puts the technology above teaching (Luckin et al., 2012). There is also a significant body of evidence to show that whether or not technology affects learning outcomes is determined by *how* it is used (Langworthy et al., 2010). We therefore need to think critically about the kind of infrastructure that needs to be developed if we are to create schools in which all students develop the knowledge, skills, abilities and competencies to be successful in the 21st century. This is not a question that can be addressed in isolation but rather must take cognisance of the other components of the education system such as pedagogy, teacher practice, professional development, curriculum, and assessment. These are addressed in the sections that follow.

2.2 Learning, Teaching and Assessment through the Use of ICT

The concept of teaching, learning and assessment through the use of ICTs is highly complex. The introduction of ICT into a learning environment does not in and of itself bring about change in pedagogical practice. Rather, its use in education is inextricably linked with understandings of the nature of knowledge and the nature of knowing. If we accept that all teaching, either explicitly or implicitly, is informed by a philosophy of teaching and learning (Becker, 2000; Bransford, Brown & Cocking, 2000; Cuban, 1993; Jones & Mercer, 1993; Becker & Riel, 1999), it follows that there is a relationship between teachers' general philosophical beliefs about teaching and learning, their pedagogical practices, and their use of ICT.

Pedagogies associated with the use of ICT include those that emphasise high levels of understanding of key concepts within subject areas and the ability to apply these concepts to solve complex real-world problems (Bransford, Brown, & Cocking, 2000). Most recently, curriculum development initiatives emphasise "21st century skills" (often referred to as "Key Skills" or "Key Competencies", ETA, 2010; OECD, 2005; NCCA, 2008a, 2008b), qualities that prepare students to live and work in a digital society. They include skills such as critical thinking and problem solving, communication, collaboration, self-regulation and information management (Binkley et al., 2012; Partnership for the 21st Century Skills, 2007, 2008). The ability to use technology effectively and reflectively is identified as a key competence in each of these initiatives. Each initiative stresses the potential of digital technologies to transform student learning experiences by helping students become engaged thinkers, global citizens, and active learners in collaborative social learning environments.

Research studies have repeatedly demonstrated that a teacher's pedagogical orientation is a dominant factor in how they use ICT in their classroom (e.g., Law, Pelgrum & Plomp, 2008; Plomp, Anderson, Law & Quale, 2009; Shear et al., 2010a; Shear et al., 2010b; Shear et al., 2011a). This is despite the fact that technology can provide the necessary tools for improving the teaching and learning process, and enhance the customisation of the learning process by adapting it to the particular needs of the student (OECD, 2010). However, a key finding from the SITES 2006 study (Law et al., 2008) was that ICT adoption per se did not determine or change pedagogocal orientation in education systems. In fact, in countries/regions such as Hong Kong and Italy, ICT-using practices exhibited a stronger traditional orientation. Research has also consistently demonstrated that

computer-based interventions tend to be more effective when combined with constructivist approaches to teaching, rather than with more traditional approaches (e.g. Becker, 2000; Li & Ma, 2010; Sandholtz, et al., 1997). This section examines trends in teacher and student use of ICT and, in particular, how these relate to teachers' pedagogical practice and student learning. The use of ICT in teaching and learning in literacy, numeracy and special educational as well as for assessment purposes are explored.

2.2.1 Teacher and Student Use of ICT

It is difficult to garner an accurate or deep understanding of how ICT is being implemented by teachers and students across a range of countries during the learning process from much of the extant large scale international literature. This is because large-scale surveys tend to be self-reporting and to focus on determining if and how often particular technologies are being used (e.g. Eurydice, 2011; European Schoolnet and Univeristy of Liège, 2013). By its very nature, self-reported work can be problematic as it is difficult to verify the rhetoric against the reality of practice. In addition, data which indicate what and how often technologies are being used do not capture the intricate process of how and why they are being used or the difference, if any, their use has had on the learning process and teachers' pedagogical practice. Despite this, such surveys are useful towards indicating trends in ICT use.

In Europe, ESSIE reports that while most EU teachers have been familiar with ICT for teaching and learning for some years, they use it first and foremost to prepare their teaching (e.g. browsing to prepare lessons, preparing tasks for students, preparing presentations, collecting online resources to be used during lessons) and for teacher presentation during lessons to explain information and concepts (European Schoolnet and the University of Liège, 2012). The survey also finds that few teachers use ICT to work with students during lessons and, where they do, the range of ICT use is limited – although this is dependent on the tool and the grade. For example, approximately 35% of students at all grades across Europe never use multimedia tools as part of learning in school while between 50% and 80% of students never use digital applications such as digital textbooks, data-logging tools, podcasts, simulations and video games. In addition, teachers are found to rarely communicate online with parents, post homework for students on the school website, or use ICT to assess students or evaluate digital resources. In fact, between 60% and 85% of students across all grades are taught by teachers who reported that they never or almost never participate in such activities (European Schoolnet and University of Liège, 2013).

It is challenging for researchers to uncover how the presence and use of ICT in schools and classrooms changes "the cultural context, the relationship and roles between teachers, learners and technologies" (Loveless, 2009, p. 12). A limited range of research has been carried out in this context. One example is Microsoft's Partners in Learning initiative, the Innovative Schools Project (ISP). This project aimed to support teachers around the world as they attempted to transform traditional schools into providers of innovative learning experiences that prepared students for the 21st century. From 2007 to 2009, 12 pilot Innovative Schools in 12 countries worked together with a local Microsoft partner and the worldwide community of Innovative Schools to design and implement new and locally-relevant approaches to education (Shear et al., 2010a, 2010b). The research focus was to investigate the purpose technology is being used for rather than merely cataloguing if and what technologies are used in classrooms. Findings from the ISP Project revealed

that, although most observed lessons involving technology included some high-level uses, the most common teacher and student uses of technology were fairly traditional. For teachers, by far the most common use of technology was giving instruction and presenting information (this occurred in 57% of all observed lessons). All other teacher uses of technology, including differentiating instruction, communicating with students, demonstrating student uses of technology, giving tests or quizzes, and conducting class administration were found in less than a quarter of the lessons observed (Shear, Gallagher & Patel, 2010a). Similarly, the use of technology to practice basic skills was the dominant use of technology by students. This occurred in 40% of the lessons observed. In contrast, high-level use of technology for the purposes of organising, manipulating and interpreting information was dominant in only 13% of the lessons observed (Shear et al., 2010b).

Similar trends were observed in the subsequent Innovative Teaching and Learning (ITL) study (Shear et al., 2011a), indicating that while ICT use in teaching is becoming more common globally, ICT use by students in their learning is still the exception. The most common uses of ICT found in this study related to teacher presentation tools, whereby teachers often used computers with projection devices or electronic whiteboards. The teachers reported that use of ICT in this way allowed them to make their lessons more engaging and to make difficult content more accessible for students. The students themselves, however, most often remained in the role of receivers of information. Although they did sometimes use ICT in ways that afforded learning opportunities that were otherwise unobtainable, for the most part student use of ICT in school was basic. The majority of students used ICT to find information on the Internet, practice routine skills, or take tests.

Trends in Ireland are broadly similar to those observed in the Innovative Schools and Innovative Teaching and Learning projects. Reports indicate that only a minority of teachers in Ireland make considerable or extensive use of ICT in their daily teaching and learning. Where they do, it is predominantly as a teacher presentation tool and for the purpose of consolidating learning (Conway & Brennan, 2009; Cosgrove & Marshall, 2008; DES, 2008; European SchoolNet and University of Liège, 2013). This suggests that, for the most part, the use of ICT in schools in Ireland is at the *technology literacy level* (UNESCO, 2008a, 2008b, 2011). What this implies is that teachers use ICT in computer laboratories or in classrooms with limited facilities to complement standard curriculum objectives, existing assessment approaches and traditional teaching methods (UNESCO, 2008a).

2.2.2 Teacher Understandings of 21st Century Skill Requirements and Use of ICT

Research has also demonstrated that teachers' understandings of 21st century skill requirements have influenced the ways in which they use ICT (Butler & Leahy, 2010a, 2010b, 2011a; Leahy & Butler, 2011; Plomp et al. 2009; Shear et al., 2010; Shear et al., 2010a; Shear et al., 2011a, 2011b). When teachers' pedagogical orientations are driven by understandings of 21st century learning, they take on a more facilitative role, provide student-centered guidance and feedback, as well as engage more frequently in exploratory and team-building activities with students. According to the UNESCO (2008a, 2008b, 2011) competence framework (ICT-CF), this is a *knowledge deepening approach* and implies that teachers make use of ICT in ways that support an enquiry process and enable their students to work on solving complex real-world problems. The approach emphasises depth of understanding while also providing opportunities to engage in collaborative project-based learning activities that go beyond the classroom. A *knowledge creation approach* further builds on this approach, suggesting that the curriculum goes beyond a focus on knowledge of school subjects to

explicitly includes the knowledge society skills and competences that are needed to create new knowledge such as problem solving, communication, collaboration, experimentation, critical thinking and creative expression. The teacher's role in a knowledge creation approach is to design a learning community which makes pervasive use of technology to support students who are creating knowledge products and are engaged in planning and managing their own learning goals and activities. In this learning environment, a variety of networked devices, digital resources, and electronic environments are used to create and support the community in its production of knowledge and anytime, anywhere collaborative learning.

In larger scale studies such as the ITL research, it was unusual to see students using ICT in classes that also featured student-centred pedagogies to a large extent (i.e., skilled communication, collaboration, knowledge building, and self-regulation). What is particularly concerning about this is that these students were attending schools that had been identified in each country as demonstrating innovative practices. However, an extensive range of small-scale, in-depth studies, particularly those focused on the different pedagogical uses of specific digital technologies such as the interactive whiteboard, mobile technologies and the virtual learning environment, suggest that "ICT is more than 'just a tool', and contributes to disruptive, distinctive, relationships in pedagogical activities (Loveless, 2009). From this it can be concluded that some students do have access to innovative teaching and use ICT to support their learning. However, when such practices occur, they often take place in isolation, rather than as part of a coherent and integrated learning experience across a school system that blends a range of pedagogies with creative uses of ICT to support new learning opportunities.

In order to try to understand the contextual factors that are critical to successful implementation and sustainability of innovative pedagogical approaches using ICT, a small number of studies using more in-depth research methods have been carried out. One study of particular note is the SITES (M2) project (Kozma, 2003; Kozma & Mc Ghee, 2003). SITES (M2) conducted in-depth case studies in 28 countries in an effort to describe innovative practices using ICT. Although conducted in 2000-2001, a noteworthy finding was that in nearly every innovative practice selected, students were using the Internet, which at that time was an emerging technology. Not only were the students using the Internet, but they were using it in ways that entailed knowledge management activities including searching, evaluating and organising knowledge. As such, the students were not only using cutting-edge technologies but, more importantly, they were using them to construct deep understandings while engaged in self-directed enquiry which involved communicating and collaborating with others. The emerging technologies were thus being used in ways that facilitated knowledge deepening and creation, a practice that was clearly supported by the underlying pedagogical approach. In other words, the underlying pedagogical approach supported the innovative practices observed rather than simply the introduction of emerging technologies.

The type of learning environment observed in SITES (M2) remains quite a radical shift in pedagogical orientation for teachers, and requires a huge investment of teacher effort, individually and collectively (OECD, 2010). There has to be a motivation that is driving the need for this change, which could be linked to national policy initiatives or priorities. For example, the central tenet of the Knowledge Deepening level of the UNESCO framework (UNESCO, 2008a, 2008b, 2011) is that ICT is used by learners in enquiry-based learning environments as they work collaboratively to solve complex problems. However, if the school culture or national policy does not advocate or support

this pedagogical approach, how is it possible to have school systems that are functioning at the Knowledge Deepening level? In addition, the empirical evidence connecting particular uses of technology with improvements in student performance that could eventually drive this change, is scarce and not communicated in proper ways to teachers (OECD, 2010, p.16).

Overall, this evidence serves to strengthen the argument that the introduction or use of digital technologies does not necessarily lead to the development of innovative teaching practices. New tools can easily be used to reinforce or automate traditional methods of teaching (Campuzano et al., 2009; Law & Chow, 2008; Law, Pelgrum & Plomp, 2008; Plomp et al., 2009). Having technology in schools does not by itself lead to changes in learning outcomes (Dynarski et al., 2007) nor does it mean that educators will use it or meaningfully integrate it in teaching and learning (Cuban, Kirkpatrick & Peck, 2001; Russell et al., 2003). Instead, what research shows is that how technology is used can determine whether or not its use affects learning outcomes (Wenglinsky, 2005).

2.2.3 Teaching, Learning through the use of ICT in Specific Areas

The use of ICT in specific contexts, namely literacy, numeracy and special educational needs, was identified by the DES as a theme to be addressed in the 2013 Census. These areas are also identified as key strategic priorities by the Teaching Council (2011a). For this reason, a brief review of the use of ICT in each these areas is presented in the sections that follow.

2.2.3.1 The use of ICT in Mathematics and Literacy

The potential for ICT to transform curriculum areas such as mathematics and literacy education is well established. However, despite substantial developments in both the theory of mathematics education and understandings of literacy, the core challenge of 'implementation' remains: how to ensure that digital technology is used in mathematics and literacy classrooms, and, if it is used, how to enhance mathematical thinking or literacy rather than simply reiterating current practice or enhancing the learning of traditional skills.

Over twenty major reviews have been conducted on the use of technology in education over the past three decades (e.g.; Christmann & Badgett, 2003; Kulik, 2003; Kulik & Kulik, 1991; Ouyang, et al., 1993; Rakes, Valentine, McGatha, & Ronau, 2010; Slavin, Chung, Groff & Lake, 2008; Slavin, Lake, & Groff, 2009). The majority of these examined a wide range of subjects including literacy and mathematics and were carried out at both primary and post-primary levels. Overall, the conclusions reached by research studies are equivocal. In terms of literacy, some studies yielded evidence of improved literacy performance when digital technologies are used, while others do not. For example, there is evidence to suggest that a wide range of digital technologies support teachers as they work to increase pupil fluency with phonics, word attack skills and vocabulary development (e.g. Pearson et al., 2005). In terms of mathematics, the majority of reviews conclude that there were positive effects of educational technology applications on mathematics achievement. However, the effect varies widely and it is accepted that the results must be interpreted with caution. Irrespective of whether technology has a positive impact on various aspects of literacy or mathematics attainment, what is notable across these reviews is the tendency to view technology as distinct from literacy or mathematics. The reviews generally consider technology as an add-on to existing practice and a means to enhance the learning of traditional skills. They view technology as a way of becoming more proficient in literacy or mathematics rather than as a part of learning in literacy or mathematics.

In Ireland, an in-depth large-scale evaluation study carried out by the Inspectorate of the Department of Education and Science examined the extent to which digital technologies have been used in Irish schools as well as the impact that they had on teaching and learning (DES, 2008). At primary level, the inspectors reported evidence of the use of digital technologies in 59% of classrooms they observed. In particular, they found that the use predominated in curricular areas such as English, Mathematics and Social, Environmental and Scientific Education (SESE). However, they found that only 39% of teachers used digital technologies weekly as part of their literacy curriculum. This compared with 28% in mathematics and 14% in SESE. Even more significantly, indications were that digital technologies were mainly used for the purpose of consolidating learning in numeracy, reading and writing skills. For example, use of digital technologies to teach writing was found to be generally limited to presenting personal writing and writing for projects, with little emphasis on the writing process. It was also found that the development of research skills was conducted mainly in the context of SESE and looking-and-responding activities in the Visual Arts. Overall, the Inspectorate report a limited use of digital technologies in the development of higher-order thinking skills, creative or collaborative skills, independent working skills, or communication skills. This led them to conclude that the use of ICT is "somewhat limited in primary schools, and that the potential for using ICT to develop critical life skills, such as communication, problem-solving and independent working skills, is not being realised" (DES, 2008, p. 116). Cosgrove and Marshall (2008) report similar findings, noting that the types of activities most commonly engaged in by students in school were low-level activities such as word processing, Internet searches and playing computer games.

At post-primary level, 18% of the lessons observed in the same study made use of ICT, and student interaction with technology was observed in only 24% of these lessons (DES, 2008). The most commonly observed use of ICT was as a teacher presentation tool; interviews with teachers found that the main use of ICT in all subjects was to develop student research skills (81%) and their writing and presentation skills (65% and 64% respectively). Similar to primary schools, ICT was less likely to be used to develop higher-order skills such as problem solving, analytical and evaluative skills (27%) and collaborative skills (21%). ICT was reported to be most frequently used in classrooms by teachers of science subjects, applied science subjects, mathematics and subjects in the social studies group (History, Geography, Art, Craft and Design, and Music). Teachers of subjects such as foreign languages were also found to be regular users of ICT while Irish was identified as a subject whose teachers rarely made use of ICT. The provision of continuing professional development by support services, particularly in syllabus revision, was found to have a positive effect on the level of integration of ICT in learning and teaching for some subjects. However, problems with access and scheduling, inadequate teacher professional development, lack of teacher confidence and inadequate facilities were reported as factors generally inhibiting use. As a consequence, the inspectors concluded that teachers must not only be provided with opportunities to develop skills that are directly applicable to the use of ICT in the classroom but they must also be supported in meeting the challenge of effectively integrating ICT into their classroom practices.

2.2.3.2 ICT and Special Educational Needs

While there is a substantial body of research into the ways ICT can support students with special educational needs (SEN), most of these are relatively small-scale, qualitative studies. There is little published, peer-reviewed research in this area as well as a notable absence of longitudinal, large-scale research (Abbott, 2007; Becta, 2003; Condie et al., 2007). Common themes include the

benefits of assistive technologies for pupils with particular needs, the personalisation of the curriculum, and effects on self-esteem, motivation and engagement as well as achievement in both generic and subject-specific skills. However, as noted by Abbott (2007) in a critical review of literature, the research generally takes a technologically determinist perspective. As such, it not only takes insufficient account of the pedagogical approaches used but also of the social and cultural contexts in which the technology is used.

Studies such as IETA (Bakia et al., 2011) and Eurydice (2011) as well as reviews of innovative practice in the area (Watkins, 2011) highlight an increasing focus on the use of ICT for special educational needs in countries across the world. In particular, it is high on the political agenda of those countries that have ratified the United Nations Convention on the Rights of Person with Disabilities (CRPD, 2006) (Watkins, 2011). However, while many countries centrally recommend or promote the use of ICT for this purpose (Eurydice, 2011), at present, few countries have programmes that are implemented at national level or by the national government (Bakia et al., 2011). One example is the 'ICT Without Boundaries' programme in Belgium. The programme focuses on developing learning materials for special-needs students, including learning objects for the deaf, those who have learning disabilities, and those who are on the autism spectrum. The programme also has an email client for children who have a learning disability and a remote-access project for homebound students. Professional development and project support is included for teachers and other staff members involved in the programme (De Craemer, 2010a).

In an effort to avoid a technologically determinist perspective and to shift the focus to designing appropriate learning environments for students with special educational needs, Watkins (2011) identifies four thematic areas to be addressed in policy and practice in this area going forward. They are:

- ICT to support access to information and knowledge – ICT as a tool for improving a learner's access to information and knowledge in formal and non-formal learning situations.
- ICT to support learning and teaching situations – ICT for pedagogical uses, assisting in personal learning development and shaping new skills; ICT as a tool for teachers to support learning.
- ICT to support personal communication and interaction – ICT as a tool for alternative/augmentative communication to replace or supplement personal communication barriers; ICT as a tool for overcoming social and/or geographical isolation.
- ICT to support access to educational and administrative procedures – ICT as a tool for administrators to improve their services for learners with disabilities.

Consideration of these four categories implies that the use of ICT for special educational needs should not be seen as an end in itself but rather as a tool for increasing effective access to, and meaningful participation in, educational opportunities (Watkins, 2011).

2.2.4 Assessment through the use of ICT

Shifts in pedagogical orientations, in particular those towards knowledge deepening and knowledge creation approaches to learning emphasise a need for alternative approaches to assessment. Until now, the development and rollout of technology-supported assessment has been cost prohibitive but advances in digital technologies are opening up new alternatives to the old modes. At this point,

ICT-supported student assessment is considered an emerging area (Bakia et al., 2011; Eurydice, 2011; EACEA/Eurydice, 2009). However, as of yet, there is a lack of evidence on actual classroom and school use of ICT for assessment purposes. Neither is technology-supported assessment widely used in Europe (Redecker, 2013). Where it is used, ICT mainly supports summative assessment although interest in formative and diagnostic assessment is growing, and recent efforts have focused on assessing higher-order skills such as problem solving in collaborative settings (e.g. ACT21s[17]). Development has also taken place in the context of diagnostic testing environments (Luckin et al. 2012). In a landmark paper on technology-supported assessment, Binkley et al. (2012) specify in detail the components of 21st century skills, and how such skills, including complex problem solving, communication, team work, creativity and innovation, can be assessed using technology. According to Binkley et al., traditional tests tend to give relatively little attention to complex thinking and problem solving and focus on lower levels of learning, which can lead to similar emphases in classroom practice. They also argue that there is little value in simply transferring paper-and-pencil multiple-choice tests to computer-based platforms, claiming instead that computer tools like modelling, video data, data processing, simulation and visualisation should be utilised. In support of this, they point to a range of projects that have been successful in measuring at least some 21st century skills. These include a suite of computer-based tests developed in the UK for 8-14 year olds, which are known as 'World Class Tests', and assess problem solving in mathematics, science, design and technology[18]. They also include the Virtual Assessment Performance Project, which assesses process skills by asking students to investigate authentic ecological problems[19].

Binkley et al. argue that there is a role for large-scale assessments, to the extent that such assessments draw attention to key skills and provide a model of how they can be assessed. They cite the assessment of digital reading in PISA 2009, in which Ireland participated, as an example of an effective assessment in that it combines a web-based reading environment with innovative assessment tasks. They argue that 21st century assessments should be aligned with the development of important 21st century goals, incorporate adaptability and unpredictability, be largely performance-based, add value for teaching and learning, make students' thinking visible, be technically sound, generate information that can be acted upon, and provide productive and usable feedback for all intended users.

In Ireland, the dialogue on ICT-supported assessment is just beginning. Questions that need to be addressed include:

- *How can digital technologies be used to assess 21st century skills? What digital tools do we need to do this? Which skills can we reasonably assess using the digital tools that are available to us?*
- *How can digital technologies be used to provide effective feedback (both formative and summative) to students on their performance?*

To conclude, the question of what works, that is, the connection between pedagogical and assessment practices involving technology and their effects on quality, equity and performance,

[17] http://atc21s.org/
[18] http://www.worldclassarena.org/en/about/aboutWCT.htm
[19] http://virtualassessment.org/index.html

remains ill-addressed (OECD, 2010). Such evidence is necessary as "educators need to relate examples of 'good practice' to the reality and materiality of their own contexts and experiences" (Loveless, 2009, p.16).

2.2.5 Digital resources to support teaching, learning and assessment

The use of ICT in learning encompasses a wide range of teaching and learning tools. Currently, there are a number of emerging and innovative technologies in use in education settings. They include digital textbooks and apps, learning management systems, online learning environments and mobile devices. While these technologies have the potential to transform student learning experiences, it is essential to keep in mind that technology in and of itself does not have an impact on learning; instead, its impact depends on how it is used. Therefore, as policy decisions are being made, there is a need to move beyond the hype of any new technology and to "inquire into how effective it might be in terms of promoting long-term, deep learning" (Melhuish and Falloon, 2010). The question to ask is not 'Can the technology support learning?' but rather how it can be used to "support collaborative learning, or exploratory learning, or whatever?" (Clarke & Luckin, 2013, p.4).

Ministries of Education worldwide are trying to make digital resources more widely available for use by schools. Partnerships between ministries and publishers are increasing in many countries in order to make possible the development of high-quality digital learning digital resources. Many countries have some type of formal incentive in place for the development of ICT-related materials for instruction (e.g. such Belgium, Canada, Chile, Denmark, France, Great Britain, Hong Kong, the Netherlands, Portugal and South Korea). Some of these arrangements are solely with the private sector but others include university researchers and semi-governmental agencies. Outside of these formal arrangements, a number of countries pursue similar partnerships with developers and publishers (Bakia et al., 2013). In contrast, a market-driven approach currently exists in Ireland whereby schools encourage parents to purchase digital textbooks from traditional book publishers.

Critical decisions relating to the purchase of resources such as digital textbooks relate to the purpose of the books. Are they to replace or complement traditional paper-based textbooks or should they offer a more interactive, personalised experience with the material they contain? Different approaches have been adopted across the world. In countries such as South Korea, digital textbooks are open resources and are loaded onto a tablet-style device, such as an iPad. South Korea plans for digital textbooks to replace paper textbooks in all grade levels (Bakia et al., 2011). In contrast, Hong Kong intends that digital textbooks should complement traditional materials. They view digital textbooks as a way to offer a more individualised, interactive experience with course content, while allowing anytime-anyplace access to tutorials and other supports (ibid). In Ireland, the market for digital textbooks is largely unregulated, and usually funded by parents/family.

Linked to the development of digital textbooks and other resources is the question of intellectual copyright. Copyright law has been and continues to be radically challenged by the rapid and unprecedented development of digital and networked technologies. The growing use of open resources gives rise to a complex range of copyright issues and a range of approaches are adopted across countries to address them. Counties such as Australia and Belgium are pursuing specific copyright agreements or copyright reform in order to make existing materials such as digitised archival materials or reference resources available for free use in schools (Bakia et al., 2011).

2.2.6 Moving beyond the "Traditional" / Technology Literacy

Currently, there is a number of technologies emerging in educational settings which are interrelated and, if used in a coherent innovative manner, have the potential to change the education landscape as we know it. However, as indicated previously, teachers' pedagogical orientation as well as the prevailing school, regional and national cultures, together with government current policy priorities, are influencing the shape and form of how these digital tools are used. They include: digital textbooks and apps, learning management systems, online learning environments and mobile devices.[20]

2.2.6.1 Digital Textbooks

There has been a significant rise in the number of publishers who are developing a range of digital textbooks. This has been accelerated in part by the increase in the number of affordable devices for student use. The critical decision to be made when purchasing digital or e-books books is whether the digital textbooks are to replace or complement traditional paper-based textbooks to offer a more interactive, personalised experience with the material they contain. In South Korea, for example, digital textbooks are open resources and are all loaded onto a tablet-style device, such as an iPad. This country plans for digital textbooks to replace paper textbooks in all grade levels (Bakia et al., 2011). In contrast, Hong Kong intends that digital textbooks should complement traditional materials. They view digital textbooks as a way to offer a more individualised, interactive experience with course content, while allowing anytime-anyplace access to tutorials and other supports (ibid). Partnerships between ministries and publishers are increasing in many countries in order to make possible the development of high-quality digital learning resources. Currently, France is engaged in a small pilot programme at the middle school level. The Ministry of Education has purchased a four-year license to the contents of the digital textbooks, and the digital textbooks are stored in schools' learning management systems (LMSs). In contrast, a market-driven approach has emerged in Ireland whereby schools encourage parents to purchase electronic textbooks from commercial book publishers.

2.2.6.2 Open resources / approaches to copyright

Ministries of Education worldwide are trying to make digital resources more widely available for use by schools. For example, 20 of the 21 counties that participated in the IETE study report placing priority on the improvement of access to and the dissemination of digital resources (Bakia et al., 2011). Eleven of these countries (Belgium, Canada, Chile, Denmark, France, Great Britain, Hong Kong, Israel, the Netherlands, Portugal and South Korea) have some type of formal incentive in place for the development of ICT-related materials for instruction. Some of these arrangements are solely with the private sector but others include university researchers and semi-governmental agencies. Outside of these formal arrangements, a number of countries report plans to pursue similar partnerships with developers and publishers. Ministries, such as that in Hong Kong, hire university-affiliated or independent experts as consultants on the development of in-house materials. In contrast, in South Korea the state ICT in education agency, Keris, is a strong advocate of open

[20] With the exception of the IETE study (Bakia et al., 2011), these emerging trends are not yet reflected in international survey reports. In many ways, this is not surprising as the countries that participate in this study were considered to have relatively advanced ICT infrastructure in place.

resources and produces materials in house. These, along with the nationally-implemented learning management systems and their digital textbook programme run on open Linux platforms.

Linked to the development of digital textbooks and other resources is the question of intellectual copyright. Copyright law has been, and continues to be, radically challenged by the rapid and unprecedented development of digital and networked technologies. The growing use of open resources gives rise to a complex range of copyright issues and a range of approaches are adopted across countries to address these. For example, counties such as Australia and Belgium are pursuing specific copyright agreements or copyright reform in order to make existing materials such as digitised archival materials or reference resources available for free use in schools (Bakia et al., 2011). In Ireland, an objective of the National Digital Strategy (DCENR, 2013) is the development of strategic partnerships with Irish public bodies and agencies that hold relevant cultural and historical content in order to transform any valuable indigenous content into accessible learning resources.

2.2.6.3 Online Courses / Videoconferencing

The provision of online courses has become increasingly popular in recent years as broadband and connectivity to schools improves. Online courses have been designed for a range of purposes. Many act as substitutes for face-to-face courses in remote or underserved areas that may not have a large enough school population or sufficient funds to provide the same range of language instruction or advanced/supplementary courses. Many countries also have national programmes for offering online courses to all students or to special populations. Examples include:

- Alberta Distance Learning Centre[21] (Canada), which serves 30,000 elementary and secondary students in a range of distance formats including blended and fully online. The Centre also manages a virtual school.

- Finland's online education programme, VIRTA[22], which is used to support language instruction and orthodox religion courses for recently arrived immigrants.

- An online portal called Acadin[23] has been developed in the Netherlands to provide challenging, creative opportunities for gifted students, as well as resources for teachers and parents. In contrast, Belgium's Bednet[24] project enables chronically ill students to follow and participate in classes from home or hospital.

- In the UK, Ultralabs "Not School[25]" online environment is designed to meet the needs of young people, 'for whom school did not fit'. They include the phobic, ill, disaffected, pregnant and the excluded. Many of these young people have successfully renewed their confidence in learning, and the majority have gained certificates in recognition of their learning progress.

- In Israel and South Korea, individual supplementary help is provided to struggling students through online tutoring courseware (Cyber Home Learning System). In South Korea, the

[21] http://www.adlc.ca/
[22] http://www.virtualschoolsandcolleges.info/sites/default/files/VISCED_Handbook-Volume-1.pdf
[23] http://virtualschoolsandcolleges.eu/index.php/Acadin.nl
[24] http://www.virtualschoolsandcolleges.info/presentation/bednet-online-school-education-children-and-youngsters-medical-needs-els-janssens
[25] http://www.naec.org.uk/ultralab/ww3/projects/notschool/

Cyber Home Learning System is also open to all students to provide more equitable access to high quality tutoring services. The aim of this service is to reduce the advantage of the private tutoring that has been traditionally acquired by wealthier South Koreans for their children (Bakia et al., 2011).

In Ireland, iScoil[26] has been developed with the aim of re-engaging those students who have become disengaged with learning and our education system. Born out of the belief that all young people inherently want to learn but not all are 'school shaped', and thus become disengaged, iScoil, provides a range of programmes tailored to the individual needs of the students. Students are also supported to progress back to school, to other training/education provisions, to college and to work.

It is also the case that as the technology becomes more advanced and the related cost becomes more affordable, online environments can be augmented with other tools. For example, videoconferencing was once very expensive as it demanded specific high-tech equipment and software, but it is now very accessible to most schools as connectivity and hardware have developed exponentially. A particularly useful tool for language learning, video-conferencing enables students to interact with native-speaker peers in other countries as they collaborate on interdisciplinary themed projects or subject-specific assignments (e.g. European Commission's eTwinning[27]). In the UK, BECTA and Future Lab have promoted the use of ICTs including videoconferencing for foreign language learning since 2004 (Facer & Owen 2004; BECTA 2004).

2.2.6.4 Learning Management Systems (LMS)

The nationwide or regional adoption of learning management systems offers new possibilities for managing courses and designing innovative learning spaces as it increases the possibilities of creating and sharing resources (both human and material) across a range of different environments.

Learning management systems (LMSs), also known as curriculum or course management systems (e.g. Moodle, SharePoint, Blackboard) are platforms that offer discrete digital spaces for courses in which teachers and students can upload or download material, create content, and respond to one another's materials in blogs, wikis, and discussion forums. Teachers have access to additional functions, such as the ability to post assignments or announcements and to maintain an e-grade book. However, permissions can be extended to allow students access to these functions too. Storage space can also be allocated to students, thus facilitating student collaboration across courses. Access can also be granted to parents and other agencies although this is dependent on the goals of the stakeholders, how the learning and assessment process is understood, the pedagogical orientation of the teacher and the expected relational interaction between teachers and students.

According to the IETA study (Bakia et al., 2011), Denmark, Finland, and South Korea have LMSs in place in all schools while Belgium, Estonia, Hong Kong, Iceland, Singapore, and Sweden have LMSs in most schools. However, the ways in which LMSs are conceived, constructed and used varies widely across these countries as do the selection of the platform, installation and the provision of training. In some countries a single LMS platform has been developed, and schools have been strongly encouraged to adopt it. With this approach, the LMSs can be nationally networked as in South

[26] http://www.iscoil.ie
[27] http://www.etwinning.net

Korea; they can be nationally cloud-based as in Austria's EduMoodle; or regional educational authorities such as Northern Ireland's EN(ni)-Frontier can host the platform. Alternatively, some governments (e.g. France, Denmark) support the development of LMSs by a number of companies and the choice of selection is left to the regional educational authorities or schools.

Regardless of the ways LMSs are provided, there needs be a rationale underpinning the introduction of an LMS in order to inform its design and sustain its use. For example, early adoption and enthusiasm led to the adoption of LMSs in nearly all schools in Sweden but now questions about the value of the investment have been raised, with particular complaints about accessibility features. If student-centred learning is the focus, the design of the LMS is critical and it must allow students to generate course content and resources, work in groups collaboratively and respond to each other's work. Researchers such as Watson and Watson (2007) and Carlson (2009) have shown that LMSs can support constructivist, student-centered learning. Related to this, the Moodle website states that the system was designed with constructivist approaches in mind.

2.2.7 Mobile Devices / One-to-One initiatives / BYOD

As outlined in the section on infrastructure (section 2.1.2), a number of countries have already either completed one-to-one pilots or have current programmes to support the adoption of one-to-one computing. The rationale motivating policy decisions to invest in Internet-enabled mobile devices is associated with a number of factors including, but not limited to:

- The belief that students will gain self-confidence with ICTs and take responsibility for their own learning (Stansbury, 2010).
- The possibility of individualised and personalised experiences, with the mobile device offering a "unique scaffolding that can be customised to the individual's path of investigation" (Peters, 2009, p.117).
- The promise of situated, 'just-in-time' learning opportunities as the development of cloud-based computing has spurred a social expectation that we can engage and process information whenever and wherever we want (Johnson, Levine, Smith & Stone, 2010; Van't Hooft, 2008).

Research indicates that one-to-one computing/mobile devices can lead to improved student engagement, motivation, greater use of independent inquiry/research (e.g. Melhuish & Falloon, 2010; Sauers & McLeod, 2011; Vuorikari et al., 2011; Burden et al., 2012; Clarke & Svanaes, 2012; Heinrich, 2012; Ludwig & Mayrberger, 2012), allowing students to augment and enhance their learning in ways that were previously not possible or not easy to do (Clarke & Luckin, 2013), with modest increases in student achievement if the devices are used effectively (Stansbury, 2010). This would include students conducting their own research, gathering their own data, devising solutions to open-ended problems and collaborating with other students (Baumgartner et al., 2010; Trucano 2010; Stansbury, 2010).

However, whether countries invest in hardware for classrooms or mobile devices, research suggests that thoughtful planning, relevant teacher training, and buy-in from school leadership, teachers, students and parents are all factors that contribute to improving student outcomes through the use of ICT (Stansbury 2010). As policy decisions are being made, it is imperative to see "beyond the

hype" of the device (Ng'ambi & Bozaleck, 2013) and to "inquire into how effective it might be in terms of promoting long-term, deep learning" (Melhuish & Falloon, 2010, p.5). It is essential to keep in mind that "...technology alone is a mode of delivery and not a pedagogy" (Galvin, Coates & Murray, 2010, p. v). Technology does not have an impact on learning in its own right; rather its impact depends on how it is used. The question that must be asked therefore is not 'Can tablets [or any other technology tool or device] support learning?' but rather 'How can tablets be used to support collaborative learning, or exploratory learning', or whatever' (Clarke & Luckin, 2013).

2.3 Teacher Professional Learning

The preceding sections have outlined a number of emerging technologies which, if used in a coherent innovative manner, have the potential to change the education landscape as we know it. However, as indicated previously, teachers' pedagogical orientations are important in influencing the shape and form of how these digital tools are to be used in order to move beyond the traditional. This section outlines how teacher professional learning can be designed to support teachers to move from technology literacy to knowledge deepening and finally to knowledge creation.

Teachers in today's classroom must not only be prepared to use technology but they must also know how to use technology to support student learning. According to UNESCO, these have become "integral skills in every teacher's professional repertoire" (2008a, p.1). How, then, do we go about ensuring that teachers have these skills in their repertoires? The importance of developing these skills cannot be emphasised enough, especially when one considers that, of the conditions that support the performance of the world's best education systems, teacher quality, not funding, is the determinant factor (McKinsey, 2007). It is also important to stress that merely introducing new technology does not in and of itself bring about change and that it is often best to link the introduction of new technologies with other changes (Kozma, Voita & Bsaiso, 2010). A number of initiatives relating to professional development in which professional development is closely linked with other changes in the system are currently occurring in some countries worldwide (Shear et al., 2011a). For example, the ICT master plan in Singapore used the distribution of computers in schools in tandem with an extensive school-based professional development programme as a lever to change pedagogy and curriculum content. Similarly, in Jordan, the introduction of ICT to schools was connected with teacher professional development in order to develop new pedagogical models that incorporate new technologies (Kozma et al., 2010).

A useful lens for discussing changes in how teacher professional learning is conceptualised is the UNESCO ICT Competency Standards for Teachers (ICT-CST) (UNESCO, 2008a, 2008b, 2011). This framework is a useful resource for policymakers and has been used as a benchmark for recent ICT policies in many countries. For example, policies developed in Jordan (Alnoaimi, 2011) and Rwanda (Issacs, 2011) were closely linked to the UNESCO ICT-CST. The framework is elaborated in the sections that follow.

2.3.1 Technology Literacy

The technology literacy approach to teachers' professional learning for the most part maintains the existing status quo with regards to overall structures within the educational system in that there is no significant focus on dramatically changing pedagogical practices. The role of the teacher is still mainly traditional – presenting and explaining information and concepts, setting learning tasks, and

monitoring students' progress (Plomp et al., 2009). Teacher competences related to the technology literacy approach:

> include basic digital literacy skills along with the ability to select and use appropriate off-the-shelf educational tutorials, games, drill-and-practice, and web content in computer laboratories or with limited classroom facilities to complement standard curriculum objectives, assessment approaches, unit plans, and didactic teaching methods. Teachers must also be able to use ICT to manage classroom data and support their own professional development (UNESCO, 2008a, p.6). See Figure 2.1.

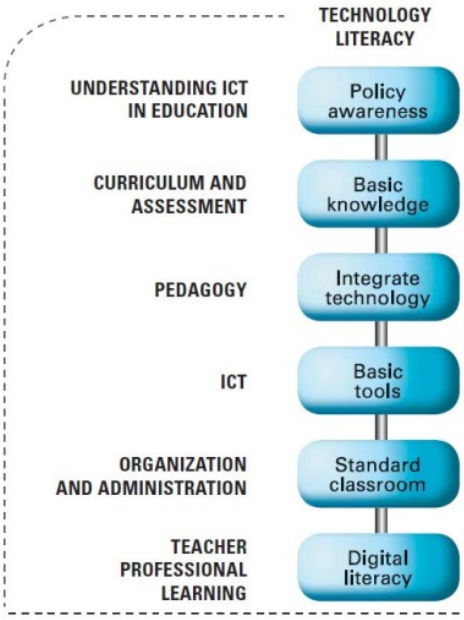

Figure 2.1. Technology Literacy (UNESCO, 2011)

Professional development programmes in the area of technical skills have been more readily available than pedagogically-oriented ones (Plomp et al., 2009). There are concerns that these models of professional development, which focus solely on technical competences, are simply 'retooling' teachers for specific tasks, rather than engaging them in pedagogy of a substantial nature (Watson, 2001). Therefore, it is not surprising that the two most commonly reported national priorities for teacher development programmes reported in the IETE study (Bakia et al, 2011) were:

(a) supporting teachers' integration of ICTs into instruction
    - 21 countries reported this as a priority, and 17 reported having national programmes in this area.

(b) improving teachers' pedagogical skills
    - 20 countries reported this as a priority, and 18 reported having national programmes to address it. Seventeen countries indicated that using ICTs to improve teachers' subject matter knowledge was a priority, and 15 reported having national programmes to address this need.

In Ireland, the initial focus of the NCTE when it was launched in 1998 was on "upskilling" teachers with basic 'ICT competencies'. Entitled the 'IT Skills Programme', the professional development programmes prepared as part of the initiative functioned as independent units and did not link to other professional development providers such as the Primary Curriculum Support Service (PCSS) who were engaged with other policy-related initiatives (e.g., the introduction of the new Primary Curriculum, DES/NCCA, 1999). Since the mid-2000s this focus has shifted; subsequent programmes have been designed with the goal of developing teachers' technological literacy combined with the pedagogical use of basic ICT tools in the curriculum subjects. The likelihood is that this shift of focus is reflective of a greater understanding of the interrelatedness of policies relating to education and a greater awareness of the complexities of the use of ICT in teaching and learning. Ireland was not alone in this regard. The need to understand the use of ICT in education as related to other education policies is a recent trend. The addition of a strand explicitly related to policy to the UNESCO ICT-CST Framework in 2011 is reflective of this trend. Currently, the main focus of the PDST-Technology in Education (formerly NCTE) is to provide courses and other continuing professional development (CPD) opportunities to support the integration of ICT in the curriculum[28].

An innovative and creative approach to professional development that ran in tandem with the IT Skills programme was the NCTE's Schools Integration Project (SIP) initiative. SIP funded the development of a range of innovative projects across a number of local communities. The idea behind the SIP initiative was that technologies, pedagogical approaches, etc., could be experimented with and that the successful ones could be possibly developed and scaled. The projects were for the most part teacher-led, driven by keen interest among participating teachers, and participants developed key skills and knowledge in collaboration with each other (e.g. Sligo Coastline project) and the wider community, drawing on technical knowledge (e.g. Thin Client, Wired for Learning projects) as well as pedagogical support (e.g. Empowering Minds project). The development of partnerships was a key aspect of the SIP projects. In many, funding was provided through public-private collaborations and support was provided through the local ICT advisor. Not only did the SIP initiative enable a range of innovative projects but its approach to teacher professional development moved beyond technical literacy. As part of a project, teachers could set their own learning goals and were in some part responsible for determining their own development. The approach is more characteristic of the next level of the UNESCO ICT-CFT, Knowledge Deepening. Unfortunately, a rigorous system of evaluation was not put in place as part of the SIP initiative and most of the SIP projects were abandoned after the initial pilot phase. If supported further, the likelihood is that many of the SIP projects would have continued to develop and that many of the participating teachers might not only have become peer mentors for others but also might have become key figures in the establishment of communities of practice for teachers.

2.3.2 Knowledge Deepening

If ICT integration is to increase the ability of learners to apply school knowledge to solve complex real-world problems, teachers need to adopt a knowledge-deepening approach (Plomp et al., 2009). With this approach, teaching is:

> student-centred and the teacher's role is to structure tasks, guide student understanding and support them as they tackle collaborative projects. Teachers help students create, implement and monitor project plans and solutions. Lessons and classroom structure are more dynamic,

[28] http://www.ncte.ie/ICTTraining

with students working in groups for extended periods of time. In guiding students' understanding of key concepts, teachers employ open-ended ICT tools that are specific to their subject area, such as visualisations in science, data analysis tools in mathematics and role play simulations in social studies (UNESCO, 2011, p.11).

In addition, as teachers support student-led collaborative projects, they should be able to use networked and web-based resources. Such resources should help students collaborate, access information, and communicate with external experts to analyse and solve their selected problems. Teachers also need to be able to use ICT to create and monitor individual and group student project plans. In terms of their own professional learning, teachers must be able to access information and expertise, and must collaborate with other teachers to support this learning (UNESCO, 2011) (Figure 2.2).

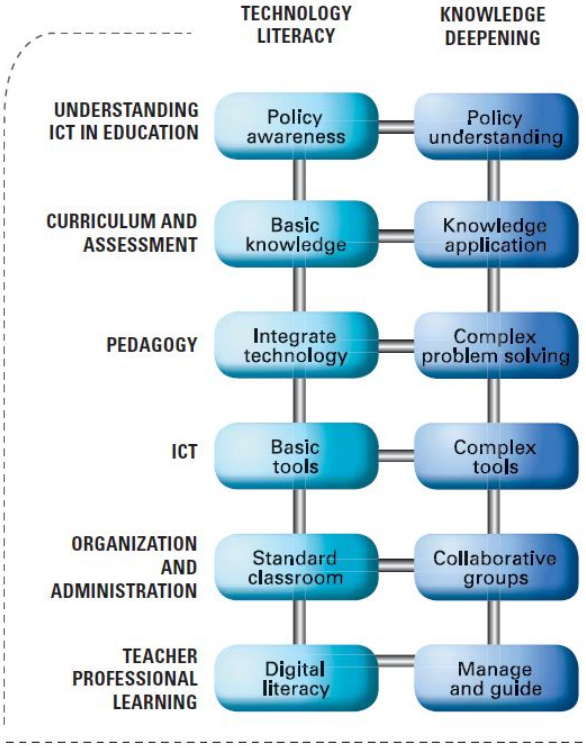

Figure 2.2. Knowledge Deepening (UNESCO, 2011)

The catalyst which appears to promote movement from technology literacy to knowledge deepening is a change in curriculum policy that emphasises depth of understanding over coverage of content and assessments as well as the application of understanding to real-world problems (UNESCO, 2008b). Singapore's policy of "teach less, learn more" is an example that captures the essence of what is meant by this approach. In this system, the teacher, as outlined in UNESCO (2008b), serves as a "guide and manager of the learning environment and students are engaged in extended, collaborative project-based learning activities that can go beyond the classroom and may involve local or global collaborations." (p. 10). In addition, ICT is increasingly used to support professional development activities by providing teachers with self-assessment and monitoring tools, learning resources, and community building and sharing environments. This approach is central to two initiatives in Singapore's third ICT master plan: the EduLab initiative and the FutureSchools initiative (Wong, 2011). The EduLab initiative supports and encourages teacher professional development and

innovation in developing, planning, and delivering ICT-enriched experiences. The FutureSchools initiative pushes this concept by encouraging ICT-based experimentation to redefine professional learning communities, among other school conditions, such as learning and teaching practices, time, environment, and infrastructure (Kozma, 2010).

In Ireland, the proposed changes in curriculum and assessment at both primary and post-primary levels provide an opportunity to promote understandings of how to make innovative uses of ICTs beyond "integration" (e.g. Junior Cycle, Project Maths, the Integrated Primary Language Curriculum for Infants to Second Class[29], review of primary maths[30], and revision of the senior cycle sciences). As teachers engage with these new curricula, dialogue centring on possible uses of complex technologies can take place in meaningful contexts. It also provides an opportunity to re-examine assessment procedures and to incorporate assessment that focuses on complex problem solving, emphasises the application of understanding to real-world problems and also incorporates assessments into the ongoing activities of the class (Binkley et al., 2012; Griffin, McGaw & Care2012; UNESCO, 2011). This would enable teachers to develop their own thinking around how to make use of ICT in ways that would support knowledge deepening approaches to learning.

2.3.3 Knowledge Creation

If the goal is to nurture students to become citizens who continually engage in and benefit from knowledge creation, innovation and participation in a learning society, teachers will need to adopt a knowledge-creation approach (Plomp et. al., 2009). With this approach, the curriculum "goes beyond a focus on knowledge of school subjects to explicitly include the knowledge society skills that are needed to create new knowledge … [e.g.] problem solving, communication, collaboration, experimentation, critical thinking and creative expression" (UNESCO, 2011, p. 13). These lifelong skills become curricular goals in themselves and the objects of new assessment methods. Roles within the learning environment are thus significantly transformed. Students are "expected to be able to create their own learning goals and plans—to establish what they already know, assess their strengths and weaknesses, design a learning plan, stay on-task, track their own progress, build on successes and adjust to failures" (UNESCO, 2011, p. 13). Teachers are expected to build a learning community in which students are continuously engaged in developing their own and each other's learning skills. Schools are thus transformed into "continuously improving learning organisations in which all its members are involved in learning" (ibid). The use of ICT is pervasive in this networked anytime, anywhere collaborative learning environment. In this context, teachers both model the learning process for students and serve as model learners through their own ongoing professional development—individually and collaboratively (UNESCO, 2008b, 2011) (see Figure 2.3).

[29] The integrated language curriculum specifications for infants to Second class was sent out for consultation in spring 2014.

[30] The NCCA has begun work on the structure of the revised primary maths curriculum in line with the specification for the Junior Cycle maths curriculum. Background research papers are to be published in November 2014.

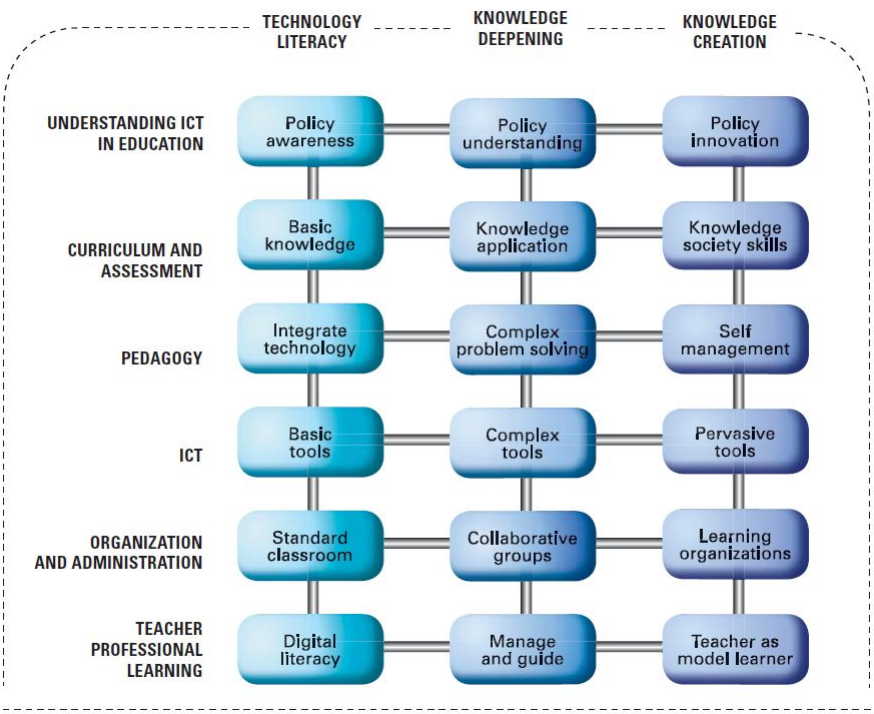

Figure 2.3. Knowledge Creation (UNESCO, 2011)

Strong support needs to be put in place by governments to underpin the development of these learning communities. The governments of Canada and Belgium, for example, are encouraging teacher participation in nationally sponsored communities of practice (Bakia et. al., 2011). A key implementation strategy to help build these learning communities would be to:

> leverage social networking technologies and platforms to create communities of practice that provide career-long personal learning opportunities for educators within and across schools, preservice preparation and in-service education institutions, and professional organizations (NETP, 2010, p.14).

Policy aspirations in this direction are evident from the NCCA's Key Skills and Junior Cycle documentation. Digital technologies have been identified as essential to teaching, learning and assessment in all recently published education policies and plans in Ireland. The *National Strategy to Improve Literacy and Numeracy among Children and Young People* (2011-2020) (DES, 2011b)*, Project Maths* (NCCA, 2008c), *Key Skills Framework* (NCCA, 2009), *Towards a Framework for Junior Cycle* (NCCA, 2011), the *Framework for the Junior Cycle* (DES, 2012a), and the *School Self-Evaluation Programm*e (DES, 2012b) all require that ICT is used as a part of student learning. While this recognition is important and a necessary starting point, the development of a coherent framework for teacher professional learning is imperative if ICT is to be used effectively in teaching, learning and assessment across each of these policy initiatives.

If, as the research suggests, the use of these new technologies implies new teacher roles, new pedagogies and new approaches to teacher education (Makrakis, 2005), a reappraisal of the design of teacher professional learning as currently conceptualised in Ireland is needed. A key question that underpins this dialogue is:

- *How can professional learning be designed so that teaching, learning, assessment and the use of ICT are inextricably linked?*

2.3.4 Designing Teacher Professional Learning

A range of approaches to professional development is employed worldwide. Systems such that in Japan provide centralised training while others have set timelines for teachers to reach the required levels of competence which are stipulated as an implementation target. For example, Chinese Taipei, Hong Kong and Singapore stipulate the minimum percentage of class teaching time that should involve computer use. In contrast, other systems have devolved the responsibility for deciding how to use ICT in teaching and learning to schools, with strategic support being provided for professional development (Plomp et al., 2009). A programme was initiated in New Zealand in 1999, for example, within which clusters of schools were supported for three years by a national facilitation team.

How professional development programmes are structured also differs significantly across countries. Many systems provide face-to-face programmes, in designated venues. There may also be school-based programmes and some systems provide professional development as part of ICT in education pilot schemes (e.g. Cyprus). In areas where the population is more distributed and Internet connectivity is appropriate, online courses are offered (e.g. Australia, Catalonia). Increased use of social media tools for more general teacher and learning opportunities have also been reported in recent years. In the IETE study, nine countries (Austria, Chile, Denmark, France, Iceland, Israel, New Zealand, South Korea, and Sweden) reported providing formal online or blended courses to either build teachers' capacity to integrate ICT or for more general pedagogical training (Bakia et al. 2011). Similarly in Ireland, there has been an increase in online provision from a range of DES- approved providers, particularly for extra personal vacation (EPV) accredited courses.

A model of professional development of particular interest is the use of action research to promote change in educational practice. Examples of this include the Discovery Network Teacher Program in South Australia (Ainley, 2009) and the European Learn-Net Oroject under the Socrates initiative (Bonamy, Charlier & Saunders, 2001). This model acknowledges not only that the purpose of teacher learning is to bring about pedagogical change in teachers' practices but that this change involves a process of innovation (Law, 2008; Looi, Lim & Chen, 2008).

In addition to the provision of dedicated courses, a range of other approaches and/or initiatives are employed to engage teachers in professional learning. These include: websites/portals, ICT standards frameworks and leadership development.

2.3.4.1 Websites / Portals

A common strategy to build teacher capacity is the development of websites and portals that contain digital resources tied to the curriculum (Bakia et al. 2011; Plomp et al., 2009). However, as reported by Bakia et al. (2011), the use of these websites typically relies on teachers to seek out digital learning resources or to voluntarily participate in communities of practice. There needs to be a reason or motivation for teachers to use the portal coupled with some form of on-going support. An emerging trend in the use of websites/portals is a move to interactive, collaborative models of material development and a sharing of instructional materials and strategies. In Sweden,

Lektion.se[31] was developed by former teachers and it is now one of the most active websites within the European Union for facilitating a community of practice. It features shared lesson plans, activities and other instructional resources. It also provides discussion forums and other ways for teachers to collaborate and share materials. New Zealand's Te Kete Ipurangi[32] (TKI) is another example of an interactive online educational web portal. Driven by teachers, it provides access to online communities and educational materials for teachers and other educators.

Some ministries are beginning to use web-based tools to support communities of practice among teachers. Belgium, Canada, New Zealand, Singapore, South Korea, and Sweden use web-based tools such as blogs, chat rooms and wikis to support nationwide communication, collaboration, and sharing among teachers (Bakia et al. 2011). In Ireland, the NCCA is evaluating the experience of JC2.0, an online network for teachers in the NCCA Junior Cycle network. To encourage participation by teachers, some ministries have also developed incentive systems. Belgium, for example, uses a simple points system where points are allocated for uploading and downloading resources, as well as for participation in postings. The portal also offers a free weblog service for teachers and their classes (De Craemer, 2010a, 2010b). Alberta has a more developed strategy and promotes communities of practice through teacher qualification requirements, applied research initiatives and regional consortia. Teacher standards in Alberta include a requirement that teachers communicate with others electronically and use electronic media for their own enrichment while initiatives such the Emerge One-to-One Laptop Learning have established communities of practice.

2.3.4.2 Hardware Acquisition and Professional Development

As outlined in the section on infrastructure (section 2.1.2), some countries have tied hardware acquisition to professional development (e.g. Israel, Chile). In contrast, spending in Ireland as part of initiatives such as *IT 2000* and *Blueprint for the Future of ICT in Irish Education* was devolved to schools. Schools were permitted make their own decisions relating to the purchase of hardware, software, etc. and professional development was not explicitly linked to this spending. Instead the onus was on teachers to determine their own professional development needs. Since then, there have been stipulations relating to the purchase of hardware (e.g. projection and Internet access in every classroom) but there has never been provision for professional development to ensure that teachers engaged with using these technologies in their classrooms.

2.3.4.3 ICT standards for Teachers in the Form of a Framework or Set of Guidelines

Many countries have established ICT standards for teachers in the form of a framework or set of guidelines. They describe desired teacher outcomes or competencies that may be recommended or mandatory. In 2010, 17 of the 21 countries participating in the IETE study had teacher technology standards in place. Nine of these countries conduct some form of assessment of teacher ICT skill (Austria, Canada, England, Estonia, France, Israel, Japan, the Netherlands, and Norway) while four tie ICT skills to teacher licensing requirements (Canada, England, France, and Israel). In France and Israel, only new teachers needed to meet this requirement. In Estonia, teacher promotions are tied to a number of factors, including ICT skills (Bakia et al., 2011).

In Ireland, there has been a move in recent years towards the establishment of a general set of standards for teachers which includes the use of ICT in teaching and learning. The Teaching Council

[31] www.lektion.se
[32] www.tki.org.nz

acknowledges that the “emergence of new technologies and social media play a central role in the way young people communicate and learn and this is having an impact across all education provision …[Consequently,] regard for ICT [is an] increasingly significant issue” (2011a, p.7). To this end, the Council states that Initial Teacher Education (ITE) programmes “should equip newly qualified teachers with a set of competences to facilitate quality learning and cater for current educational priorities such as literacy and numeracy, ICT and inclusion” (p.12). Highlighting ICT as one of the “important components of student teachers’ developing professional skills” (p.15), the council lists “ICT in Teaching and Learning” as one of the mandatory elements of Initial Teacher Education (ITE). By doing so, the Council believes it is ensuring that in future, “all student teachers will be required to undertake them” (Teaching Council, 2011a, p.14). They also stress that the recent change to Initial Teacher Education (ITE) degree programmes (4 years rather than 3 years) should allow for “an increased emphasis on the key strategic priorities of literacy and numeracy, ICT and inclusion” (ibid).

The Teaching Council also documents detailed learning outcomes for the teacher graduate which “are directly related to the complex role of the teacher”. These learning outcomes “encompass the standards of teaching, knowledge, skill and competence together with the values, attitudes and professional dispositions which are central to the practice of teaching”. It clearly indicates that these learning outcomes should “take cognisance of the fact that this is the beginning of a journey of life-long learning” and it is expected that these “outcomes will be built on and will lead to engagement at a broader and deeper level as the teacher grows in confidence and experience” (Teaching Council, 2011a, p.24). This is reflective of the staged development outlined in the UNESCO ICT framework. The newly qualified teacher (NQT) is expected to demonstrate knowledge and understanding of “ICT, as appropriate to the sector and stage of education, and how these are related to life experiences” (p.26) in relation to subject knowledge, curriculum process and content. In addition, these graduates are expected to “use technology, including multi-media resources, effectively to aid pupil learning with regards to the planning, teaching, learning and assessment skills” (p.27)

What is particularly encouraging for the use of ICT in teaching and learning from a policy perspective is that the Teaching Council expects NQTs to be “continually adapting over the course of their careers to enable them to support their students’ learning” (Teaching Council, 2011a, p.6). The Council indicates clearly that “teaching is an instance, par excellence, of life-long learning" (p.16) and that continuing professional development (CPD) “should foster the development of competences to facilitate quality learning and cater for educational priorities” (p.21). The Council has identified ICT as a key national priority area. It is highly significant from a policy perspective that the Council “intends to work towards a position, following the adoption of a coherent national framework for CPD…, where renewal of registration with the Teaching Council will be subject to the receipt of satisfactory evidence in relation to engagement in CPD” (p.19).

2.3.4.4 Leadership Development

An important aspect of staff development is building leadership at the school level, not only in terms of supporting the introduction of ICT into the school curriculum but also in determining the goals and directions of change. How ICT is used and its impact on learning and teaching are substantially determined by the vision and understanding of the school principal and the prevalent school culture (Law et al., 2000; Yuen, Law & Wong, 2003). However, few countries have special arrangements for the professional development of principals in the context of ICT (Plomp et al., 2009). In Singapore,

principals were among the first staff to undergo professional development and their role in leading the change process is clearly articulated within professional development programmes. Similarly, New Zealand iimplemented a 'Principals First' programme which was aimed at developing their leadership skill in relation to planning ICT use in their schools.

2.5 Conclusion

In 2011, the ICT-CFT has changed the language it uses from "Teacher Professional Development" (UNESCO, 2008a) to "Teacher Professional Learning" (UNESCO, 2011). This implies that the teacher is more actively involved, has more control over their own professional development and is responsible for determining their own learning goals. Despite this, clear guidance is needed to ensure that this "professional learning … is collaborative, coherent, and continuous" (NETP, 2010, p.10). To this end, the Irish Teaching Council has indicated clearly that "CPD is a responsibility of all registered teachers... [and that] individual teachers should actively shape their own professional development, in the context of a professional development portfolio commenced during initial teacher education and retained throughout the teaching career" (Teaching Council, 2011a, p.20). Moreover, the Council states that "CPD should be based on teachers' identified needs within the school as a learning community" (ibid, p. 20) and also take cognisance of "the needs of the school and the needs of the system" (ibid, p. 21). However, teachers cannot do this in isolation and in many countries teachers are being supported to form professional communities of co-learners, to share new knowledge and skills and the products of their work. In some cases, teachers generate this new knowledge as they engage in action research projects that employ and evaluate a new technique that they may have developed individually or collectively (Kozma, 2010). The Irish Teaching Council supports this position and highlights the importance of "learning communities for life-long learning as professionals" and it has committed to the development of a "life-long learning framework to be designed by the Council" (Teaching Council, 2011a, p.17). Recent developments in online environments and social media tools may be particularly useful in building the range of collaborative learning communities that teachers require. They will ensure a blending of the "more effective in-person courses and workshops with the expanded opportunities, immediacy, and convenience enabled by online environments full of resources and opportunities for collaboration" (NETP, 2010, p. 10).

It appears that Ireland is in line with current contemporary policies which view professional development as a career-long process (Kozma, 2010). However, we need to ask if teachers are proactively engaged in this process. Do they identify their own professional learning goals and the means to accomplish them? It is difficult to assess if this is happening, not only in Ireland but worldwide. The current literature is of little help as the types of data that would provide this information are lacking from national and international collections. These include "teacher surveys of professional development needs related to ICT, the use of ICT to deliver teacher professional development, and participation of teachers in interactive collaborative environments with other teachers" (Bakia et al., 2011, pp. 49-50).

What is urgently needed is a framework to develop the capacity of teachers to embrace the idea of becoming self-determined learners who work together in a range of learning communities, virtually and in person. For this to be effective and lead to transformational change, it needs to be

acknowledged that “teacher professional development has an impact only if it is focused on specific changes in teacher classroom behaviours and particularly if the professional development is on-going and aligned with other changes in the educational system” (UNESCO, 2008a, p.9). In Jordan, for example, the curriculum policy, the ICT policy, and the assessment policy all focus on the “knowledge economy skills” of communication, collaboration, problem solving, and critical thinking (Kozma et al., 2010). In Singapore, all three of its master plans align ICT, the curriculum, and assessment (Wong, 2011). In the US State of Maine, the one-to-one laptop programme focused on teacher preparation and professional development and changes in the curriculum to support 21st century skills and economic development (Silvernail, 2009). In the State of Florida, a central goal of ICT policy is the integration of technology into the curriculum through professional development and the use of research-based instructional methods. What was interesting is that classroom observations conducted as part of the policy’s evaluation found significant increases in student engagement in project-based learning, independent student inquiry, and student use of technology as a learning tool or resource (Center for Research in Education Policy, 2007).

Bearing all this in mind, with the current roll-out of broadband to second-level schools in Ireland, there needs to be a strategy in place which capitalises on having extra bandwidth and enables teachers to design learning environments to meet the diverse learning needs of their students. Other intended reforms currently taking place within the system (e.g. Junior Cycle) should also inform the overall strategy so that a coherent and cohesive framework for teacher learning can be put in place. Using the lens of the UNESCO Competency Framework, policy makers need to establish where Ireland fits on each of these key areas and then plan implementations strategies that will operationalise policies effectively while bringing each separate area more into alignment with the others.

In conclusion, the linking of investment in ICT to improvements in student outcomes is the next big research challenge for all countries investing heavily in the use of ICT for education. Many countries are working on similar issues so it may be an opportune time for the international community to collaborate on collection methods, measures, and instruments and collectively participate in data collections in order to maximise resources supporting ICT use in education. A common goal of the international community could be to improve the collective understanding of how best to implement ICT in education and of how best to support teachers and students in acquiring the skills necessary to teach and learn with technology (Bakia et al., 2011).

Chapter 3: Implementation of the 2013 ICT Census

This chapter is divided into six sections. First, the content of the School and Teacher Questionnaires is described. Second, information on how the survey was administered is provided. Third, we describe the response rates for the questionnaires the methods used to weight the School Questionnaire data to provide estimates that are representative of the populations of primary, post-primary, and special schools. The responses on the Teacher Questionnaire are not weighted, and we explain why this is the case. Next, we describe how the quantitative and qualitative analyses were conducted. Finally, we highlight differences between the 2002, 2005 and 2013 Censuses in order to provide some guidance on how to interpret comparisons of results over time.

3.1 Content of the School and Teacher Questionnaires

The content of the questionnaires was guided by the policy priorities of the Department of Education and Skills, the ICT in Schools Steering Group, and the project team. Table 3.1 shows the content of the School Questionnaires, while Table 3.2 shows the main themes covered in the Teacher Questionnaires. With one or two exceptions, the content of questionnaires for primary, post-primary and special schools was identical (and where differences exist, these are flagged in the discussion of the results in Chapters 4, 5 and 7).

As mentioned in Chapter 1, the inclusion of the Teacher Questionnaire in the 2013 ICT Census represents an important new development since the 2005 ICT Census. This was done in order to try to capture actual usage patterns in classes, and the views and needs of teachers themselves, thereby extending the scope of the survey well beyond ICT infrastructure and broad usage patterns.

It should be noted that the design of the 2012 survey did not include questionnaires for other important groups in the education systems such as students and their parents.

Table 3.1: Content areas covered in the school questionnaire

Theme	Example(s)
School details	School name and roll number
ICT planning	Yes/No responses to, e.g. “ICT planning is an integral part of the overall school planning process”; “the school promotes the sharing of good practice in ICT integration among teachers”
ICT priorities	Rate items as very low/low/high/very high priority, e.g. “Use of ICT to support student collaboration and small group learning”; “High-quality broadband Internet connectivity”
ICT infrastructure	Number of computing devices (desktops, laptops/notebooks, tablets) used by teachers, by students, and by school administrators Location of computing devices in the school by user (staff or students) Age of computing devices Number of other ICT equipment (e.g. interactive whiteboards, digital projectors, printers/scanners, cameras) Number of computing devices with fixed and wireless network connection, by location in the school School website and updating of the website

Table 3.1: Content areas covered in the school principal questionnaire (continued)

Theme	Example(s)
Use of ICT in general	No/in some cases/regularly responses to, e.g. "student-owned devices are being used in some classes" "online tools and/or applications are used to support teaching and learning" (Principals may type in tools and applications in use in the school)
Use of assistive technologies	Yes/no/not applicable responses to using software or devices, e.g. "to support students with disabilities or disorders such as dyslexia, dyspraxia, ADHD, Asperger's syndrome, autism"; "to support literacy or numeracy for students with SEN"
Perceived obstacles to effective use of ICT	Respondents select six of 18 statements as the most pressing issues in their school, e.g. "low level of teacher confidence regarding the use of ICT"; "insufficient levels of technical support"
Impact of ICT	Rate items as large decrease/decrease/no change/small increase/large increase, e.g. "students' level of interest and engagement"; "ability of the school to meet the needs of lower-achieving students"
CPD priorities	Respondents select three of 12 content areas, e.g. "how to use ICT to support assessment of/for learning"; "how to use ICT as a teaching and learning tool across the curriculum (including its application to specific subject areas)"
Preferences for the organisation of CPD	Respondents rate the suitability of various delivery modes for CPD, e.g. "bringing in an external tutor to enable formal CPD take place in the school (using the school's own equipment)"; "supporting teachers to attend formal CPD in external venues (such as the education centres)"
Preferences for the timing of CPD	Respondents rate the suitability of various delivery times for CPD, e.g. "during additional/Croke Park hours"; "in summer"
Responsible use of the Internet	Yes/no responses to statements relating to acceptable use policy (AUP), e.g. "the school AUP is reviewed and updated regularly"; "the AUP refers to Internet safety advice and guidelines"
Context in which AUP is taught	Yes/no responses to, e.g. "Internet safety is taught as part of SPHE in the school"
Procurement frameworks	Perceived usefulness of procurement frameworks for PCs, notebooks etc. (not aware of framework/aware but not used framework/have used framework and disagree/have used framework and agree)
Technical support	Who carries out technical support in the school (ICT coordinator, shared staff role, etc.)
Engagement with industry	Yes/No; if yes, a description of the nature of the engagement
Additional comments	Space for comments to be typed including ICT-related priorities

Table 3.2: Content areas covered in the teacher questionnaire

Theme	Example(s)
School details	School name and roll number
Teacher details	Age range, gender, year or class levels taught, main subjects taught (post-primary), working as a teaching principal (primary)
General beliefs relating to teaching and learning	Strongly agree/agree/disagree/strongly disagree with items, e.g. "my role as a teacher is to facilitate students' own enquiry"; "a quiet classroom is generally needed for effective learning"
Frequencies of teaching and learning activities (general)	Items rated as never or hardly ever/in about one quarter of lessons/in about one half of lessons/in about three quarters of lessons/in almost every lesson, e.g. "I review with students the homework they have prepared", "Students give feedback on other students' work"
Access to ICT	Items rated as never/sometimes/frequently/usually or always/not applicable, e.g. "I have access to a digital projector", "each student has access to a dedicated computing device"

Table 3.2: Content areas covered in the teacher questionnaire (continued)

Theme	Example(s)
Perceived obstacles to effective use of ICT	Respondents select six of 18 statements as the most pressing issues in their school, e.g. "my own low level of knowledge of how to use ICT effectively in teaching and learning; "insufficient levels of technical support"
Use of ICT in teaching and learning (general)	Never/sometimes/frequently/usually or always use ICT or have students use ICT during and outside class time
Teacher use of ICT in teaching and learning (specific)	Never/sometimes/frequently/usually or always do various activities using ICT, e.g. "use social networks in teaching and learning"; "present information or give class instruction to students"
Student use of ICT in teaching and learning (specific)	Never/sometimes/frequently/usually or always have students do various activities using ICT, e.g. "work with spreadsheets or databases"; "find information on the Internet"
Use of ICT in assessment	Never/sometimes/frequently/usually or always do various assessment activities using ICT, e.g. "I use a variety of digital tools to assess students' work"; "my students submit essays, reports or projects in digital format"
Impact of ICT	Rate items as large decrease/decrease/no change/small increase/large increase, e.g. "students' level of interest and engagement"; "ability of the school to meet the needs of lower-achieving students"
ICT planning and collaboration	Yes/no responses to statements relating to planning and collaboration with other teachers, e.g. "do you plan for ICT use in your class?"; "do you share experiences and ideas for ICT integration with other teachers in the school informally during the school day?"
ICT priorities	Items rated as very low/low/high/very high priority, e.g. "access to a wider range of tools and applications "; "student access to mobile computing devices"
Perceived level of ICT-related skills (self)	Items rated as none/basic/moderate/high, e.g. "using the Internet to find educational resources"; "downloading and editing of curriculum resources"
Time spent on ICT-related CPD	In the past two years, none/up to three hours/three to five hours/five to 20 hours/more than 20 hours
ICT-related CPD content	Yes/no responses to CPD content statements, e.g. "digital media skills (including the use of digital video and audio)"; "how to use ICT to support assessment for learning"
ICT-related CPD timing and format	Yes/no responses to CPD timing and format statements, e.g. "online course on ICT in teaching and learning during term time"; "formal mentoring/peer coaching on the use of ICT in teaching and learning"
CPD priorities	Respondents select three of 12 content areas, e.g. "how to use ICT to support assessment of / for learning"; "how to use ICT as a teaching and learning tool across the curriculum (including its application to specific subject areas)"
Preferences for the organisation of CPD	Respondents rate the suitability of various delivery modes for CPD, e.g. "bringing in an external tutor to enable formal CPD take place in the school (using the school's own equipment)"; "supporting teachers to attend formal CPD in external venues (such as the education centres)"
Preferences for the timing of CPD	Respondents rate the suitability of various delivery times for CPD, e.g. "during additional/Croke Park hours"; "in summer"
Perceived importance of digital content	Items rated as very low/low/high/very high importance/not applicable, e.g. "presentations/teaching materials created by me"; "E-books"
Use of websites	Frequency of use of scoilnet.ie and other websites; teachers are asked to type in three websites that they find the most useful
Creating, sharing and borrowing digital resources	Whether or not respondents create, share or borrow various digital resources Views on sharing digital resources and open educational resources (OER)
Additional comments	Space for comments to be typed including ICT-related priorities

3.2 Administration of the Survey

The survey questionnaires were delivered online using SurveyMonkey, which was housed on the PDST website, with separate links to survey materials for primary, post-primary and special schools. While respondents were invited to complete the survey online, they had the option of printing out a PDF hardcopy. A small number of respondents returned questionnaires in hardcopy, and these were data entered by PDST-Technology in Education and the DES.

All schools (primary, post-primary and special) were contacted in mid-April by the DES, inviting principals to complete the online School Questionnaire. They were informed that their responses would contribute towards a new *ICT Strategy for Schools.* Principals were also asked to select teachers in their school to complete a Teacher Questionnaire. At primary level, principals were asked to select one second class teacher and one fourth class teacher; at post-primary level, they were asked to select two second year and two fifth year teachers; and in special schools, they were asked to select one or two teachers. Guidelines for selecting teachers at random were included with the letters, along with an email template to send to the selected teachers. A phone number and email address were provided to assist with queries.

The number of School and Teacher Questionnaires submitted was tracked on a rolling basis. Schools were sent reminders about the study by email during May and June.

Originally, it had been planned to close the surveys and complete survey administration by the end of the 2012-2013 school year. However, although the response rates for School Questionnaire were satisfactory for analysis purposes, response rates for teachers in primary and post-primary schools on the Teacher Questionnaire were much lower (see Section 3.3). Therefore, the teacher survey for primary and post-primary schools was re-opened in early October 2013 and principals in schools without Teacher Questionnaires returned (or just one returned in the case of post-primary schools) were asked to invite teachers to complete questionnaires prior to the end-of-October mid-term break. Following this, data from the two data collection phases were combined for analysis and reporting.

3.3 Response Rates and Survey Weights

3.3.1 Target Populations, Principal Questionnaire Response Rates and Survey Weights

The target population at primary level was defined as all schools with one or more pupils at second and/or fourth class that had been open before September 2012, and excluding those schools opening in September 2012 or later. Schools due for closure in September 2012 or later were also excluded from the target population. In all, 3120 schools were open prior to September 2012. A further 15 schools were due to open in September 2012 or later, while 24 were due for closure or amalgamation (or recently closed).

Of the 3120 schools in the target population, it was estimated that 2948 had one or more pupils at both second and fourth classes[33], 68 schools had pupils at fourth class but not second class, and 104 schools had pupils at second class but not fourth class. Following data collection, it emerged that 17

[33] The second and fourth class totals are based on the 2011-2012 primary schools database, taking in first/second and third/fourth class levels, so are estimates.

of the 104 schools that were thought to have second class did not have any pupils at that level; one school that was thought to have fourth class pupils only did not; and a further three schools had pupils at one or other level, but not both levels. So the corrected figures are 2945 schools with pupils at both levels, 68 with pupils at fourth class only, and 89 with pupils at second class only.

In total, 2109 School Questionnaires were returned from primary schools, yielding a response rate of 67.6%. This can be considered adequate for analysis and reporting provided that sampling weights, which encompass important characteristics of the population and which are related to the outcomes under consideration, are applied. (By comparison, the school participation rate standard in in the OECD's 2008 Teaching and Learning International Survey (TALIS; OECD, 2009) was set at 75%, while the teacher participation rate standard was also 75%).

Table 3.3 shows the number of primary schools in the target population compared with the achieved sample, distributed across categories of school size, DEIS classification, and gender composition. Table A3.1 shows the distribution of schools in the population and in the sample for each combination of these characteristics. The strata combinations in Table A3.1 were used as a basis for computing the sampling weights, i.e. the ratio of the number of schools in the population to the number of schools in the sample.

These weights correct for any differences observed in the distribution of school characteristics across the sample and the population in both Tables 3.3 and Table A3.1. However, as with survey weights generally, their application necessarily assumes that responding and non-responding schools are comparable with respect to ICT-related characteristics.

Table 3.3: Number of schools in the target population of primary schools and number of schools with a School Questionnaire returned, by school enrolment size, DEIS status, and gender composition

School characteristic	N schools in population	% schools in population	N schools in sample	Response rate (%)
School size				
Small (1 to 60 pupils)	756	24.2	509	67.3
Medium (61 to 120 pupils)	872	27.9	601	68.9
Large (121 to 240 pupils)	837	26.8	552	65.9
Very large (more than 240 pupils)	655	21.0	447	68.2
DEIS status				
Not in DEIS	2464	79.0	1677	68.1
DEIS Band 1	189	6.1	128	67.7
DEIS Band 2	146	4.7	108	74.0
DEIS Rural	321	10.3	196	61.1
Gender composition				
All boys	224	7.2	137	61.2
Mixed	2761	88.5	1871	67.8
All girls	135	4.3	101	74.8
TOTAL	3120	100	2109	67.6

Note. The total includes 17 schools with no pupils at second or fourth class; this discrepancy was discovered after the computation of school sampling weights.

While response rates for the primary school principal questionnaire did not vary much by school enrolment size, they varied somewhat by DEIS status (with higher response rates from Band 2

schools and lower rates from rural DEIS schools) and gender composition (with lower returns from all boys' schools, and a higher rate of returns from mixed schools). Response rates within strata combinations vary between 50% and 100% (Table A3.1).

At post-primary level, the target population was defined as schools with one or more students at second and/or fifth year that had been open before September 2012, and excluding those schools opening in September 2012 or later. The 22 senior colleges were also included. In all, there were 721 schools in the population. A total of 498 School Questionnaires were returned from post-primary schools, yielding a post-primary response rate of 69.1%[34].

Table 3.4 shows the number of post-primary schools in the target population compared with the achieved sample, distributed across categories of school size, sector/gender composition, and DEIS classification. Table A3.2 shows the distribution of schools in the population and in the sample for each combination of these characteristics. As with primary schools, the strata combinations shown in Table A3.2 were used as a basis for computing the sampling weights.

Table 3.4: Number of schools in the target population of post-primary schools and number of schools with a School Questionnaire returned, by school enrolment size, DEIS status, and gender composition

School characteristic	N schools in population	% schools in population	N schools in sample	Response rate (%)
School size				
Small (250 or fewer students)	120	16.6	69	57.5
Medium (251 to 450 students)	206	28.6	144	69.9
Large (451 to 600 students)	154	21.4	109	70.8
Very large (600 or more students)	241	33.4	176	73.0
School sector/gender composition				
Secondary mixed	129	17.9	88	68.2
Secondary girls	108	15.0	71	65.7
Secondary boys	138	19.1	98	71.0
Vocational	231	32.0	158	68.4
Community and Comprehensive	93	12.9	72	77.4
Senior colleges	22	3.1	15	68.2
DEIS status				
In DEIS	231	32.0	174	75.3
Not in DEIS	490	68.0	324	66.1
TOTAL	721	100	498	69.1

Response rates for the School Questionnaire varied somewhat by school size and DEIS status (Table 3.4). Rates of return were lower in schools with lower enrolment rates and higher in large to very large schools; principals in DEIS schools were more likely to return a questionnaire than principals in non-DEIS schools. Response rates, however, did not vary appreciably by school sector/gender composition, being highest in community and comprehensive schools. Response rates within strata combinations vary between 25% and 100% (Table A3.2).

[34] This includes responses from principals in three senior colleges without a junior or a senior cycle curriculum in place.

As with primary schools, the weights adjust for these variations in response rates, but again, make the assumption that non-responding schools are comparable to those returning a School Questionnaire in terms of ICT-related characteristics.

In total, there were 140 special schools in the population. Of these, 90 returned a School Questionnaire, yielding a response rate of 64.3%. For the purposes of computing the sampling weights, the only characteristic used was school enrolment size, due both to the small number of special schools in the population and the heterogeneous nature of the student population in these schools. Table 3.5 shows the number of special schools in the population and the achieved sample, split by enrolment size. Response rates were highest in schools with larger numbers of students enrolled.

Caution is advised in generalising the results of the special school sample to the population, since the weight adjustments are coarser than those for primary and post-primary schools; also, the student composition varies greatly across these schools.

Table 3.5: Number of schools in the target population of special schools and number of schools with a School Questionnaire returned, by school enrolment size

School size	N schools in population	% schools in population	N schools in sample	Response rate (%)
20 or fewer students	36	25.7	22	61.1
21 to 40 students	26	18.6	17	65.4
41 to 60 students	26	18.6	16	61.5
61 to 80 students	26	18.6	15	57.7
81 or more students	26	18.6	20	76.9
TOTAL	140	100	90	64.3

3.3.1 Teacher questionnaire response rates and non-response bias analysis

In the introductory section to this chapter, we indicated that a second data collection phase was initiated in October 2013 in order to try to increase the number of returns from teachers. As of the end of June 2013, return rates for teachers at both primary and post-primary levels were around 33%, which is far short of the desired 65%. In contrast, Teacher Questionnaires were returned from 68 of 140 special schools.

Specifically, from the 3120 primary schools in the study, surveys were returned by 2019 teachers, around half of whom teach second class (51.2%) and half fourth class (48.8%). Of these schools it is estimated that 3034 have pupils in second class and 3013 have pupils in fourth class (with pupils in both class levels in 2948 schools). This implies that a total of 6047 (3034+3013) questionnaires could have been returned, if all schools and all selected teachers had done so. Thus, the response rate at primary level at the end of June was 33.4% (2019/6047).

At post-primary level, 910 teacher surveys were returned, again reasonably evenly split by year level (53.5% were second year teachers and 46.5% were teaching fifth year). Of the 721 schools invited to participate, 22 were senior colleges (i.e. with PLC or similar courses, but no students enrolled at Junior or Leaving Certificate levels), meaning that four questionnaires should have been received from each of 699 schools. Further, 694 schools have students in junior cycle, and 697 have pupils in

senior cycle (with students in both junior and senior cycles in 692 schools), so the maximum number of Teacher Questionnaires that could have been returned is 2782 ([694*2]+[697*2]). This yields a post-primary teacher response rate of 32.7% (910/2782).

To assess the representativeness of the sample of respondents at the end of the first data collection phase, the research team at the ERC conducted a comparison of stratum characteristics of schools without any teacher questionnaires and schools with one or more teacher questionnaires returned. At both primary and post-primary levels, the analyses indicated significant under-representation of teachers in smaller schools. There was also slight but statistically significant under-representation of teachers in mixed primary schools, and of teachers in non-DEIS post-primary schools.

In a second step, schools with and without teacher questionnaires were compared on four key ICT infrastructure characteristics drawn from the School Questionnaire: pupil-computer ratio, and percentages of all computers that are desktops, that are laptops, and that are tablets. Broadly speaking, schools with and without Teacher Questionnaires were similar to one another in terms of these characteristics, so it could be concluded from the analyses that while the teacher samples are not representative of their populations, they are not biased in terms of broad ICT infrastructure measures.

The significant under-representation of teachers in smaller schools resulted in a decision to re-open the Teacher Questionnaire at primary and post-primary levels. Data were collected during October 2013. In total, 1110 post-primary Teacher Questionnaires were returned from 417 of 721 schools (22 of which are senior colleges), yielding a response rate of 39.9%, up 7.2% from the initial 32.7%. At primary level, 2838 teacher questionnaires were returned from 1986 schools, giving a response rate of 46.9%, up 13.5% from the initial rate of 33.4%.

It is important to note that despite the follow-up surveying in October, response rates for teachers at both primary and post-primary levels fall short of what would be required in order to be able to consider the samples representative. However, some broad comparisons can be made between the characteristics of schools with and without Teacher Questionnaire data, in order to provide some guidance as to whether and how the samples may specifically under-represent certain sub-groups of the population.

Table 3.6 compares the characteristics of post-primary schools without any Teacher Questionnaires to those with one or more Teacher Questionnaire returned. Although DEIS and non-DEIS schools were equally as likely as each other to return Teacher Questionnaires, as were schools across the different sectors, Table 3.6 shows that smaller schools are significantly less likely to have Teacher Questionnaire data. In this sense, the sample cannot be considered representative.

Table 3.7 compares schools with and without Teacher Questionnaires on four key ICT indicators that were calculated on the ICT School Questionnaire (see Chapter 4). None of the odds ratios are significant, which means that the schools returning teacher questionnaires may be considered broadly representative of the population of schools in terms of ICT infrastructure.

Table 3.6: Logistic regression of post-primary school teacher returns by key school characteristics: All characteristics considered together, and excluding senior colleges (N=699)

Characteristic/Comparison	Beta	SE (Beta)	p	Odds Ratio
School enrolment size				
Up to 250 students-601 or more students	-1.143	.251	**<.001**	**0.319**
251 to 450 students-601 or more students	-.709	.210	**.001**	**0.492**
451 to 600 students-601 or more students	-.593	.221	**.007**	**0.553**
DEIS status				
In SSP under DEIS-Not in SSP under DEIS	.282	.197	.151	1.326
Sector/Gender Composition				
Girls' Secondary-Mixed Secondary	-.218	.268	.416	.804
Boys' Secondary-Mixed Secondary	.022	.255	.930	1.023
Vocational-Mixed Secondary	.141	.240	.558	1.151
Community and Comprehensive-Mixed Secondary	.054	.290	.851	1.056

Note. Nagelkerke R^2 = .051.

Table 3.7: Logistic regression of post-primary school teacher returns by key ICT indicators: Indicators considered one by one, and excluding senior colleges (N=699)

Characteristic	Beta	SE (Beta)	p	Odds Ratio
Ratio of pupils to all working computer devices	.033	.024	.172	1.034
Percentage of computers that are desktops	.004	.005	.409	1.004
Percentage of computers that are laptops	-.008	.006	.158	0.992
Percentage of computers that are tablets	.003	.009	.713	1.003

Note. Nagelkerke R^2 ranges from .000 to .009.

Table 3.8 compares primary schools by key school characteristics for schools with and without Teacher Questionnaires returned. Schools with and without Teacher Questionnaires are evenly distributed across DEIS category and gender composition, but small schools (those with 60 pupils or less) are significantly less likely to have returned Teacher Questionnaires.[35]

Similar to Table 3.7 for post-primary schools, Table 3.9 compares primary schools with and without Teacher Questionnaires on four ICT indicators derived from the ICT School Questionnaire. Schools with and without Teacher Questionnaires are similar to one another in terms of the percentages of working devices that are desktops, laptops, and tablets, but schools without Teacher Questionnaires returned have a significantly lower pupil-working device ratio than schools with Teacher Questionnaires returned (8.77 compared with 11.86). This finding is counter-intuitive, but it is likely to be related to the lower teacher return rates from small schools, which themselves have lower pupil-working device ratios (see Chapter 4).

[35] It is important to note, however, that part of the reason for this is due to the higher percentage of teaching principals in small primary schools, some of whom would have been selected to complete *both* the school *and* the teacher questionnaires. Across all schools, 12.7% of principals indicated that they had teaching duties. This figure is much higher (38.7%) in small schools (i.e. with up to 60 pupils); it is 15.8% in schools with 61 to 120 pupils, 3.6% in schools with 121 to 240 pupils, and just 0.4% in schools with more than 240 pupils enrolled.

Table 3.8: Logistic regression of primary school teacher returns by key school characteristics: All characteristics considered together

Characteristic/Comparison	Beta	SE (Beta)	p	Odds Ratio
School enrolment size				
Up to 60 pupils-241 or more pupils	-.586	.119	**<.001**	**0.557**
61 to 120 pupils students-241 or more pupils	-.190	.114	.095	0.827
121 to 240 pupils-241 or more pupils	-.191	.112	.090	0.826
DEIS status				
DEIS Band 1-Not in SSP under DEIS	-.132	.160	.411	0.877
DEIS Band 2-Not in SSP under DEIS	-.010	.188	.957	0.990
DEIS Rural-Not in SSP under DEIS	-.284	.124	**.022**	**0.753**
Gender Composition				
All girls-Mixed sex	-.269	.147	.052	0.752
All boys-Mixed sex	.016	.195	.936	1.016

Note. Nagelkerke R^2 = .018.

Table 3.9: Logistic regression of primary school teacher returns by key ICT indicators: Indicators considered one by one

Characteristic	Beta	SE (Beta)	P	Odds Ratio
Ratio of pupils to all working computer devices	.023	.008	**.003**	**1.024**
Percentage of computers that are desktops	.001	.002	.398	1.001
Percentage of computers that are laptops	.000	.002	.869	1.000
Percentage of computers that are tablets	-.006	.004	.106	0.994

Note. Nagelkerke R^2 ranges from .000 to .014.

No sampling weights were computed for the teacher data, since there is no centralised information on the numbers of teachers in each school. Also, the number of teachers sampled from each school was small, so generalising the results to the population of teachers would not be appropriate. In order to obtain a representative sample of teachers, we would have had to either sample a larger number of teachers from each school in the population, or a larger number of teachers from a representative subset of schools in the population.

The results of analyses of the teacher questionnaires should not be generalised to the population of teachers and, for this reason, we have avoided making detailed comparisons between groups of teachers in this report on the basis of their own characteristics such as gender and age group, and various school characteristics.

3.4 Quantitative Data Processing and Analysis

The online survey tool (SurveyMonkey) captures the data entered by respondents once they press the 'submit' button. The data can then be exported in a format that is compatible with both Excel and IBM SPSS Statistics. Analyses were undertaken in SPSS. Data were processed in a number of steps for each of the six questionnaire files as follows:

1. Roll numbers were used as the ID number for the purposes of processing the data (which needed to be matched with the Department of Education and Skills Schools Database in

order to calculate response rates, match in important school characteristics, and compute the sampling weights). A large number of errors were present in the roll numbers entered by respondents (e.g. digits juxtaposed; one digit miskeyed; numeric and text digits mixed up) and these were corrected manually with reference, where available, to the school's name. In a small number of instances, it was not possible to match the record with the schools database (for example if the respondent entered a 'dummy' value for roll number and did not provide a school name); these records had to be dropped from the datafiles prior to analysis.

2. In a number of instances, respondents had entered data into the wrong instrument (e.g., teachers in special schools completed the Teacher Questionnaire for primary school teachers; post-primary principals completed the School Questionnaire for primary principals). These were identified on the basis of the (corrected) roll numbers, exported, and, following data restructuring, were re-matched to the correct file.
3. Each of the six questionnaire files was checked for records which contained 90% or more missing data, and these were dropped from the files.
4. A small number of duplicate records remained in each of the six files. These were also deleted from the files prior to analysis.
5. Each item or question in the questionnaires was checked for out-of-range values (e.g. a coding error with respect to missing data values) and corrected if necessary.
6. The questionnaires were then reviewed in order to develop and apply a sequence of recodes in order to (i) reduce the amount of missing data and (ii) correct logical discrepancies in the data. For item sets such as a set of statements for which a yes/no response was requested, missing responses were recoded to 'no' where that set had at least one valid response. For numeric data, such as responses provided by principals on the numbers of computing devices in the school by location, missing data were recoded to zero where a related response had valid values (i.e. where the logical inference was that the respondent intended a zero rather than a missing response). Had these recodes not been applied, any resultant indicators of ICT infrastructure would have been over-estimated. In addition, numeric data were checked for highly implausible response patterns, though no data were recoded to invalid on this basis. The numeric data provided by principals form much of the analyses reported in Chapter 4 of this report.
7. Some item sets were recoded in order to collapse categories for reporting purposes (e.g. recoding of "strongly agree"/"agree"/"disagree"/"strongly disagree" to "agree"/"disagree").
8. In the case of the School Questionnaire datafiles, sampling weights, along with variables drawn from the schools database (e.g. enrolment size, DEIS status) were matched to the files for analysis of sub-groups. As noted in the previous section, weights were not applied to the Teacher Questionnaire files, though additional variables drawn from the schools database were matched to them for analysis purposes.

In interpreting the results, it should be borne in mind that the primary focus of this report is *descriptive* – i.e. to provide a detailed, up-to-date picture on ICT infrastructure, access and usage in schools. While the report provides comparisons of results across primary, post-primary and special schools, along with comparisons of results by sub-groups within these levels (i.e. school size, DEIS status and gender composition at primary level; school size, sector/gender composition and DEIS status at post-primary level; and school size within the category of special schools), they are not

intended to be detailed. For this reason, standard errors are not included in the report. This approach is consistent to that taken in the report on the 2005 census on ICT in schools (Shiel & O'Flaherty, 2006).

The main body of the report includes comparisons across primary, post-primary and special schools, while the Data Appendix (presented as a separate, online volume) provides comparisons of sub-groups within these categories. Where policy-relevant sub-group differences are evident in the tables in the Data Appendix, these are flagged in the main part of the report.

For most of the items in the questionnaires, rates of missing data were low, and were further reduced during the data cleaning and recoding described above. However, some data, particularly from questions requiring a numeric response (e.g. number of laptops in the school for student use) have higher rates of missing data. Where 10% or more of data are missing on a question or measure, this is noted in the data tables.

Chapter 4 includes a description of various indicators of ICT infrastructure, e.g. pupil-computer ratio, age of computing devices, and percentage of computing devices with a network connection. Some of these indicators involve the computation of ratios and each of these is described in Chapter 4 before presenting the results. Missing data on some of these indicators is quite high so caution should be applied in interpreting the results, particularly since they may be of somewhat limited generalizability to the populations.

3.5 Qualitative Data Analysis

The ICT Census questionnaires sought written comments or information in response to some questions. The questions that were subjected to qualitative analysis were as follows:

1. Teacher Questionnaire – use of websites in teaching and learning: Please provide the addresses of the three most useful websites you use for teaching/learning.
2. School Questionnaire – use of tools and applications: please state the main online tools and applications being used in the school.
3. School Questionnaire – nature of involvement with industry in relation to teaching and learning.
4. Teacher Questionnaire – additional comments (at the end of the questionnaire): Please state your additional comments here, including your specific ICT-related priority areas.
5. School Questionnaire – additional comments (at the end of the questionnaire): Please state your additional comments here, including your specific ICT-related priority areas.

The results of these analyses are described in Chapters 6 and 8 under the main topics that emerged during analysis. In Chapter 10, we combine the qualitative and quantitative results, as well as those from Chapter 9 (which examines data from international studies) in order to draw conclusions.

Regarding 4 and 5 above, the reporting of the qualitative data necessitated the development and validation of a classification scheme on the basis of the content of each comment. Where individual responses covered more than one content area, these were split into discrete parts. A classification scheme was developed iteratively while going through the data, and with reference to the analyses of the 2005 survey results (see Shiel & O'Flaherty, 2006, Chapter 12). The scheme distinguished between 16 major topics (and an 'other' category) and themes in the School Questionnaire data. In

the Teacher Questionnaire data, 14 major topics comprising of 63 themes were identified. For example, one major topic identified was *professional development*, which had a number of themes relating to it, e.g.: *need for more, better or tailored ICT training; insufficient time allocated for CPD in ICT/teachers training in their own time;* and *insufficient funding of training/teachers funding their own CPD*. The major topics are shown in Tables 6.1 to 6.3 (Chapter 6) and Tables 8.1 to 8.3 (Chapter 8). The themes arising from these topics were developed in order to allow for a more detailed classification and were used mainly to help focus the work of coding responses.

The coding scheme was developed initially by one member of the research team on the basis of the responses of post-primary school principals, and then applied to the primary school and special school principals' written comments, with small adjustments made to some categories where appropriate. To validate the scheme, a second member of the team 'blind-coded' a subset of 228 of these comments selected at random. The two researchers then discussed responses on which the two sets of codes did not match. This resulted in some minor changes being made to the classification scheme (consisting of small re-wordings to the category descriptions).

The agreement rate between the two sets of classifications was 75.4% at the detailed (theme) level, and 89.0% at the major topic level, indicating satisfactory to good levels of agreement[36]. Where the two sets of codes diverged, these tended to be on related content. For example, the following response: "*the up-skilling of staff is of prime importance, time to facilitate the investigation of ICT advances"* was coded 3b by one researcher (insufficient time allocated for CPD in ICT/teachers training in their own time) and 6a by the other (insufficient time for teacher planning/preparation), and code 3b was agreed on after discussion for this response.

3.6 Comparing the Results of the Present Survey with Previous Surveys

In Chapters 4 and 5, some comparisons are made with the ICT Censuses conducted in 2002 and 2005. There are some differences in the design and implementation of the three studies. In 2002 and 2005, responses were not weighted, while in 2013, weights have been applied to the School Questionnaire data to allow for generalisations to be made to the population. Weights were also applied since the response rates in 2013 were lower than in either 2002 or 2005.

Second, the mode of administration differed, since the 2013 census was administered online for the first time. It might be the case that this may have given rise to systematic changes in how principals responded to questions on the census, but it is not possible to test whether this occurred or not.

Third, the questionnaires administered in 2013 were somewhat more detailed than in previous Censuses. In particular, the questions asking about ICT infrastructure were more detailed. For example, these questions necessarily distinguished between desktops, laptops and tablets, while in previous years, tablets were not in general use so were not included in the questionnaires. These differences may have given rise to slight differences in interpretation on the part of respondents.

[36] There are a number of ways to evaluate inter-rater agreement, and although percent agreement is sometimes criticised for being too lenient, it was applied in this instance, due to the very detailed, non-ordered nature of the classification scheme (see, for example, Lombard, Snyder-Duch & Bracken, 2002).

Fourth, the 2013 ICT Census included a Teacher Questionnaire for the first time. It is not possible, therefore, to compare responses of teachers with previous surveys, and it may also be the case that the addition of a Teacher Questionnaire resulted in somewhat lower response rates on the School Questionnaire in 2013.

These differences should be borne in mind when interpreting comparisons across surveys. For example, we observe that there has been a decrease in the pupil-computer ratio since 2005 in Chapter 4. We cannot definitively conclude that there has been a statistically significant change; rather, what we can say is that the general trend indicates a decrease.

Table 3.9 summarises the main features of the 2002, 2005 and 2013 studies.

Table 3.9: Numbers of principals, principal response rates, administration method, inclusion of teachers, and use of sampling weights in the 2002, 2005 and 2013 Censuses on ICT in schools

Aspect of survey	2002	2005	2013
N principals - primary	2715	2825	2109
Response rate - primary	85.6	89.7	67.6
N principals - post-primary	551	592	498
Response rate - post-primary	73.9	80.9	69.1
N principals - special	105	102	90
Response rate - special	80.2	82.3	64.3
Administration method	Paper	Paper	Online
Teachers surveyed?	No	No	Yes
Sampling weights used?	No	No	Yes

Chapter 4: ICT Infrastructure in Schools

This chapter describes principals' reports on ICT infrastructure in schools. Data are included on the number of working computing devices in schools, the ratio of pupils to computing devices, the distribution of devices by type, age, and location in the school, and the extent and type of networking in place. The prevalence of school websites/blogs is presented. Principals' awareness and perceived usefulness of procurement frameworks, and access to technical support, are discussed. Some comparisons of subgroups within categories are also made. The chapter closes with some comparisons with data from the 2005 census.

Some key points should be noted in interpreting the information presented here. First, the present (and subsequent) chapters focus on data for three overall school categories, that is, primary, post-primary, and special schools. Although some sub-group comparisons are made, detailed information relating to these is provided in the Appendices which accompany this report. In the primary category, comparisons are made by DEIS status and school enrolment size. In the post-primary category, comparisons are made on both these characteristics as well as by school sector (mixed school, single-sex girls, single-sex boys, community school, vocational school, and senior colleges). No subgroup comparisons are made for special schools. Although school sector (e.g., gender mix) is also considered important for the primary category, analyses indicate that gender mix covaries with school enrolment size. This means that differences according to gender mix in primary schools would be difficult to interpret reliably, and are thus not considered in this chapter.

Second, it should be noted that the rates of missing data for information presented in Tables 4.1 to 4.6 are generally high, and caution should be exercised in interpreting the results, since the sample weights cannot adequately compensate for missing data.

A third important point relates to the presentation of the pupil-computer ratio. There are several definitions of pupil-computer ratio that could be used. If comparisons are made with other studies or reports, the calculation used to generate pupil-computer ratios in those reports should be considered.

Finally, it should be noted that overall data in many tables may not sum to the total of the separate components because of missing data. For example, the number of devices found in general classrooms is computed as a sum of the number of desktops, laptops, and tablets in general classrooms. Only cases (respondents or schools) for which data were available for each of the three items are used to compute the overall figure.

4.1 ICT Devices

First, we consider the numbers of working computing devices in schools. These figures do not take school size into account. (Pupil-device ratio, considered later, does take enrolment size into account.)

Principals were asked to report on the numbers of devices of different types in their school. Principals also provided information on the number of devices by usage (i.e., for students, teaching,

SEN, or administration) and estimated the age of computing devices and recorded their location within the school.

Table 4.1 shows the average number of working computer devices (i.e., desktops, laptops, and tablets) in primary, post-primary, and special schools. Across all categories, the majority of devices are classified for use by students in general. For example, an average of 19 devices are used by students in general in primary schools, while 16 are used for teaching purposes, 4 are used by students with special education needs, and 2 for school administration. In post-primary schools, which are generally larger than primary schools, 84 devices are available for use by students in general, 63 for teaching purposes, 13 for students with SEN, and 9 for school administration. In special schools, an average of 20 devices were available for use by students, 15 for teaching and 3 for administration.

Table 4.1: Average number of working computing devices (and by type/purpose) in primary, post-primary, and special schools

Usage/Type		Primary		Post-primary		Special	
		M	*SD*	*M*	*SD*	*M*	*SD*
For teaching	Desktops	6.43	9.38	38.47	40.10	7.03	5.94
	Laptops	8.84	8.41	18.66	18.57	5.68	4.45
	Tablets	0.82	5.76	5.92	13.06	2.65	4.81
	Overall	16.00	16.04	62.69	49.28	14.94	10.30
For SEN	Desktops	1.61	3.06	6.15	19.78	-	-
	Laptops	1.75	2.38	5.87	7.47	-	-
	Tablets	0.64	2.16	0.99	2.70	-	-
	Overall	3.58	4.75	12.54	22.84	-	-
For students in general	Desktops	10.88	12.19	65.61	50.44	11.65	10.69
	Laptops	8.04	9.78	14.62	49.18	4.69	6.29
	Tablets	1.67	8.05	6.84	24.91	4.34	5.16
	Overall	18.74	16.79	84.36	70.47	19.83	13.54
For school admin	Desktops	1.40	1.51	6.43	5.54	1.91	1.14
	Laptops	1.00	1.37	2.13	2.11	1.29	1.23
	Tablets	0.04	0.23	0.58	1.41	0.11	0.31
	Overall	2.32	2.25	9.05	6.59	3.02	1.64

Missing data: Primary: 4-32%. Post-primary: 4-24%. Special: 4-27%.
Note: Overall figures are for those schools that had complete data on the three components, and therefore may not sum to the total of those three components as shown in the table.
M = mean or average number of working computers. SD = Standard Deviation – which gives an indication of the spread of computer numbers, such that 66% of computers fall within one standard deviation of the mean.

Similar patterns of availability were observed for subcategories of schools. In the primary category, DEIS Band 1 and Band 2 schools reported greater numbers of devices than either non-DEIS or Rural schools (see Table A4.1[37]). To some extent, this was also observed in post-primary schools. On average, DEIS post-primary schools reported a higher number of devices for use by students in general compared with non-DEIS schools (97, compared with 80). However, DEIS post-primary schools had fewer devices for teaching (57) than did non-DEIS schools (65). Numbers of devices for administration and for SEN were comparable between DEIS and non-DEIS post-primary schools (see Table A4.3).

[37] Where the letter A precedes the table number (e.g., Table A4.1), this indicates that the table can be found in the book of appendices (see www.erc.ie/publications)

Table 4.2 shows the pupil-computer ratio for primary, post-primary, and special schools. In this instance, a "computer" is defined as any working device for use in the school (i.e., no distinction is made between computers for student use and for other purposes). This corresponds with one definition of pupil-computer ratio implemented in the 2005 census and as such, facilitates comparison with earlier data. It should also be noted that this is an *average ratio* (i.e., it is the average of the ratios from each school, not the total number of pupils in a category [e.g., primary schools] divided by the total number of computers in that category). [38]

Based on the working devices definition, it can be seen that special schools had one working device (i.e., desktop, notebook, laptop, or tablet) per 1.7 students (a ratio of 1.7: 1). Post-primary schools had a ratio of 3.7:1, while primary schools had a slightly less favourable ratio of 4.6:1 (Table 4.2).

There were some differences observed according to DEIS status. At primary level, Band 1 schools (4.0:1) and DEIS Rural schools (3.1:1) had lower pupil-computer ratios (i.e., fewer students sharing each working device) than did non-DEIS schools (4.8:1) (Table A4.6). The ratio for DEIS Band 2 schools (4.7:1) is almost identical to non-DEIS schools. At post-primary level, the pupil-computer ratio in DEIS schools (2.9:1) is more favourable than in non-DEIS schools (4.0:1) (Table A4.8).

Table 4.2 also shows the percentages of devices for *student* use that consisted of desktops, laptops, and tablets. The majority of devices in schools were desktops. However, there was some variation across school category, with desktops accounting for 83% of devices available for student use in post-primary schools, but only 54% in primary schools (51% in special schools). In contrast, tablets accounted for one quarter of devices in special schools, but only 5% of devices in primary and post-primary schools.

In terms of DEIS status, desktops accounted for a greater percentage of devices in non-DEIS compared with DEIS primary schools (Table A4.6). However, the breakdown of desktops, laptops, and tablets was quite similar for post-primary schools (Table A4.8).

Although the distribution of devices by type varied substantially between primary and post-primary overall, the breakdown of devices in terms of use was consistent. In both categories, about 40% of devices were used for teaching, with 47-49% used for students, 8-9% for students with SEN, and 6-7% used for administration. In the special school category, 44% of devices were used for teaching, 55% for students, and 10% for administration.

Some variation was also noted in terms of school enrolment size.[39] In the primary category, desktops accounted for less than half of devices in small primary schools, but 64% of devices in very large schools (Table A4.7). Similarly, desktops accounted for 74% of devices in small post-primary schools, but for over 80% of devices in other schools (Table A4.9). There was little consistent variation in use

[38] Because readers may be interested in the ratio of pupils to devices specifically allocated for student use, this is reported in Table 4.10 (pupil-student device ratio). As ICT use in schools becomes more common, the latter ratio (pupil-student device ratio) may be considered more appropriate for future comparisons.

[39] In the primary category, a small school is defined as one with up to 60 pupils. A medium school has between 61 and 120 pupils, a large school has between 121 and 240 pupils, and a very large school has over 240 pupils. In the post-primary category, a small school has fewer than 250 students, a medium school has between 251 and 450 students, a large school has 451-600 students, and a very large school has greater than 600 students.

by school size in post-primary schools (Table A4.9). However, in the primary category, there was some indication that bigger schools devoted a greater proportion of devices to teaching and a smaller proportion for student use than did smaller schools. Variation by post-primary sector is presented in Table A4.10.

Table 4.2: Average percentages of working computer devices categorised by (a) type and (b) use, and pupil-computer ratio, in primary, post-primary, and special schools

Indicator	Primary		Post-primary		Special	
	M	*SD*	*M*	*SD*	*M*	*SD*
Total	39.60	33.37	163.91	117.51	34.25	18.72
Pupil-computer ratio	4.6	2.8	3.7	2.0	1.7	1.2
% Desktops	53.9	37.1	83.1	24.1	51.0	28.8
% Laptops	40.9	36.4	11.7	19.4	24.0	24.6
% Tablets	4.9	14.9	4.8	14.5	24.7	25.2
% for teaching	39.5	17.3	40.3	16.7	43.6	21.9
% for SEN	8.6	7.9	7.7	6.2	-	-
% for students	46.6	18.6	48.8	15.9	55.1	20.0
% for admin	7.2	5.6	6.4	3.7	10.0	5.5

Missing data: Primary: 17-33%. Post-primary: 8-26%. Special: 13-27%.

Principals also reported on the location of working devices in their schools. Here, data are reported on devices in general classrooms and in computer rooms. Only schools that reported having computer rooms are included for computer room analyses (i.e., the average number of devices reflects the average among schools *with* computer rooms, rather than averages across all schools in the samples). As shown in Table 4.3, almost all (99%) post-primary schools had a least one computer room (two computer rooms was the most common response [39%]). In the primary category, only about one third of schools reported having a computer room, while fewer again did so in the special category (28%).

As shown in Table 4.3, for both primary and post-primary categories, the average number of devices in computer rooms was higher than the average in general classrooms. Differences were also observed in terms of usage, with half the devices in primary general classrooms being used for students, with slightly fewer available for staff. The reverse was observed for post-primary schools, with over half of general classroom devices being used for staff, and fewer (16 of 43) for students. For both categories, the majority of devices in computer rooms were used for students.

The special school category reported an average of eight computers in general classrooms for staff use, and 11 for student use. The numbers in dedicated computer rooms were lower – three for staff, and seven for students. As these data are based on a subsample of an already small sample of respondents, caution should be taken when interpreting the findings.

There was substantial variation in the number of primary schools with dedicated computer rooms by DEIS status (Table A4.11). The majority of Band 1 schools reported having a dedicated computer room, as did almost half of Band 2 schools. However, less than one third of non-DEIS and DEIS Rural schools had a computer room. In contrast, DEIS and non-DEIS post-primary schools were equally

likely to have a dedicated computer room. These findings need to be interpreted with regard to school size. A detailed breakdown of the data in Table 4.3 is available in Tables A4.11 to A4.15.

Table 4.3: Average number of computing devices in general classrooms and computer rooms and by use in primary, post-primary and special schools

Location/Use		Primary		Post-primary		Special	
		M	*SD*	*M*	*SD*	*M*	*SD*
General classrooms	Staff	7.30	7.03	23.77	17.67	8.38	7.52
	SEN	1.59	3.12	3.72	7.09	-	-
	Students	9.13	11.52	15.71	45.14	11.50	11.85
	Overall	18.0	16.9	43.07	55.74	19.89	16.10
Schools with computer rooms (%)		33.3	-	99.1	-	28.2	-
Computer rooms	Staff	5.5	8.5	14.6	22.7	3.23	4.88
	SEN	2.3	6.1	3.3	7.2	-	-
	Students	15.5	8.8	50.3	49.8	7.01	6.57
	Overall	22.8	15.8	63.5	58.7	10.25	9.09

Missing data: General classrooms: <15% for each category. Schools with computer rooms: Primary: <19%. Post-primary: <11%. Special: 34%. Computer rooms: Primary: <20%. Post-primary: ≤15%. Special: ≤ 25%.

Table 4.4 presents data on the age of working computer devices in schools. On average, in primary schools, just six computers were less than two years old, while 11 were between two and four years old, eight were between four and six years old, and a further eight were more than six years old. In contrast, post-primary schools reported a relatively large proportion of "new" devices (an average of 39 overall, compared with 49 aged between two and four years, 33 aged between four and six years, and 21 older than six years).

Primary schools had an average of about seven desktop computers that were more than six years old, and only one desktop that was less than two years old. In contrast, only two laptops per school were more than six years old. The majority of laptops were between two and four years old (an average of seven per school), suggesting an increase in expenditure on laptops during that time frame (or, conversely, a decrease in the last two years). Primary schools did not report having tablets that were more than four years old, but had acquired an average of about two per school in the two years prior to the census.

The majority of newer devices in post-primary schools were desktops (an average of 21), with averages of nine laptops and nine tablets per school. In contrast, desktops were the least common "new" device in special schools (an average of three) with four new laptops per school, and about six new tablets.

In the primary sector, DEIS Band 1 and Band 2 schools had an average of eight 'new' computing devices, compared with six in non-DEIS schools and 4 in DEIS Rural schools (Table A4.16). However, DEIS Band 1 and Band 2 schools also had the highest average number of computing devices that were more than six years old (13 and 12 respectively). At post-primary level, DEIS and non-DEIS schools were broadly similar in terms of average numbers of new and older computing devices reported (Table A4.18).

Table 4.4: Average number of computing devices by age and type, in primary, post-primary and special schools

Age/Type		Primary		Post-primary		Special	
		M	*SD*	*M*	*SD*	*M*	*SD*
Less than 2 years old	Desktops	1.38	4.73	21.24	39.70	2.22	3.48
	Laptops	3.10	5.59	9.43	25.19	3.06	4.27
	Tablets	1.75	7.00	9.41	25.60	4.97	5.59
	Overall	5.80	10.52	38.94	53.06	9.50	7.71
Between 2 and 4 years old	Desktops	3.49	7.52	32.86	43.00	2.75	3.40
	Laptops	7.15	8.16	16.01	38.85	4.30	5.72
	Tablets	0.38	5.35	0.78	3.97	0.35	1.03
	Overall	10.57	13.43	48.59	59.97	7.12	8.07
Greater than 4 but less than 6 years old	Desktops	4.31	7.63	27.21	35.39	6.41	8.88
	Laptops	3.97	6.92	7.28	13.12	2.24	4.05
	Tablets	0.04	0.73	0.11	1.79	0.00	0.00
	Overall	7.67	11.12	33.03	39.80	7.53	10.31
More than 6 years old	Desktops	6.65	9.24	20.69	37.73	7.42	8.59
	Laptops	1.83	4.79	2.53	7.46	1.37	3.82
	Tablets	0.01	0.32	0.02	0.42	0.25	1.73
	Overall	7.74	10.60	21.62	37.30	9.18	11.03

Missing data: Primary: ≤35%. Post-primary: <35%. Special: 25%.

Table 4.5a displays the average numbers of additional digital devices in schools besides desktops, laptops, and tablets. This information should be considered in the context of the data in Table 4.5b, which shows the percentages of schools that did not have *any* of each of the digital devices.

In some cases, categories are collapsed (e.g., digital projectors include both short/ultra-short and long throw projectors). As shown in Table 4.5a, digital projectors were the most common piece of additional equipment in schools, with an average of approximately 30 per post-primary school. Primary schools had an average of six projectors, while special schools had five.

Both primary and post-primary schools reported an average of approximately seven interactive whiteboards in their schools compared with four in special schools. On average, this was the next most common digital device after projectors. However, one fifth of special schools and almost one quarter of post-primary schools did not have an interactive whiteboard (compared with only 6% of primary schools). On average, post-primary schools had over twice as many digital projectors, and printers, scanners, and printer-scanners, than did primary or special schools. There was little variation in other "multi-function devices" (i.e., incorporating a copier, printer and scanner in one device) by school type.

Table 4.5a: Average number of devices (other than computers) of different types in primary, post-primary and special schools

Type of device (other than computers)	Primary		Post-primary		Special	
	M	*SD*	*M*	*SD*	*M*	*SD*
Interactive whiteboards	6.56	5.85	6.99	10.90	4.42	4.28
Visualisers (also known as document cameras)	2.95	4.03	4.18	7.83	0.89	2.11
Laptop trolleys	0.43	1.26	0.67	1.92	0.35	0.82
Multi-function devices	2.08	3.30	2.70	3.07	2.55	3.73
Digital projectors	6.37	6.40	29.54	15.20	4.57	4.89
Digital cameras and voice recorders	4.00	6.49	4.53	4.80	6.40	5.83
Printers, scanners, and printer-scanners	6.86	6.64	14.50	9.28	8.36	6.34

Missing data: Primary: <5%.Post-primary: <10%. Special: <5%.

Table 4.5b: Percentage of primary, post-primary and special schools reporting absence of specified devices (other than computers)

Type of device (other than computers)	Primary	Post-primary	Special
Interactive whiteboards	6.3	23.9	19.9
Visualisers (also known as document cameras)	24.3	27.3	63.3
Laptop trolleys	71.7	64.9	79.6
Multi-function devices	22.5	19.3	19.5
Digital projectors	12.1	0.7	16.7
Digital cameras and voice recorders	4.1	3.3	4.7
Printers, scanners, and printer-scanners	0.8	0.4	1.2

Missing data: Primary: <5%.Post-primary: <10%. Special: <5%.

As shown in Table A4.21, there was some variation in interactive whiteboard availability according to DEIS status in the primary category. Overall, urban DEIS schools were relatively well-equipped in terms of ICT infrastructure. For example, DEIS Band 1 and Band 2 schools reported an average of 11 interactive whiteboards, compared with six in non-DEIS schools and three in DEIS Rural schools. A similar pattern was observed for digital projectors: urban DEIS urban schools reported 10, compared with six in non-DEIS schools and three in DEIS Rural (three) schools. In fact, only one piece of equipment was *not* more commonly held by urban DEIS schools in comparison with other school types – non-DEIS schools reported 1.07 scanners on average, with 1.05 in Band 2 schools. Although DEIS Rural schools appear to have lower quantities of equipment, this may be a reflection of smaller school size, and does not necessarily indicate a disadvantage. This is further supported by the pupil-computer ratios outlined in Table A4.6, showing that Rural schools have similar (or even better) pupil-computer ratios in comparison with other groups.

In general, and as might be expected, larger schools reported having more digital devices than smaller schools. For example, very large primary schools had an average of 15 interactive whiteboards, compared with seven in large schools, four in medium schools, and only two in small schools. Likewise, very large schools had 15 projectors, with seven in large schools, three in medium schools, and two in small schools (Table A4.22). See Tables A4.21 to A4.25 for additional detail.

Table 4.6 shows the percentages of devices available in general classrooms and computer rooms that are networked and have wireless access. Again, these data should be considered in light of the

fact that only one third of primary schools (and fewer again in the special category) reported having a dedicated computer room in their school. The table shows that in general classrooms in primary schools, 77% of computers are networked, while 56% have wireless. The corresponding estimates at post-primary level are 87% and 61% respectively. Most computing devices in computer rooms are networked. See Tables A4.26 to A4.30 for additional detail.

Table 4.6: Percentages of computing devices that are networked and with wireless connection by location, in primary, post-primary and special schools

Location/Connectivity information		Primary		Post-primary		Special	
		M	*SD*	*M*	*SD*	*M*	*SD*
General classrooms	Overall number	38.0	10.3	25.8	12.9	8.0	4.0
	Percentage networked	76.7	39.4	87.0	29.7	70.2	40.1
	Percentage with wireless	56.3	47.0	61.1	45.5	56.5	48.7
Computer rooms	Overall number	10.2	6.7	2.4	3.0	1.2	0.6
	Percentage networked	89.7	30.4	96.5	18.2	77.8	42.6
	Percentage with wireless	51.2	50.0	62.0	47.9	71.5	46.2

Missing data: Primary general classrooms: < 20%, computer rooms: <20% of those that reported having computer rooms. Post-primary general classrooms: <20%, computer rooms: <20%. Special general classrooms: ≤ 25%, computer rooms: <15%.

4.2 School Websites

Table 4.7 shows the percentages of schools with websites/blogs, and the percentages that update these regularly (of the total number of schools, and of those that *have* a website/blog). In general, the majority of principals reported that their school has a school website or blog. Over 95% of post-primary schools have a website/blog, falling to just over 70% of primary schools, and 64% of special schools. Of these, about four fifths of primary school websites were updated regularly, as were 90% of post-primary sites, and 57% of sites in special school.

Table 4.7: Percentages of principals reporting having a school website and regularly updating it in primary, post-primary and special schools

Statement on website	Primary	Post-primary	Special
The school has a website or blog in place	70.6	96.5	64.6
This is updated regularly (of those with website/blog only)	81.3	89.6	57.0
The school has a website or blog that is updated regularly (of total sample)	57.4	86.5	36.8

Missing data: Primary: 5%. Post-primary: <10%. Special: <10%.

In the primary category, urban DEIS schools were most likely to have a website or blog (88% for Band 1 and 92% for Band 2) (Table A4.31). In contrast, about 70% of non-DEIS schools had a website/blog, and only about half (52%) of DEIS Rural schools did so. DEIS Rural schools that did have websites were somewhat less likely to update their sites regularly (73%) compared with other categories (80-84%). DEIS and non-DEIS post-primary schools were about equally likely to have a school website (see Table A4.33). However, over 90% of non-DEIS schools with websites updated these regularly, compared with about 80% of DEIS schools.

Across both primary and post-primary categories, bigger schools were more likely to have a website in place, and to update it regularly (Tables A4.32 and A4.34).

4.3 Knowledge and Use of Procurement Frameworks

Data on principals' awareness of and experiences with procurement frameworks are outlined in Table 4.8. Specifically, principals were asked about whether or not they were *aware* of procurement (purchasing) frameworks for PCs, notebooks (laptops), digital projects, and printers. These frameworks are available on the PDST Technology in Education website (www.pdsttechnologyineducation.ie).[40] Principals were further asked to indicate whether or not they had *used* these frameworks, and if they agreed that these were useful. In primary schools, one quarter of principals reported that they were unaware of procurement frameworks. Corresponding estimates at post-primary level and in special schools were one quarter and one third respectively.

Across all school categories, at least 40% of principals reported being aware of but not having used the printer procurement framework. Within each school category, relatively low numbers indicated that they had both used this framework and found it to be of benefit – in fact, the printer framework was least likely to be both used and regarded as beneficial across the four frameworks, for all school categories. Approximately 10% in each school category *had* used the printer procurement framework but had *not* found it of benefit.

Approximately one third of primary principals reported using the frameworks for PC, notebook, and digital projector and found these useful. In the post-primary category, 56-57% used the PC and digital projector frameworks and found these useful, with fewer (42%) indicating this for the notebook framework. Among special schools, the PC framework was most beneficial for 31%, followed by the notebook framework (27%) and projector framework (22%).

Less than one fifth of DEIS Band 1 primary principals were *unaware* of frameworks for PC, notebook, tablet, and printer (Table A4.36). In contrast, about one quarter of principals in other school types were unaware of the printer framework. However, principals of DEIS Band 1 primary schools were also most likely to report being aware of but not having *used* the frameworks, with at least 30% selecting this option in relation to each framework. Band 2 schools were more likely than Band 1 and DEIS Rural schools to have both used the frameworks and to have found them useful.

DEIS post-primary schools were also more likely to be aware of procurement frameworks than non-DEIS post-primary schools (Table A4.38). In contrast to the findings for primary schools, greater percentages of non-DEIS post-primary principals reported being aware of, but *not* having used, procurement frameworks, than did principals of DEIS schools.

In the post-primary category, small schools were somewhat more likely to report being unaware of procurement frameworks in comparison with bigger schools (Table A4.39). This general pattern was also evident between small/medium schools and other schools in the primary sector (Table A4.37).

Principals of girls' post-primary schools were more likely to be unaware of procurement frameworks than were principals of other types of school (Table A4.40).

[40] The Digital Projector framework was issued by the NCTE, while the PC and printer frameworks were issued by CMOD (Centre for Management and Organisation Development, and e-government, Department of Public Expenditure and Reform).

Table 4.8: Percentages of principals with knowledge of and experience with procurement frameworks, and evaluations of their usefulness in primary, post-primary and special schools

Aspect	Primary	Post-primary	Special
PC			
Not aware of the framework	18.6	14.4	27.1
Aware of, but have not used framework	29.4	19.1	26.8
Have used framework, and I disagree	18.9	10.3	15.3
Have used framework, and I agree	33.1	56.2	30.7
Notebook (laptop)			
Not aware of the framework	21.8	18.8	27.5
Aware of, but have not used framework	26.7	31.6	30.6
Have used framework, and I disagree	16.4	7.7	15.3
Have used framework, and I agree	35.1	41.9	26.6
Digital projector			
Not aware of the framework	20.6	14.9	27.5
Aware of, but have not used framework	31.8	21.0	39.4
Have used framework, and I disagree	15.2	7.0	10.8
Have used framework, and I agree	32.5	57.2	22.3
Printer			
Not aware of the framework	25.3	20.1	33.4
Aware of, but have not used framework	43.5	40.9	42.5
Have used framework, and I disagree	12.1	8.9	11.6
Have used framework, and I agree	19.1	30.0	12.5

Missing data: Primary: <10%. Post-primary: <12%. Special: <12%.

4.4 Provision of Technical Support

Principals reported on the extent to which technical support was provided by a range of personnel, including the ICT coordinating teacher, a number of staff jointly, a technician (either part- or full-time), an external IT company or contractor, and students. Principals also reported the extent to which technical support was organised via a group of schools. Responses to these items indicated that members of school staff were less involved in technical support provision than were external contractors (Table 4.9). In post-primary and special schools, approximately 20% of principals reported that an external IT company or contractor was fully responsible for technical support (17% in primary schools). In contrast, in only about 5-7% of schools was the ICT coordinating teacher fully responsible for technical support.

Additionally, in over half of special schools, the ICT coordinating teacher played no role in technical support, but this was not the case for post-primary (72% were involved in some capacity) or primary schools (57%). Across both categories, 6-7% indicated that students were involved *to some extent* with a very small proportion (<1%) indicating involvement *to a large extent*. However, the norm was for students not to be involved in providing technical support (92% for primary, 94% for post-primary, and 99% for special schools). Likewise, only 2% of primary and 3% of special schools reported that provision of technical support involved a cluster of schools, though this was much more evident for post-primary schools (20%).

Table 4.9: Percentages of principals reporting different types of technical support provision in their school in primary, post-primary, and special schools

	Primary	Post-primary	Special
The ICT coordinating teacher			
No	43.2	28.0	51.0
To some extent	31.6	36.9	21.8
To a large extent	20.2	30.6	20.3
Fully	4.9	4.5	6.9
A number of staff share the role			
No	52.6	61.6	55.2
To some extent	35.0	28.0	34.8
To a large extent	10.3	8.5	8.7
Fully	2.1	1.9	1.3
A part-time/full-time technician			
No	67.9	72.4	71.5
To some extent	15.1	6.5	11.9
To a large extent	13.2	11.9	12.6
Fully	3.8	9.2	4.0
An external IT company/contractor			
No	28.5	27.4	26.4
To some extent	24.9	20.3	19.2
To a large extent	30.0	33.1	34.8
Fully	16.7	19.2	19.6
Organised via a group of schools (including the regional VEC)			
No	98.0	80.7	96.5
To some extent	0.8	3.4	0.0
To a large extent	0.5	8.0	1.0
Fully	0.7	8.0	2.5
Students			
No	92.3	93.9	99.0
To some extent	7.2	5.7	1.0
To a large extent	0.5	0.4	0.0
Fully	0.1	0.0	0.0

Missing data: Primary: <10%. Post-primary: <10%. Special: <10%.

Table A4.41 displays data on the provision of technical support by DEIS status for primary schools. The ICT coordinating teacher was least likely to provide technical support in DEIS Rural schools (52% provided no support) compared with 43% in non-DEIS schools, and 31% in Band 1 (38% in Band 2). More DEIS Rural schools (20%) reported that support was fully provided by an external contractor. Group schemes were relatively un-utilised across all school types. Ten percent of Rural schools involved students in technical support provision, with fewer non-DEIS schools indicating this (7%), and fewer schools again in Band 1 (5%) and Band 2 (4%).

Little variation by DEIS status was observed for most types of technical support in post-primary schools (Table A4.43). However, over two fifths of DEIS post-primary principals stated that they did not use an external contractor, compared with one fifth of non-DEIS principals. Non-DEIS principals were twice as likely (22%) to fully rely on an external contractor compared with DEIS principals (10%). DEIS post-primary schools were more likely to be involved with a group of schools for support provision (about one third were involved at least to some extent, compared with less than half that for non-DEIS schools).

As shown in Table A4.42, the ICT coordinating teacher was least likely to be responsible for technical support provision in small primary schools. Small schools were most likely to rely fully on the services of an external contractor. Medium and large schools were more likely to make use of a full- or part-time technician, and less likely to involve students in technical support provision.

At post-primary level, vocational schools and senior colleges were much more likely to organise provision via a group of schools (Table A4.45). Over one fifth of these schools did so 'fully', compared with about 1-2% of other school types. Mixed secondary schools and boys' secondary schools were more likely to fully rely on external contractors than other school types.

4.5 Comparisons with 2005

This section compares some of the ICT infrastructure information that was collected in 2013 with previous surveys of ICT infrastructure in schools that were administered by the NCTE. It is emphasised that comparisons should be interpreted cautiously, since, as noted in Chapter 3, the 2013 survey differs to those conducted previously. Also, since the content of the 2013 survey questionnaires was heavily revised to reflect changes in ICT technology and infrastructure, the scope of comparisons is limited to pupil-computer ratio (overall), priority areas, and technical support. Each is discussed in turn below.

4.5.1 Pupil-computer Ratio

In previous ICT surveys, no distinction was made between computers within schools in terms of who had access to them or used them. In 2013, principals were asked to differentiate between computers used by teachers, students, students with SEN, and persons involved in administration.

As might be expected, the overall pupil-computer ratio has decreased since the last ICT census in 2005. This is particularly evident for primary and post-primary schools, where pupils now have at least twice as many computing devices (on average) than they did in 2005. The improvement in special schools is somewhat less pronounced. In 2005, there was one computing device per 3 pupils in such schools, while in 2013, there was one device per 1.7 pupils.

Table 4.10 also shows the pupil-computer ratio based on number of devices specified for student use. This ratio draws on the more differentiated information on the usage of ICTs obtained in the present study. As can be seen, a similar pattern is observed, with primary schools having the greatest number of pupils sharing a device, followed by post-primary schools, and special schools.

Table 4.10: Pupil-computer ratio in 2005 and 2013

Pupil-computer ratios	Primary	Post-primary	Special
2005 pupil-computer ratio* (all computers/devices)	9. 8	8.2	3.2
2013 pupil-computer ratio (all computers/devices)	4.6	3.7	1.7
2013 pupil-computer ratio (computers/devices for student use only)	11.1	8.8	3.3

*Source: Shiel & O'Flaherty (2006), Appendix B,

4.5.2 Technical Support:[41]

The percentages of schools whose ICT coordinating teachers were involved in technical support provision increased from 2005 to 2013. In 2005, 41% of primary and two-thirds of post-primary schools reported that the ICT coordinating teacher provided technical support. This rose to 57% (primary) and 72% (post-primary) in 2013. In contrast, in special schools, the percentages of ICT coordinators involved in technical support fell slightly from 54% to 49%.

Other members of teaching staffs are also increasingly involved in providing technical support. In 2005, about 12-13% provided support in primary/post-primary schools, rising to 47% in primary schools in 2013, and to 38% in post-primary schools. Special schools reported a similar trend, with 17% in 2005 rising to 45% in 2013.

In 2013, 72-74% of schools across all categories reported that technical support was provided at least to some extent by an external contractor. For special schools, this represented an increase from 2005, where 61% made use of an external contractor. For other schools, this represented a slight drop, with 76% of primary and 79% of post-primary schools availed of an external contractor in 2005.

In 2013, principals were not asked if parents were involved in technical support. Likewise, in 2005, principals were not asked if pupils were involved in technical support.

[41] Data Source: Table 49 of 2005 ICT Census Report (Shiel & O'Flaherty, 2006)

Chapter 5: ICTs in Teaching and Learning: Views of Principals

This chapter covers principals' reports on the use of ICTs to support teaching and learning in their schools. Included are principals' views on the topics of ICT planning, the use of ICTs in schools, and the perceived effects of ICTs on aspects of teaching and learning. Principals' perceptions of obstacles to using ICTs, their priorities for supporting ICTs in teaching and learning, and their reports on the ICT-related CPD needs of their schools are presented. Principals' responses to questions about Internet safety, use of assistive technologies to support students with special educational needs, and the use of ICTs for communicating, are reported. The chapter closes with principals' reports on collaboration between their schools and industry in relation to the use of technology.

5.1 ICT Planning

Principals were asked to indicate whether a series of statements relating to ICT planning applied to their schools. As shown in Table 5.1, the vast majority of primary (95%), post-primary (96%) and special school (97%) principals agreed that their schools promote the sharing of good practice in ICT integration among teachers. Most principals also indicated that ICT planning is an integral part of the overall school planning process (75-83%). Post-primary schools were more likely to have a designated ICT coordinating teacher (75%) than primary (58%) or special (55%) schools. Post-primary schools were also more likely to have a designated ICT coordinating team which includes school management (56%) than were primary (27%) or special schools (35%), and were more likely to report that the school management and the ICT coordinating teacher jointly develop the ICT planning section (65%), than were principals of primary (43%) or special schools (45%).

Table 5.1: Percentages of principals responding yes to ICT planning statements, by school category

	Primary	Post-primary	Special
ICT planning is an integral (rather than separate) part of the overall school planning process	74.4	81.4	83.1
The school has a written ICT planning section which forms part of the overall school plan	62.4	61.7	52.5
The ICT planning section is updated regularly to reflect overall school priorities	43.7	57.2	41.7
The school has a designated ICT coordinating teacher	58.3	74.7	54.9
The school has a designated e-Learning (ICT coordinating) team which includes school management	26.6	56.2	34.7
The 'NCTE e-Learning Handbook' and 'Roadmap' are used for ICT planning purposes, in the context of overall school planning	50.6	60.4	46.1
The school promotes the sharing of good practice in ICT integration among teachers	94.6	96.2	96.7
The school management and the ICT coordinating teacher jointly develop the ICT (e-Learning) planning section	42.5	64.5	45.2
The school e-Learning team, including school management, ICT coordinating teacher, and all teachers are involved in co-developing the plan	42.8	53.8	46.4
ICT/e-Learning is a regular agenda item at staff meetings	44.0	55.8	51.6

At primary level, DEIS Band 1 and DEIS Band 2 schools were more likely to have a designated ICT coordinating teacher (70% and 74% respectively) than non-DEIS (57%) or DEIS Rural (51%) schools

(see Table A5.1). Similarly, DEIS Band 1 and DEIS Band 2 schools were more likely to have a designated e-Learning team which includes school management (36% and 37% respectively) than were schools not in DEIS (26%) or DEIS Rural (19%) schools. Higher proportions of very large and large schools had a designated ICT coordinating teacher (78% and 65% respectively) than either small (47%) or medium (47%) schools, and were also more likely to have a designated e-learning team which contains school management (see Table A5.2). Principals of girls', boys' and mixed primary schools were similar in their responses to the ICT planning statements; however, girls' schools were more likely to have an ICT coordinating teacher (77%) than were mixed schools (57%) or boys' schools (65%; see Table A5.3).

At post-primary level, there was little variation between DEIS and non-DEIS principals in their responses to the ICT planning statements (see Table A5.4). In relation to school size, smaller schools were less likely to have a designated ICT coordinator than larger schools. Correspondingly, they were also less likely to agree that school management and the ICT coordinating teacher jointly developed the ICT (e-Learning) planning section (see Table A5.5). There was also some variation across school sector at post-primary level (see Table A5.6). Only 32% of senior college respondents reported using the NCTE Handbook and Roadmap when developing an e-Learning plan, compared with 56-67% of respondents in other sectors. However, senior college principals were more likely to indicate that e-Learning is a regular agenda item at staff meetings (78%) than were principals from other sectors (42-62%).

As mentioned above, in 2013, 58% of primary schools, three quarters of post-primary schools and 55% of special schools reported having a designated ICT coordinating teacher. As shown in Table 5.2, this constitutes a decrease in the proportion of schools with an ICT coordinator from 2005 in primary, post-primary and special schools. The proportion of schools with an ICT coordinating teacher is also lower in 2013 than in 2002 in all three school categories. In relation to having a written ICT plan, lower proportions of primary and special schools, but more post-primary schools reported having such a plan in 2013 than did so in 2005 or 2002.

Table 5.2: Percentages of schools with a designated ICT coordinating teacher and a written ICT plan by school category (2002, 2005, 2013)

		2002	2005	2013
ICT Coordinating teacher	Primary schools	69.4	74.5	58.3
	Post-primary schools	79.5	86.2	74.7
	Special schools	70.5	71.3	54.9
Written ICT Plan	Primary schools	71.5	78.6	62.4
	Post-primary schools	55.5	55.6	61.7
	Special schools	63.8	77.5	52.5

5.2 Use of ICTs in Schools

Principals reported on the frequency of ICT use in their schools by responding *no*, *in some cases* or *regularly* to a series of statements relating to the use of ICTs to support teaching and learning. Table 5.3 shows percentages of primary, post-primary and special school principals reporting *regular* use of listed ICT resources. The use of online tools and/or applications to support teaching and learning was the ICT use most frequently reported to be regular. Over half of post-primary principals and over one third of primary and special school principals reported that their schools regularly used

content and resources on the local school server to support teaching and learning, while approximately one quarter of primary schools, one fifth of post-primary schools and just 12% of special schools used an external virtual learning environment to support teaching and learning regularly. The least common regular use of ICT at both primary and post-primary level related to student-owned devices (e.g. tablets, smartphones, cameras) to support learning within the school. In special schools, the use of e-books as an alternative to paper-based textbooks was the least frequently reported regular use of ICT (11%), although regular use of this type of ICT was reported by a higher proportion of special school principals than was reported by primary (7.8%) or post-primary (3.2%) principals.

Table 5.3: Percentages of primary, post-primary and special school principals reporting regular use of ICTs in schools

	Primary	Post-primary	Special
Online tools and/or applications are used to support teaching and learning	58.1	67.5	65.8
The school uses content and resources on the local school server to support teaching and learning	52.1	35.3	36.3
The school uses content and resources accessed through an external virtual learning environment (VLE) to support teaching and learning	23.0	18.8	12.1
Student-owned computing devices (i.e., where each student has their own device) are being used in some classes/year groups	9.6	6.0	20.5
E-books are being used by some year groups as an alternative to paper based textbooks	7.8	3.2	10.5
Students may use their own devices (e.g., tablets, smartphones, cameras) to support their learning within the school	7.5	2.1	20.4

At primary level, there was little variation in reports of ICT use by DEIS status; however, just over half of DEIS Band 1 principals reported that their schools regularly use content and resources on the local school server to support teaching and learning, compared to just over a quarter of DEIS Rural schools (see Table A5.7). Very large schools were also more likely to report use of ICT in this way (60%) than were large (36%), medium (24%) or small (26%) schools (see Table A5.8). Primary principals from mixed, boys' and girls' schools were similar in their reports of ICT use (see Table A5.9).

As at primary level, there was little variation between DEIS and non-DEIS principals' reports of ICT use at post-primary level (see Table A5.10). Larger schools were more likely to report using content and resources on the local server, and using content and resources accessed through an external VLE to support teaching and learning than were smaller schools (Table A5.11). Similarly, larger schools were more likely to report regular use of online tools and/or applications to support teaching and learning than were smaller schools. However, small schools were more likely to report regular use of e-books (17%) than medium (3%), large (5%) or very large (9%) schools. Two thirds of senior college principals indicated that students regularly use their own devices to support their learning within the school, and 100% indicated that they may do so in at least some cases (see Table A5.12). By contrast, only 1-9% of principals in other sectors indicated that ICT was regularly used in this way, and 40-55% reported that this did not happen in their schools. Over 90% of senior college principals reported regular use of content and resources on the local server (46-57% in other sectors). Additionally, 82% of senior colleges made use of a VLE, compared with 48-62% in other sectors. Senior colleges were more likely to make regular use of online tools/applications (86%) than schools in other sectors (14-

27%) and to report use of student-owned computing devices to be used regularly in some year groups (46%, compared to 5-12% in other sectors).

5.3 Effects of ICTs on Aspects of Teaching and Learning

Principals were asked to reflect on the past two years and to indicate the extent to which the use of ICT had affected aspects of teaching and learning in their schools. As shown in Table 5.4, most primary principals agreed that ICT had positively influenced a number of aspects of teaching and learning. The most widespread impact was seen in relation to students' level of interest and engagement, with 91% of primary principals indicating that this had increased because of ICT use in their schools. However, over half of principals (52%) indicated that the use of ICT had led to no change in students' performance on standardised tests, with a similar proportion (49%) indicating no change in the performance of students on other tests. Very few principals indicated that ICT had negatively affected aspects of teaching and learning. There was little variation in responses at primary level by DEIS status or by enrolment size (see Tables A5.13 and A5.14). Principals of boys' post-primary schools were more likely to report an increase in performance in State examinations and in other tests attributable to ICT use than were principals of mixed schools or girls' schools (see Table A5.15).

Table 5.4: Percentages of primary school principals reporting effects of ICTs on aspects of teaching and learning

	Decrease	No change	Increase
The range of teaching methodologies used by teachers	1.6	9.7	88.7
Students' levels of interest and engagement	1.4	8.1	90.5
The amount of planning and preparation for lessons	2.8	17.1	80.1
Meeting the needs of students with special educational needs (SEN)	1.1	36.2	62.8
The levels of positive interaction among students during classes	1.4	19.3	79.3
The ability of students to work independently	2.6	28.4	69.0
The depth of subject matter knowledge covered	1.1	16.5	82.4
Ability of the school to meet the needs of lower-achieving students	1.8	20.3	77.9
Ability of the school to meet the needs of higher-achieving students	1.3	18.1	80.6
Improvements to literacy across the curriculum	0.9	22.1	77.1
Improvements to numeracy across the curriculum	0.8	21.0	78.1
The performance of students on other tests	0.8	48.9	52.4
The performance of students on standardised tests	0.8	51.9	47.3

At post-primary level, the most frequently reported impact related to the range of methodologies used by teachers, with 94% of principals reporting that this had increased because of the use of ICT (Table 5.5). Again, slightly smaller proportions of principals reported that the use of ICT had led to improved performance on standardised and other tests than reported that there had been no change in performance as a result of ICT use. Very few respondents indicated that ICT use had had a detrimental impact on aspects of teaching and learning.

DEIS principals were more likely to say that the use of ICT had led to improvements to literacy across the curriculum (82%) and to improvements in performance in State examinations (59%) than were

principals of non-DEIS schools (65% and 41%, respectively; see Table A5.16). Principals of vocational schools were more likely to report that the use of ICT had increased the depth of the subject matter covered (86%) than principals of community (66%) or senior (62%) colleges (Table 5.18). Principals of senior colleges were less likely to report increases in the ability of the school to meet the needs of lower-achieving students, meet the needs of students with SEN, or improve literacy and numeracy across the curriculum. Principals of vocational schools were likely to report increases in positive interaction among students during class, performance of students on State examinations, and the ability among students to work independently, than principals of any other sector (see Table A5.18). Principals of schools of different sizes were not found to differ substantially in terms of their responses to this question (see Table A5.17).

Table 5.5: Percentages of post-primary school principal reporting effects of ICTs on aspects of teaching and learning

	Decrease	No change	Increase
The range of teaching methodologies used by teachers	1.0	5.4	93.6
Students' levels of interest and engagement	0.8	10.5	88.7
The amount of planning and preparation for lessons	1.8	12.7	85.5
Meeting the needs of students with special educational needs (SEN)	1.0	15.8	83.2
The levels of positive interaction among students during classes	0.7	18.2	81.1
The ability of students to work independently	1.8	18.6	79.6
The depth of subject matter knowledge covered	0.7	21.2	78.1
Ability of the school to meet the needs of lower-achieving students	1.5	21	77.5
Ability of the school to meet the needs of higher-achieving students	0.9	26.5	72.7
Improvements to literacy across the curriculum	1.4	28.6	70.0
Improvements to numeracy across the curriculum	1.1	33.9	65.1
The performance of students on other tests	0.4	50.5	49.1
The performance of students on State examinations	0.2	54.0	45.8

As shown in Table 5.6, the most frequently reported increase attributed to ICT by special school principals related to the range of teaching methodologies used by teachers (92%), followed closely by the ability of students to work independently (91%). As at primary and post-primary levels, very few principals reported negative effects of ICT use on the listed aspects of teaching and learning.

Table 5.6: Percentages of special school principals reporting effects of ICTs on aspects of teaching and learning

	Decrease	No change	Increase
The range of teaching methodologies used by teachers	1.2	7.1	91.7
The amount of planning and preparation for lessons	3.6	14.5	81.9
The depth of subject matter covered	0.0	30.0	70.0
Ability of the school to meet the needs of lower achieving students	1.2	19.5	79.3
Ability of the school to meet the needs to higher-achieving students	0.0	37.0	63.0
Improvements to literacy across the curriculum	0.0	11.9	88.1
Improvements to numeracy across the curriculum	0.0	16.7	83.3
Meeting the needs of students	0.0	9.8	90.2
Students' levels of interest and engagement	1.2	9.6	89.2
The levels of positive interaction among students during classes	0.0	18.3	81.7
The ability of students to work independently	0.0	9.5	90.5

Missing data: 13% or less per item

5.4 Perceived Obstacles to Using ICTs

Aside from funding/expense concerns, principals were asked to select the six most significant obstacles (from a list of 18) to the effective use of ICTs to support teaching and learning, and to rank these from 'most significant' to 'sixth most significant'. Table 5.7 shows the mean rating and ranks of each obstacle by primary, post-primary and special school principals. The higher the mean rating, the more significant a challenge the obstacle in question was rated as being. The obstacles were then ranked from highest rated across the three school categories. The six top-rated obstacles in each category are highlighted.

Four of the listed challenges were selected in the top six most significant obstacles by primary, post-primary and special school principals; these were: insufficient access to high-quality broadband, age of computing devices, insufficient time for planning and preparation, and insufficient levels of technical support. Insufficient technical support was the only common item in the top three obstacles reported in primary, post-primary and special schools. Pressure to cover the prescribed curriculum was the most significant obstacle for primary principals, but was rated as less of a challenge by post-primary (6th) and special school principals (10th). Insufficient access to ICT for students was also among the top six obstacles selected by primary principals, but was less of an issue at post-primary level (11th) and in special schools (17th). Insufficient access to suitable ICT-related CPD opportunities for teachers appeared as the sixth most significant challenge in special schools, but did not feature in the six most significant challenges at either primary or post-primary levels.

Table 5.7: Mean ratings and ranks of obstacles to using ICTs to support teaching and learning, by school category

	Primary		Post-primary		Special	
	Mean rating	Rank	Mean rating	Rank	Mean rating	Rank
A low level of teacher ICT skills	0.86	9	1.12	8	1.37	7
A low level of teacher confidence regarding the use of ICT	1.09	8	1.51	4	1.29	8
Insufficient teacher knowledge of how to use ICT effectively in teaching and learning	1.15	7	1.78	3	1.68	5
Insufficient awareness of suitable ICT-related CPD opportunities for teachers	0.48	15	0.82	12	1.08	9
Insufficient access to suitable ICT-related CPD opportunities for teachers	0.66	12	0.97	10	1.42	6
Insufficient awareness of suitable digital content	0.81	10	1.03	9	1.02	11
Insufficient access to suitable digital content	0.48	16	0.49	17	0.45	16
Insufficient access to ICT for teachers	0.48	17	0.37	18	0.64	13
Insufficient access to ICT for students	1.18	6	0.88	11	0.45	17
Insufficient access to high quality broadband	1.85	5	1.37	7	1.80	4
Age of computing devices	2.09	3	1.47	5	2.21	1
Insufficient levels of technical support	2.11	2	1.95	2	1.84	3
Insufficient time for planning and preparation	1.86	4	2.16	1	1.99	2
Insufficient levels of pedagogical support	0.57	14	0.72	14	0.61	14
Blocked access to relevant websites	0.74	11	0.50	16	0.69	12
Difficulties accessing computer rooms	0.26	18	0.81	13	0.17	18
Pressure to cover the prescribed curriculum	2.82	1	1.38	6	1.07	10
Timetabling arrangements	0.59	13	0.64	15	0.48	15

Most, second most and third most significant obstacles are shaded in dark grey, while fourth, fifth and sixth most significant are shaded in light grey.

At primary level, the same three factors were reported as the most significant challenges in non-DEIS, DEIS Band 1 and DEIS Band 2 schools (see Table A5.19). The most significant obstacles chosen by principals in these schools were pressure to cover the prescribed curriculum, followed by insufficient levels of technical support, with age of computing devices as the third most significant obstacle. Pressure to cover the prescribed curriculum was also the most significant obstacle reported by DEIS Rural principals; however, they rated insufficient access to high quality broadband and insufficient time for planning and preparation as greater obstacles than did other principals. Pressure to cover the prescribed curriculum was also rated as the most significant obstacle in small, medium, large and very large schools (see Table A5.20). Insufficient access to high quality broadband featured among the top six challenges of all school size categories; however, it was rated as a more significant issue in small and medium schools (2nd most significant in each category) than in large or very large schools (5th most significant in both categories). Insufficient levels of technical support, insufficient time for planning and preparation, and age of computing devices were all obstacles common to the six most significant challenges reported by principals of all school sizes. However, insufficient teacher knowledge of how to use ICT effectively in teaching and learning rounded off the top six in small and very large schools, while insufficient access to ICT for students was rated as the

sixth most significant challenge by principals in medium and large schools. There was little variation in mean ratings of obstacles by principals of mixed, girls' and boys' schools (see Table A5.21).

At post-primary level, DEIS and non-DEIS principals selected five common items in their six most significant obstacles. Pressure to cover the prescribed curriculum was selected in the top six by non-DEIS principals, whereas DEIS schools rated insufficient access to quality broadband as more significant (see Table A5.22). There were some sectoral differences in the obstacle ratings (see Table A5.24). Insufficient time for planning and preparation was selected as the most significant or the second most significant challenge by principals of all sectors excepting those of Senior Colleges, among whom it did not feature in the six most significant challenges. Pressure to cover the prescribed curriculum was rated as the third most significant challenge in vocational schools and did not feature in the six most significant in any other sector. Low levels of teacher ICT skills and low levels of teacher confidence regarding the use of ICT were reported as more significant obstacles in Senior Colleges (most significant and second most significant) than in any other sector. There was little variation by school enrolment size; however, principals of large and very large schools rated pressure to cover the prescribed curriculum as a more significant issue than did principals of medium and small schools, who rated insufficient access to quality broadband as a greater obstacle (see Table A5.23).

5.5 ICT Priorities

Principals rated 18 activities to support improvements in teaching and learning on a four-point scale (very low priority/low priority/high priority/very high priority). Responses of *very high priority* are reported below (see Tables A5.25, A5.37 and A5.50 for full breakdowns of responses at primary, post-primary and special schools, respectively). The issues most frequently rated as very high priorities at primary level were high-quality broadband connectivity (58%) and Internet safety and related issues (53%). Least likely to be rated as a very high priority by primary principals was ICT-related CPD for teachers (12%). Little variation was observed at primary level by DEIS status (see Tables A5.26-A5.29); however, DEIS Band 1 and DEIS Band 2 principals were more likely to rate use of ICT to support administration of learning as a very high priority (35% in both bands) than were DEIS Rural principals (19%) or principals of schools not in DEIS (22%). Principals of very large schools were more likely to rate technical support as a high priority (62%) than those in other size categories (41-49%; see Tables A5.30-A5.33). Principals of mixed, boys' and girls' schools were not found to differ in terms of their ICT priorities (see Tables A5.34-A5.36).

At post-primary level, high-quality broadband (63%) and teacher access to ICT equipment (62%) were most commonly reported to be very high priorities for principals (Table 5.8). Least likely to be very high priorities were the use of ICT to support the development of higher-order thinking and critical reasoning (15%) and the use of ICT to support student collaboration and small group learning (18%). DEIS and non-DEIS principals were similar in their reports of ICT priorities (see Tables A5.38 and A5.39). Principals of small post-primary schools were less likely to rate ICT-related CPD as a very high priority (11%) than were principals of larger schools (25-28%). Considerably smaller proportions of small school principals rated technical support, use of ICT to improve literacy and numeracy across the curriculum, teacher access to ICT equipment and broadband quality as very high priorities than were principals of larger schools (see Tables A5.40-A5.43). Senior college principals differed

somewhat in terms of their ICT priorities from principals in other sectors, among which little notable variation was observed (see Tables A5.44-A5.49).

In the special schools category, teacher access to ICT equipment (64%), high quality broadband (64%) and technical support (61%) were the issues most frequently reported to be very high priorities. The least common very high priority in special schools was reported to be the use of ICT to support the development of higher-order thinking and critical reasoning in students.

Table 5.8: Percentages of principals reporting that ICT activities are very high priorities for their schools, by school category

	Primary	Post-primary	Special School
ICT-related CPD for teachers	11.9	23.6	21.4
Access to curriculum-related online digital content/resources	29.9	24.9	32.4
Use of ICT to improve literacy across the curriculum	30.6	26.7	49.3
Use of ICT to improve numeracy across the curriculum	31.2	22.1	49.9
Use of ICT to support the development of higher-order thinking…	17.5	15.3	16.0
Use of ICT to support student collaboration and small group learning	17.0	17.7	24.3
Use of ICT to support students with special educational needs (SEN)	40.1	36.1	76.7
Internet safety and related issues	52.9	54.8	54.1
High-quality broadband Internet connectivity	58.0	63.0	63.6
Teacher access to ICT equipment to support teaching and learning	47.4	62.3	63.8
Student access to mobile computing devices to support learning…	27.4	23.1	49.4
Improving the capability and speed of the existing "fixed" school network	37.2	49.9	42.9
A high quality school-wide wireless network…	38.4	50.1	44.9
Access to a range of online tools and applications…	32.1	37.6	46.5
Use of ICT to support assessment of learning (summative)…	18.4	22.5	23.3
Use of ICT to support assessment of learning (formative)…	17.1	22.8	26.6
Use of ICT to support administration of learning…	22.9	48.7	30.4
Technical support to ensure that ICT equipment is always working…	47.4	58.3	61.1

Note. Dark grey shading is used where 50% or more of principals selected a category as high priority, and light grey shading is used where 40-50% of principals selected a category as high priority.

5.6 Teachers' Continuing Professional Development

5.6.1 CPD Priorities

Principals were asked to select, from a list of 12, their top three priority areas for ICT-related CPD content for their schools. As shown in Table 5.9, the most commonly selected priorities at primary level related to the use of ICT as a teaching and learning tool across the curriculum (47%), and to the use of ICT to support the development of key skills such as literacy and numeracy (43%). Least likely to be selected as priorities were CPD relating to the use of ICT to support students with SEN (17%) and CPD relating to ICT skills needed to use new ICT/mobile devices (17%).

Principals of girls' schools were more likely to prioritise incorporation of ICT into all CPD provided for teachers (34%) than were principals of boys' schools (15%) or mixed schools (20%) (A5.53). Principals of girls' schools (27%) were also more likely to select the use of ICT to support DES priorities as a CPD priority for their schools than were principals of mixed schools (9%) or boys' schools (12%), and least likely (12%) to select use of ICT to support SEN (26% and 23% in mixed and boys' schools, respectively). Principals of boys' schools were more likely to prioritise CPD on the use of ICT as a

teaching and learning tool across the curriculum (61%), than principals of mixed (44%) or girls' (42%) schools. There was little variation in selection of CPD priorities by DEIS status (see Table A5.51) or school size (see Table A5.52).

Table 5.9 Percentages of primary principals selecting ICT-related CPD content areas among their top three CPD priorities

How to use ICT as a teaching and learning tool across the curriculum (including its application to specific subject areas)	47.1
How to use ICT to support the development of key skills (e.g., literacy and/or numeracy)	42.6
More advanced ICT skills (including blogging, website design, computer programming and other applications)	25.7
Incorporation of ICT for teaching and learning in ALL CPD provided for teachers (as distinct from ICT-specific CPD)	24
ICT skills needed to use the school's own equipment (e.g., IWBs, digital projectors, laptops)	23.7
The use of ICT to support DES priorities (e.g. school self-evaluation and school improvement)	23
Digital media skills (including the use of digital video and audio)	21
Basic ICT skills (including word processing, presentation software and Internet use)	18.7
How to use ICT to support assessment for learning	17.8
How to use ICT to support assessment of learning	17.4
ICT skills needed to use new ICT/mobile devices (including those being brought to the school by the teachers and/or students	16.7
How to use ICT to support special educational needs	16.6

At post-primary level, the most commonly selected priorities related to the use of ICT as a teaching and learning tool across the curriculum (66%), and to the use of ICT to support the development of key skills such as literacy and numeracy (37%). Least likely to be selected as priorities were CPD relating to the use of ICT to support students with SEN (12%) and CPD relating to digital media skills (12%). There was little variation in selection of CPD priorities by DEIS status (see Table A5.54) or enrolment size (see Table A5.55); however some sectoral differences were observed (see Table A5.56). Higher proportions of senior college principals reported that training on basic ICT skills was in their top three ICT-related CPD priorities (45%) than did principals in any other sector (10-24%). Similarly, senior college principals were more likely to say that they prioritised digital media skills (41%) than did other principals (9-14%).

Table 5.10 Percentages of post-primary principals selecting ICT-related CPD content areas among their top three CPD priorities

Priority	Percent
How to use ICT as a teaching and learning tool across the curriculum (including its application to specific subject areas)	66.0
How to use ICT to support the development of key skills (e.g., literacy and/or numeracy)	36.7
The use of ICT to support DES priorities (e.g. school self-evaluation and school improvement)	30.7
More advanced ICT skills (including blogging, website design, computer programming and other applications)	27.8
Incorporation of ICT for teaching and learning in ALL CPD provided for teachers (as distinct from ICT-specific CPD)	27.2
Basic ICT skills (including word processing, presentation software and Internet use)	19.0
ICT skills needed to use the school's own equipment (e.g., IWBs, digital projectors, laptops)	17.6
How to use ICT to support assessment for learning	16.9
ICT skills needed to use new ICT/mobile devices (including those being brought to the school by the teachers and/or students	16.1

How to use ICT to support assessment of learning	14.4
Digital media skills (including the use of digital video and audio)	11.7
How to use ICT to support special educational needs	10.7

As shown in Table 5.9, the priorities selected most commonly by special school principals related to the use of ICT as a teaching and learning tool across the curriculum (49%), and to the use of ICT to support special educational needs (48%). Least likely to be selected as priorities were CPD relating to basic ICT skills (10%) and CPD relating to use of ICT to support assessment for learning (10%).

Table 5.11: Percentages of special school principals selecting ICT-related CPD content areas among their top three CPD priorities

ICT-related CPD Content	Percent
How to use ICT as a teaching and learning tool across the curriculum (including its application to specific subject areas)	48.8
How to use ICT to support special educational needs	47.6
How to use ICT to support the development of key skills (e.g., literacy and/or numeracy)	35.7
ICT skills needed to use the school's own equipment (e.g., IWBs, digital projectors, laptops)	34.5
ICT skills needed to use new ICT/mobile devices (including those being brought to the school by the teachers and/or students	23.8
Digital media skills (including the use of digital video and audio)	19.0
The use of ICT to support DES priorities (e.g. school self-evaluation and school improvement)	19.0
More advanced ICT skills (including blogging, website design, computer programming and other applications)	16.7
Incorporation of ICT for teaching and learning in ALL CPD provided for teachers (as distinct from ICT-specific CPD)	15.5
How to use ICT to support assessment of learning	14.3
Basic ICT skills (including word processing, presentation software and Internet use)	9.5
How to use ICT to support assessment for learning	9.5

5.6.2 CPD Organisation

Principals were asked to indicate who is mainly responsible for the organisation of ICT-related CPD for teachers in their schools. Across school categories, the most frequent response provided was that this responsibility fell to the principal/deputy principal (44-53%) (Table 5.12). The second most frequent response was that individual teachers, support by school management, were mainly responsible for organising ICT-related CPD (22-28%), followed by a teacher or team of teachers with responsibility for coordinating ICT (20-25%). Small proportions (4-5%) of primary, post-primary and special school principals indicated that this was mainly the responsibility of 'another person/other persons'.

There was some variation observed within school categories. At primary level, DEIS Band 2 principals were less likely (13%) to report that ICT-related CPD was organised by individual teachers than DEIS Band 1 schools (26%), DEIS Rural schools, and schools not in DEIS (27% in each category; see Table A5.57). Lower proportions of DEIS Rural principals reported that ICT-related CPD was organised by an ICT coordinator/coordinating team (9%) than principals in other schools (19-41%). Principals of large and medium schools were most likely to say that ICT coordinators/coordinating teams were responsible for organising ICT-related CPD, while small and medium schools were most likely to report that the principal or deputy principal was mainly responsible for this (see Table A5.58). In girls' schools, CPD was more likely to be organised by a teacher or team of teachers with responsibility for e-Learning (38%) than by the principal or deputy principal (32%), whereas in boys'

and mixed schools the principal or deputy principal was mainly responsible for this (see Table A5.59).

At post-primary level, principals of senior colleges were more likely to report that ICT-related CPD was organised by 'other' persons (18%) than principals in other sectors (2-5%). No senior college principal indicated that individual teachers (supported by school management) were mainly responsible for the organisation of ICT-related CPD, compared to 17-31% in other sectors (see Table A5.62). Principals of smaller schools were most likely to report that ICT-related CPD organisation was mainly the responsibility of the school principal/deputy principal, while in larger schools, it was most likely to be the responsibility of the ICT coordinator/e-Learning team (see Table A5.61). There was little variation by DEIS status at post-primary level (see Table A5.60).

As at primary and post-primary levels, in smaller special schools, ICT-related CPD was most likely to be organised by the school principal/deputy principal, while in larger schools, it was most likely to be the responsibility of the ICT coordinator/e-Learning team.

Table 5.12: Person(s) responsible for the organisation of ICT-related CPD in primary, post-primary and special schools

	Primary	Post-primary	Special
The school Principal/Deputy Principal	49.8	43.5	53.0
Individual teachers, supported by school management	26.2	27.9	21.7
A teacher or team of teachers with responsibility for coordinating ICT/e-Learning	19.8	24.8	20.5
Other	4.2	3.9	4.8

Missing data: 12.3% at post-primary level

Principals were also asked to indicate the suitability of a number of approaches to the organisation of ICT-related CPD in their schools. Bringing in an external tutor to enable formal CPD to take place in the school was the approach deemed to be very suitable by the highest proportions of principals in primary (47%), post-primary (43%) and special schools (43%) (Tables 5.13 to 5.15). The most common 'not suitable' responses at primary level related to informal CPD on the general (18%) and subject-specific (18%) pedagogical use of ICT provided on peer-to-peer bases, and to self-directed informal ICT-related CPD (18%). At post-primary level, principals were most likely to report that the provision of online CPD for teachers to engage in as a school group was not suitable (13%), while 9% indicated that the provision of online CPD for teachers to engage in independently was not suitable and 9% reported that self-directed informal CPD was also unsuitable.

At primary level, principals of DEIS Rural schools were more likely to report that the upskilling of an ICT coordinating (or other) teacher was not a suitable approach to CPD (20%) than were schools in other categories (5-14%) (see Tables A5.63-A5.66). Principals of schools not in DEIS and principals of DEIS Rural schools were more likely to report that informal CPD on the general pedagogical use of ICT provided on a peer-to-peer basis was not suitable (19% and 23% respectively) than were DEIS Band 1 (10%) and DEIS Band 2 (10%) principals. Principals of small schools (23%) were more likely to indicate that the upskilling of an ICT coordinating, or other, teacher was not a suitable approach to CPD than principals of medium (13%), large (11%) or very large (9%) schools. They were also less

likely to report that bringing in an external tutor was very suitable (38%) than those in other size categories (46-55%; see Tables A5.67-A5.70). There was little variation by school gender composition (see Tables A5.71-A5.73).

Table 5.13: Percentages of primary school principals indicating the degree of suitability or otherwise of approaches to the organisation of ICT-related CPD

	Not suitable	Somewhat suitable	Suitable	Very suitable
Bringing in an external tutor to enable formal CPD to take place in the school…	5.6	15.5	32.3	46.6
Supporting teachers to attend formal CPD in external venues (e.g. the education centres)	8.0	28.1	44.5	19.5
Provision of online CPD for teachers to engage in independently	10.5	34.3	38	17.5
Provision of online CPD for teachers to engage in as a school group	15.2	32.7	35	17
Upskilling of an ICT coordinating (or other) teacher to enable him or her to provide support to others	13.6	24.1	35.2	27.1
Informal CPD on the general pedagogical use of ICT provided on a peer to peer basis…	18.4	36	32.1	13.5
Informal CPD on the subject-specific pedagogical use of ICT provided on a peer to…	18.3	37.2	32.4	12.1
Supporting self-directed, informal CPD in ICT by teachers …	17.9	43.0	29.6	9.6

Table 5.14: Percentages of post-primary principals indicating the degree of suitability or otherwise of approaches to the organisation of ICT-related CPD

	Not suitable	Somewhat suitable	Suitable	Very suitable
Bringing in an external tutor to enable formal CPD to take place in the school…	3.4	20.5	33.3	42.7
Supporting teachers to attend formal CPD in external venues (e.g. the education centres)	6.1	28.1	42.3	23.5
Provision of online CPD for teachers to engage in independently	9.3	31.9	36.9	21.9
Provision of online CPD for teachers to engage in as a school group	12.8	35.2	34.4	17.7
Upskilling of an ICT coordinating (or other) teacher to enable him or her to provide support to others	5.3	16.3	37.0	41.3
Informal CPD on the general pedagogical use of ICT provided on a peer to peer basis…	5.6	26.7	41.9	25.8
Informal CPD on the subject-specific pedagogical use of ICT provided on a peer to…	6.5	23.7	42.3	27.6
Supporting self-directed, informal CPD in ICT by teachers	9.3	32.3	39.9	28.5

Missing data: 11% or less per item

At post-primary level, principals of DEIS and non-DEIS schools were similar in their preferences for approaches to ICT-related CPD (see Tables A5.74 and A5.75). As at primary level, small schools were less likely (28%) than larger schools (36-49%) to report that the upskilling of an ICT coordinating teacher was a very suitable approach to CPD (see Tables A5.76-A5.79). There was little variation by

sector in the rating of the suitability of approaches (see Tables A5.80-A5.85); however, principals of senior colleges were more likely to rate self-directed, informal CPD as very suitable (41%) than those in any other sector (16-22%).

Table 5.15: Percentages of special school principals indicating the degree of suitability or otherwise of approaches to the organisation of ICT-related CPD

	Not suitable	Somewhat suitable	Suitable	Very suitable
Bringing in an external tutor to enable formal CPD to take place in the school…	8.3	16.7	20.2	54.8
Supporting teachers to attend formal CPD in external venues (e.g. the education centres)	4.9	22.2	43.2	29.6
Provision of online CPD for teachers to engage in independently	7.3	25.6	42.7	24.4
Provision of online CPD for teachers to engage in as a school group	4.9	26.8	40.2	28.0
Upskilling of an ICT coordinating (or other) teacher to enable him or her to provide support to others	8.5	19.5	30.5	41.5
Informal CPD on the general pedagogical use of ICT provided on a peer to peer basis	9.9	38.3	33.3	18.5
Informal CPD on the subject-specific pedagogical use of ICT provided on a peer to peer basis	13.6	43.2	29.6	13.6
Supporting self-directed, informal CPD in ICT by teachers	18.5	34.6	32.1	14.8

Missing data: 11% or less per item

Principals were also asked to indicate the suitability of four approaches to the *timing* of ICT-related CPD for their schools. This question applied to both online and face-to-face (formal and informal) CPD options. Across school categories, the most suitable approach to the timing of ICT-related CPD was reported to be during additional/Croke Park hours (Tables 5.16 to 5.18). At primary level, 58% of principals indicated that having CPD during the school day was not a suitable approach to CPD, with a similar proportion of special school principals (57%) also reporting this. At post-primary level, nearly two-thirds of principals (64%) indicated that having CPD during the summer was unsuitable, compared to 29% of primary and special school principals.

Table 5.16 Percentages of primary principals indicating the degree of suitability of approaches to the timing of ICT-related CPD

	Not suitable	Somewhat suitable	Suitable	Very suitable
During additional/Croke Park hours	4.0	18.6	38.0	39.4
During the school day (without reducing class contact/teaching time)	57.7	19.0	15.5	7.8
Outside of school/additional hours (term time)	44.4	36.2	15.7	3.7
In summer	28.9	29.4	27.6	14.1

Table 5.17: Percentages of post-primary principals indicating the degree of suitability of approaches to the timing of ICT-related CPD

	Not suitable	Somewhat suitable	Suitable	Very suitable
During additional/Croke Park hours	5.2	19.9	35.3	39.6
During the school day (without reducing class contact/teaching time)	42.4	26.8	22.9	7.9
Outside of school/additional hours (term time)	32.7	33.1	24.5	9.7
In summer	63.8	18.3	10.2	7.7

Missing data = 11% or less per item

Table 5.18: Percentages of special school principals indicating the degree of suitability of approaches to the timing of ICT-related CPD

	Not suitable	Somewhat suitable	Suitable	Very suitable
During additional/Croke Park hours	2.4	15.5	23.8	58.3
During the school day (without reducing class contact/teaching time)	56.6	19.3	14.5	9.6
Outside of school/additional hours (term time)	30.4	36.7	25.3	7.6
In summer	29.3	28.0	25.6	17.1

Missing data = 14% or less per item

At primary level, approximately half of principals of medium-sized schools (52%) and large schools (49%) indicated that it was not suitable to organise ICT-related CPD in the summer, compared to a third (33%) of principals from small schools and 22% of principals from very large schools (see Tables A5.90-A5.93). Just 10% of principals of girls' schools indicated that CPD during the summer was unsuitable, while 28% of boys' school principals and 30% of mixed school principals rated this as an unsuitable approach to timing (see Tables A5.94-A5.96). There was little variation by DEIS status at primary level (see Tables A5.86-A5.89).

At post-primary level, DEIS and non-DEIS schools differed somewhat in their preferred approaches to the timing of ICT-related CPD (see Tables A5.97 and A5.98). Of principals of schools not in DEIS, 43% reported that it was not suitable for ICT-related to CPD to take place during the school day, while just 6% of DEIS principals deemed this approach to be unsuitable. There were also some differences by size (see Tables A5.99-A5.102). A quarter of very large school principals indicated that it would be unsuitable for CPD to take place during the summer, while 58-71% of principals in other size categories reported that this was not suitable. Principals of senior colleges differed in their preferences for CPD timing from principals in other sectors. Just a third (32%) of senior college principals indicated that the summer was not a suitable time for ICT-related CPD (60-72% in other sectors). Also, just under a fifth of such principals deemed additional/Croke Park hours to be very suitable for ICT-related CPD, compared to 37-41% of principals in other sectors (see Tables A5.103-A5.108).

5.7 Responsible Use of the Internet

Principals were asked to provide information on their Internet Safety Acceptable Use Policy (AUP) (if applicable). Almost all (95%) primary schools reported having an AUP. Most of these were reported to be reviewed and updated regularly. However, fewer contained reference to copyright guidelines, and fewer still made reference to publishing a school website (Table 5.19). There was little variation

by DEIS status (see Table A5.109), enrolment size (see Table A5.110), or gender composition of schools (see Table A5.111).

Table 5.19 Percentages of "Yes" responses from primary principals to statements relating to the AUP

AUP Statement	Percent
There is an active Internet Safety AUP in our school, which guides responsible use of the Internet	94.9
The school AUP is reviewed and updated regularly	81.0
The AUP refers to Internet safety advice and guidelines	93.9
The AUP refers to online activities (e.g. searching, browsing websites…	86.9
The AUP refers to downloading or uploading of material	82.7
The AUP refers to copyright guidelines	62.9
The AUP refers to publishing a school website	64.1
The AUP refers to use of electronic communication (e.g. email…	79.6
The AUP refers to inappropriate, harmful and illegal use of online material	88.2
The AUP refers to sanctions and reporting mechanisms	79.0

(Percentages from item 2 onwards refer to the full sample [not the subsample that has an AUP]).

Almost all (97%) post-primary principals also reported having an AUP (Table 5.20). The majority of these were reviewed and updated regularly. As at primary level, fewer contained reference to copyright guidelines (67%), and fewer still made reference to publishing a school website (61%). DEIS and non-DEIS principals were similar in their endorsement of the AUP statements (see Table A5.112) and there was little variation by sector (see Table A5.114). AUPs in small schools were more likely to refer to copyright guidelines (88%) than those in other size categories (66-68%), more likely to refer to publishing a school website (91%) than those in other schools (58-65%), and less likely to refer to electronic communication (67%) than those in medium (86%), large (89%) or very large (95%) schools (see Table A5.113).

Table 5.20: Percentages of "Yes" responses from post-primary principals to statements relating to the AUP

AUP Statement	Percent
There is an active Internet Safety AUP in our school, which guides responsible use of the Internet	97.4
The school AUP is reviewed and updated regularly	86.2
The AUP refers to Internet safety advice and guidelines	95.2
The AUP refers to online activities (e.g. searching, browsing websites…	90.4
The AUP refers to downloading or uploading of material	92.1
The AUP refers to copyright guidelines	66.7
The AUP refers to publishing a school website	60.6
The AUP refers to use of electronic communication (e.g. email…	89.0
The AUP refers to inappropriate, harmful and illegal use of online material	94.9
The AUP refers to sanctions and reporting mechanisms	91.4

The vast majority (91%) of special school principals reported that their schools had an AUP, with three- quarters of principals indicating that the AUP is reviewed and updated regularly. Less than half of special school principals (48%) reported that their school had an AUP which referred to publishing a school website.

Table 5.21 Percentages of "Yes" responses from special school principals to statements relating to the AUP

AUP Statement	Percent
There is an active Internet Safety AUP in our school, which guides responsible use of the Internet	91.4
The school AUP is reviewed and updated regularly	74.9
The AUP refers to Internet safety advice and guidelines	86.6
The AUP refers to online activities (e.g. searching, browsing websites…	74.9
The AUP refers to downloading or uploading of material	74.1
The AUP refers to copyright guidelines	63.0
The AUP refers to publishing a school website	47.8
The AUP refers to use of electronic communication (e.g. email…	68.3
The AUP refers to inappropriate, harmful and illegal use of online material	79.3
The AUP refers to sanctions and reporting mechanisms	77.7

Principals were then asked to indicate the context in which students in their schools are taught specifically how to maximise the Internet's potential, while protecting themselves from possible risks of abuse. Across school categories, the most common responses were that Internet safety is taught as part of SPHE in schools, and that it is taught on an on-going basis when the Internet is being used for teaching and learning (Tables 5.22-5.24).

Table 5.22 Percentages of yes responses from primary principals to statements relating to the teaching of Internet safety

Statement	Percent
Internet safety is taught as part of SPHE in the school	86.3
It is taught on an on-going basis when the Internet is being used for teaching and learning purposes in the school	86.4
It is taught as a stand-alone class/module at an agreed time during the year	28.8
It is taught in another context	20.9

At primary level, there was little variation in responses by DEIS status, school size, or gender composition (see Tables A5.115-A5.116)

Table 5.23: Percentages of yes responses from post -primary principals to statements relating to the teaching of Internet safety

Item	Percent
Internet safety is taught as part of SPHE in the school	82.5
It is taught on an on-going basis when the Internet is being used for teaching and learning purposes in the school	83.3
It is taught as a stand-alone class/module at an agreed time during the year	26.4
It is taught in another context	36.1

At post-primary level, there was little variation by DEIS status (see Table A5.118) or enrolment size (see Table A5.119). Senior college principals were less likely to report that Internet safety was taught as part of SPHE in the school (5%) than in any other sector (80-90%) and less likely to indicate that it is taught as a stand-alone class/module (9%) than principals in other sectors (24-29%; see Table A5.120).

Table 5.24: Percentages of yes responses from special school principals to statements relating to the teaching of Internet safety

Item	Percent
Internet safety is taught as part of SPHE in the school	62.5
It is taught on an on-going basis when the Internet is being used for teaching and learning purposes in the school	72.7
It is taught as a stand-alone class/module at an agreed time during the year	15.9
It is taught in another context	14.4

5.8 Use of Assistive Technologies

Principals were asked whether a range of assistive technologies (ATs) are used in their schools to support students with special educational needs (SEN). Principals were asked to choose from three responses: *Yes*, *No,* or *Not applicable to our school* for each of the ATs.

At primary level, the most commonly used assistive technology was software to support literacy, followed by software to support numeracy. The least commonly used AT was switches (e.g., for students with physical disabilities) (Table 5.25). There was little variation in reports of AT use by DEIS status or school gender composition (see Tables A5.121 and A5.123). There was some variation by school size, with small schools least likely to report use of each of the assistive technologies listed and very large schools most likely to report such use (except for use of other computer control devices, where similar proportions of principals of very large and large schools reported use of same; see Table A5.122).

Table 5.25: Use of Assistive Technologies to support primary students with SEN

	Yes	N/A
Software or applications to support literacy for students with SEN	92.1	3.9
Software or applications to support numeracy for students with SEN	89.7	3.8
Software or applications to support students with disabilities/disorders, such as Dyslexia, Dyspraxia, ADHD, Asperger Syndrome, or Autism	76.5	7.6
Switches (e.g., for students with physical disabilities)	6.3	42.9
Other computer control devices (e.g., alternative mouse and keyboard equipment)	30.4	27
Other assistive technologies	23.9	24.9

Missing data: 11% or less per item

The most commonly used assistive technology at post-primary level was software to support literacy, followed by software to support numeracy (Table 5.26). The least commonly used AT was switches (e.g., for students with physical disabilities). There was little variation between DEIS schools and schools not in DEIS. However, DEIS schools were more likely to use software to support numeracy (91.2%) than were schools not in DEIS (80.6%; see Table A5.124). Very large schools were most likely to use software or applications with students with disabilities (91%), compared with large schools (79%), medium schools (81%), and small schools (65%). Small schools were also less likely to use "other" ATs (61% did not use these), compared with 47% of medium, 43% of large, and 39% of very large schools (see Table A5.125). Senior colleges were considerably less like to use ATs for literacy (9%

do not) and for numeracy (23% do not), and to use switches (41% do not) than were other sectors (see Table A5.126).

Table 5.26: Use of Assistive Technologies to support post-primary students with SEN

Technology	Yes	N/A
Software or applications to support literacy for students with SEN	90.2	2.4
Software or applications to support numeracy for students with SEN	83.6	2.6
Software or applications to support students with disabilities/disorders, such as Dyslexia, Dyspraxia, ADHD, Asperger Syndrome, or Autism	81.0	2.2
Switches (e.g., for students with physical disabilities)	12.6	31.5
Other computer control devices (e.g., alternative mouse and keyboard equipment)	30.7	18.2
Other assistive technologies	34.3	13.2

Missing data: 14% or less per item

As might be expected, the highest rates of AT use were reported in special schools. A majority of special school principals reported use of all but one of the ATs included in the question. The least commonly used AT (50%) was software or applications to support students with disabilities/disorders such as Dyslexia, Dyspraxia, ADHD, Asperger Syndrome or Autism.

Table 5.27: Use of Assistive Technologies to support students in special school

	Yes	N/A
Software or applications to support literacy for students with SEN	95.4	1.2
Software or applications to support numeracy for students with SEN	95.3	1.3
Software or applications to support students with disabilities/disorders, such as Dyslexia, Dyspraxia, ADHD, Asperger Syndrome, or Autism	86.0	2.4
Switches (e.g., for students with physical disabilities)	49.5	18.6
Other computer control devices (e.g., alternative mouse and keyboard equipment)	66.5	9.1
Other assistive technologies	64.6	7.6

Missing data: 11% or less for each item

5.9 Use of ICTs for Communicating

Principals were asked to review three statements relating to use of ICT for communicating in their schools, and to indicate whether they were used in their schools *in some cases*, *regularly*, or *not at all*. Table 5.28 shows percentages of primary, post-primary and special school principals who reported regular or no use of ICT in these ways. The most common regular use was the use of ICT tools to communicate with other schools in Ireland, with post-primary schools most likely to regularly use ICT in this way. Very few principals in any school category reported the use of live video links to share subjects with students in other schools.

There was little variation by DEIS status or gender composition at primary level (see Tables A5.127 and A5.129). Small schools were most likely to say that they *did not* communicate with other schools internationally (84%) and very large schools were least likely to do so (56%; see Table A5.128). There was little difference between DEIS and non-DEIS schools at post-primary level in use of ICTs for communicating (see Table A5.130) and there was little variation in responses by school

size (see Table A5.131). Nearly a quarter (23%) of senior college principals reported regular use of ICT tools to communicate with other schools in Ireland, while only 5% of community college principals reported same (see Table A5.132).

Table 5.28: Percentages of principals reporting no use or regular use of ICTs for communicating, by school category

	Primary		Post-primary		Special	
	No	Reg.	No	Reg.	No	Reg.
A 'live' video two-way link is used to share one or more subjects with students in another school	89.8	0.9	90.6	2.4	87.1	2.6
ICT tools (e.g. email, video links) are used to communicate with other schools in Ireland	62.0	6.3	49.0	14.7	56.2	11.2
ICT tools (e.g. email, video links) are used to communicate with other schools internationally	74.6	3.3	50.5	6.2	66.7	5.2

5.10 Engagement with Industry

Principals were asked if there was any engagement/collaboration between their school and industry (excluding commercial arrangements) in relation to the use of technology in teaching and learning, career guidance, work experience opportunities or any other area. At primary level, 7% responded *yes* and 93% *no* to this question. Principals of very large schools were more likely to report industry collaboration (15%) than those in other school size categories (4-6%; see Table A5.133). Rural DEIS schools were least likely to report engagement with industry (3%) and DEIS Band 2 schools were most likely to do so (13%; see Table A5.133). In relation to school gender composition, 15% of girls' schools and 14% of boys' schools collaborated with industry, compared with 6% of mixed schools (see Table A5.133).

Greater industry collaboration was reported at post-primary level, with one quarter of principals indicating *yes* and three quarters responding *no*. DEIS principals were more likely than non-DEIS principals to report industry collaboration (31%, compared with 23%) (see Table A5.134). There was little variation by enrolment size or school sector.

Table 5.29: Industry collaboration with schools by school category

Level	Percent
Primary	7.1
Post-primary	25.2
Special	10.8

Missing data: Primary: 10.05%, Post-primary: 14.3%, Special: 11.1%

Chapter 6: Key Issues Identified by Principals

This chapter summarises the key issues identified in principals' written responses to an open-ended question on the school questionnaire. The final question on the questionnaire invited principals to provide any *additional comments (including any ICT-related priorities)*. Responses to this question are considered in this chapter. Text data obtained from these responses were submitted to a content analysis, as detailed in Chapter 3. Sixteen main topics were identified in the course of the analysis, with each topic comprising a number of distinct, but related, themes. In all, 660 primary principals (31% of all primary principals who completed the survey), 130 post-primary principals (26%) and 30 special school principals (33%) availed of the opportunity to provide additional comments on aspects of ICT use in schools. Overall, 1828 comments were made by responding principals. The distributions of comments made by primary, post-primary and special school principals are reported in Tables 6.1, 6.2 and 6.3, respectively. Participants' comments relating to each of the main topics are then summarised in turn, with phrases encapsulating main themes presented in bold font. Exemplar participant quotes are presented to illustrate salient themes.[42] Primary principal quotes are identifiable by (P), post-primary by (PP) and special school by (S). In cases where Irish was used in a participant's response, it is accompanied here by an English translation.

Table 6.1: Distribution of comments made by primary school principals, by topic

Topic	Number of Schools	Percentage of Schools*	Number of Comments	Percentage of Comments
Funding of ICT Equipment / Resources	300	45.5	390	26.8
Technical Support / Maintenance	224	33.9	274	18.8
Internet	151	22.9	158	10.9
Professional Development	108	16.4	114	7.8
Teaching and Learning	85	12.9	104	7.1
ICT Census	68	10.3	78	5.4
Computing	62	9.4	70	4.8
Time (Lack of)	60	9.1	71	4.9
Teachers	46	7.0	56	3.8
ICT Coordinator	28	4.2	30	2.1
NCTE	30	4.5	30	2.1
ICT Planning	19	2.9	18	1.2
Websites	11	1.7	11	0.8
Work in progress	10	1.5	10	0.7
Projects	8	1.2	8	0.5
Network	4	0.1	4	0.2
Other	29	4.4	30	2.1
Total Comments			1457	100

*Denominator is the number of schools whose principals offered at least one comment on any topic.

[42] Comments were subjected to minor edits, where necessary, for purposes of clarity. These were largely confined to issues of punctuation and correction of typographical errors.

Table 6.2: Distribution of comments made by post-primary school principals, by topic

Topic	Number of Schools	Percentage of Schools	Number of Comments	Percentage of Comments
Technical Support / Maintenance	46	35.4	56	19.6
Funding of ICT Equipment / Resources	43	33.1	51	17.8
Internet	28	21.5	34	11.9
Professional Development	25	19.2	27	9.5
Teaching and Learning	13	10.0	15	5.2
Computing	12	9.2	12	4.2
ICT Coordinator	11	8.5	14	4.9
Time (Lack of)	11	8.5	12	4.2
ICT Census	9	6.9	9	3.1
Work in Progress	8	6.2	8	2.8
Teachers	6	4.6	9	3.1
ICT Planning	6	4.6	6	2.1
NCTE	5	3.8	5	1.7
Network	2	1.5	3	1.1
Projects	2	10.0	3	1.1
Websites	1	4.6	2	0.7
Other	10	7.7	20	7.0
Total Comments			286	100

Table 6.3: Distribution of comments made by special school principals, by topic

Topic	Number of Schools	Percentage of Schools	Number of Comments	Percentage of Comments
Funding of ICT Equipment / Resources	18	60	23	27.1
Technical Support / Maintenance	10	33.3	15	17.6
Professional Development	9	30.0	10	11.8
Internet	6	20.0	7	8.2
Teachers	4	13.3	4	4.7
ICT Census	4	13.3	4	4.7
Computing	4	13.3	4	4.7
Time (Lack of)	3	10.0	5	5.9
Teaching and Learning	3	10.0	3	3.5
ICT Planning	2	6.7	2	2.4
ICT Coordinator	2	6.7	2	2.4
Work in Progress	1	3.3	1	1.2
NCTE	1	3.3	1	1.2
Other	4	13.3	4	4.7
Total Comments			85	100

6.1 Funding of ICT Equipment and Resources

The funding of ICT in schools was the most frequently commented-upon topic amongst primary and special schools principals, and the second most frequent at post-primary level.[43] Funding-related comments were made by 300 primary principals (46% of all primary principals who provided comments), who made a total of 390 comments on this topic (representing 27% of all comments made by primary principals). At post-primary level, 51 comments (18% of all comments made) which related to the topic of ICT funding were made by principals of 43 post-primary schools (33% of all post-primary principals who provided comment). In all, 18 special school principals (60%) made 23 comments (27% of all comments in the special schools category) about the funding of ICT resources.

Of the funding-related comments provided by principals, most made general **calls for additional financial support for ICT in schools**, or made reference to the perceived **inadequacy of previous funding**. Many respondents reported that a lack of funding was the most significant obstacle to the effective integration of ICT into school life. An example of such a comment is:

> *Lack of finance and investment limits our use of ICT in delivering the curriculum and administrating the school. The world is passing our school by in terms of ICT... The teachers and staff have good sound ICT knowledge from our own personal lives, but have only poor quality tools to work with within the school*. (P)

Several principals commented that, in the context of overall reduced funding to schools, improving ICT resources had become increasingly difficult. Principals explained that, at a time when schools are struggling to manage day-to-day running costs, the development of ICT infrastructure had become an unrealistic aspiration. One principal, for example, commented that, "*Schools are under massive pressure to keep the doors open, lights on, pay for water, never mind purchasing ICT equipment.*" (P)

In addition to general comments on funding needs, some principals specified their ICT funding priorities. Many principals mentioned the **need for financial support to purchase, update or replace existing hardware** in their schools. One principal, for example, commented: "*We now have our ICT equipment 6 years. It will need to be updated soon. Will it be grant-aided?*" (PP) Fewer principals specified a **need for funding to purchase or update software** than hardware to support teaching and learning and/or administration in their schools. A small number of principals took the opportunity to express **appreciation for previous ICT grants**, and to outline the positive uses to which these monies had been put: "*Funding that was made available in 2010 proved invaluable*." (PP) However, a large number of principals highlighted the inappropriateness of once-off grants for ICT, given the constantly evolving nature of technology. Such principals argued the **need for ICT funding to be *regular***, with several advocating for an annual grant to be paid to schools to meet their ICT needs: "*An annual budget for IT is an absolute requirement for the school or every few years we will find ourselves completely out-of-date.*" (P).

[43] This section does not include comments on the funding of technical support/maintenance, continuing professional development or broadband, as these are addressed under separate headings.

A number of the comments which referred to the shortfall in DES funding for ICT also described **alternative ways in which schools have raised funds** for ICT purchases. Principals mentioned donations from local businesses:

> *Our special school is designated for students with physical and multiple disabilities. We have never received the type of core funding needed in order to update our technologies. We do this through fundraising all the time and businesses in our area help when they can by donating old computers to us.* (S)

Others highlighted the role played by parents in funding schools' ICT equipment: "*It is impossible to purchase any new equipment without fundraising through parents. This is on top of fundraising for other school necessities.*" (P)

However, a number of principals of DEIS schools described the **challenges involved in raising funds from parents and/or wider communities, in areas of disadvantage**. One post-primary principal wrote, for example, in relation to parents:

> *Junior Cycle Reform will require greater use of one-to-one student and teacher devices. The cost of such devices is prohibitive for many families attending this school where 90% of the students are medical card holders. I would consider that significant ICT funding is required to equip schools rather than this becoming a competitive issue between schools.* (PP)

Indeed, several respondents discussed what one principal described as the **'digital divide' in Irish education**, where principals commented on the inequality of access to quality ICT resources along urban/rural and advantaged/disadvantaged lines. Others reported similar disparity among pupils from schools of different sizes. A principal of a small school explained her perception of this inequality:

> *The ICT grant, though welcome at the time, was wholly inadequate for a small school like ours, where the paltry sum only covered the computers and projectors for all the classrooms. A WSE-MLL commended us on the astute use of the grant but we are way behind other schools in the area. We do not have the money to narrow that gap and it is very upsetting and frustrating having to endure this inequality on a daily basis.* (PP)

Finally, some dissatisfaction was expressed with funding arrangements for ICT in special schools. An example of this, made by a special school principal, is:

> *Although 87% of our students are second level students, the school is still under the auspices of the primary section and, therefore, has not been entitled to the large grants that were made available to second level schools over the past 14 years. In addition, the smaller grants that were handed out to primary schools (which special schools received) did not have a weighting to take account of the small numbers in classes, thus reducing these grant allocations to special schools like ourselves.* (S)

6.2 Technical Support/Maintenance

The second most frequently mentioned topic in the primary and special school categories, and the most frequent topic at post-primary level, related to technical support and the maintenance of ICT equipment. At primary level, 274 comments (19%) related to technical support and/or the maintenance of ICT equipment. Comments on this topic were made by 224 primary principals (34% of all primary principals who provided comment). At post-primary level, 56 comments (20% of all comments made) which related to technical support/maintenance were made by principals from 46 post-primary schools (35% of all post-primary principals who provided comment). In the special schools category, 10 principals (33%) made 15 comments (18% of all comments in the special schools category) about these related issues.

A large number of comments were made regarding the **costs of maintaining existing ICT equipment**. For example, one principal wrote: *"IT and maintaining it is a major drain on school funds and parent funds. Annual spend on maintenance is €14,000 in* [name of school], *notwithstanding the purchase of new equipment*." (PP) Many principals argued for the necessity of an **ICT maintenance grant** to be provided to schools. One principal wrote: "*No grants are given now for upkeep of computers and interactive whiteboards. It cost 800 euro to replace one bulb recently...we won't be able to afford to turn on whiteboards if this continues.*" (P).

Similarly, principals outlined the expense involved in obtaining technical support, arguing that insufficient funding is available to schools for this purpose. As one principal wrote, "*It is very difficult to manage our ICT infrastructure without any technical support. There absolutely needs to be funding available for this. This is particularly is an issue for small schools*." (S)

Other principals described a **lack of, or insufficient access to, technical support** (without specifically calling for funding for this purpose): "*Schools need excellent and dependable ICT support and I feel this is an area that has been too long overlooked by the DES, and an area that needs immediate attention*." (PP) A number of principals commented on the effect that this inadequacy of technical support has had on ICT use in their schools. Specifically, primary and post-primary principals described the **burden on teachers, parents, principals, and others, where access to professional technical support is lacking**. One teaching principal explained how class time was spent attempting to fix ICT equipment in the school:

> *I do most of the maintenance and advise the staff on how to "mind" the equipment. I save the school considerable amounts of money by googling ways of fixing the IWBs when problems arise and by wasting precious class time trying the different fixes I found on forums.* (P)

Another principal believed that: "*The DES should stop using individual teachers' goodwill/interest in their pupils/schools to maintain a creaking system*" (P).

A number of principals' comments called for the provision of **centralised technical support** for schools. Principals called for an **IT technician to be assigned to individual schools or to clusters of schools**. One principal commented: "*Schools MUST be provided with an IT specific person/technician either on an individual school basis or as part of a group scheme; otherwise, the provision and effective delivery of IT becomes, at best, farcical*." (PP). Principals of larger schools, in particular, argued that their schools needed **dedicated on-site technical support**. One post-primary principal,

for example, commented: "*As a large school we need an IT Technician/contractor very regularly, this expense cuts into our budget. We need a person on-site to provide technical support*" (PP). Similar comments were also made by principals of large primary schools: "*A full-time person to troubleshoot and fix/repair issues with ICT equipment is essential in a very large school such as ours… It is impossible for our teacher with ICT as a post to keep on top of maintenance."* (P)

6.3 Internet

At primary level, 158 comments (11%) about the Internet were made by 151 principals (23%). Thirty four Internet-related comments (12%) were made by 28 post-primary principals (22%). Six special school principals (20%) made seven comments (8%) on this topic.

The vast majority of comments made on this topic were expressions of **dissatisfaction with current broadband service or arrangements**. Inadequate broadband service was reported as hindering ICT development in schools. For example, one primary principal wrote: *"The biggest block to using ICT in our school is the 'Stone Age' broadband service provided by the Department of Education. It leaves us years behind the technology being used by our pupils in their homes*." (P)

Several principals argued that investment in ICT equipment, such as computing devices and interactive whiteboards, is only useful if there is sufficient Internet capacity to support their use. One post-primary principal explained that, in her school: "*There are laptops and interactive whiteboards available in all classrooms; however, the broadband is not sufficient and needs to be upgraded. The majority of the time the Internet is not working*." (PP) Similarly, a primary principal wrote:

> *If there is genuine understanding of the need for children to have access to technology, some serious investment is needed. My school invested in netbooks two years ago, confident that our access to Internet would improve and the children's learning would be enhanced. Now, looking back, I'd say it was a complete waste of money. I looked to NCTE at the time for advice but I suppose they, like me, thought the future would bring better broadband service!*

Several principals made direct pleas to the NCTE to improve the broadband service available to their schools. For example:

> *I ask NCTE and DES to do something meaningful to improve broadband service for our school. It is most unsatisfactory at the moment. We have gotten each child to subscribe individually to a school reading online programme which now cannot be accessed in school due to poor broadband.* (P)

Numerous principals described their frustration, and the frustration of teachers and pupils, at the poor broadband service available to their schools. Patchy or slow Internet service was presented as a major barrier to use of ICT for teaching and learning:

> *The very poor broadband service that the school receives greatly impacts the amount and level of engagement in ICT in the school. Only two computers can be online at any one time. Sometimes the Internet doesn't work at all and planned activities using the whiteboard have to be abandoned, or are so slow that the good is gone from them*. (P)

Reports of poor broadband affecting motivation and morale in relation to ICT use were echoed by several principals. One principal commented: "*Would love to have access to a powerful dependable broadband. No matter what wonderful plans we have the broadband lets us down and this is very discouraging for pupils and teachers alike*." (P).

Inadequate broadband service was also reported to create challenges to administration in the school. One primary principal explained:

> *Most days the Internet only works for a short time, and very sporadically, despite numerous complaints to our provider. We cannot even send emails and the secretary regularly has to go home in order to do OLCS (On-line Claims System) or send emails*. (P)

Of the remaining comments which related to the Internet, some principals explained their school's **need for a wireless network**, while others reported that their schools had **problems or difficulties with their existing wireless network**. Small numbers of primary and post-primary principals expressed **satisfaction with recent developments in broadband provision**: "*High speed broadband has been very worthwhile*". (PP)

A final theme in this category related to principals' **concerns about pupil use of the Internet**. Worries about safe and acceptable use of the Internet by pupils at school, as well as specific concerns about cyberbullying, were expressed by a small number of primary and post-primary principals: "*Safe use of mobile devices and social media and anti-bullying are areas of serious concern. Would love to go mobile and wireless with students but safety is a big issue*." (PP)

6.4 Professional Development

One hundred and eight primary school principals (16.4%) made 114 comments (7.8% of all primary principal comments) on the topic of ICT-related professional development for educators. At post-primary level, 25 principals (19%) made 27 comments (10%) on this topic, and nine special school principals (30%) did so.

Typical comments on this topic referred to the need for **more, or better, training for teachers on ICT use**, to be provided. One principal wrote: "*Teachers feel a lack of support from DES in developing ICT skills for use in classroom*". (P) Many comments also called for **training opportunities to be tailored** in specific ways. One principal suggested:

> *Local targeted support within teachers' own school and related to ICT issues they face in their day-to-day teaching, learning and assessment is what works. Follow-up training after initial set-up training is also vital or embedment does not occur*". (PP)

Several principals commented that training on the actual equipment available in the school was essential. Others emphasised that a whole-school approach, whereby all teachers receive training together, is desirable: *"Seminars for principals are ok but it helps to enthuse other staff members if they are part of the training too*." (P) Ensuring that all staff members receive training was described as being of particular importance in special schools. One principal explained:

> *Training for staff needs to be addressed – the current setup just does not suit many schools. Online training is no good for teachers and SNAs who are not IT proficient-and teachers and*

> *SNAs need to be trained together in many cases, so that needs to be accounted for as regards numbers allowable for courses. In our school it's no good having the teacher trained when the SNAs in the classroom cannot do anything with IT and need the training themselves.* (S)

However, others believed the whole-school approach to be unsuitable for ICT professional development. One primary principal wrote:

> *In my experience, the CPD model of instruction of 'all staff together' is not fruitful, as there is too much disparity in capacity among them. If pupils are to make excellent use of ICT to present their work, to develop digital media, or to programme, it will be necessary to bypass the 'whole-staff CPD' model.* (P)

This was also echoed at post-primary level, with one principal, for example, writing:

> *The NCTE and other CPD supports that have been offered have not always been sufficient to the needs of a wide diversity of staff skills. An ongoing headache for this Principal!!* (PP)

As well as variation in levels of ICT skills across teachers within schools, principals also highlighted that there is between-school variation which should be taken into account in the delivery of ICT-related CPD. One principal commented: "*As each school is different, it would help if a coordinator could visit each school and take us from where we are at*." (P)

Some principals emphasised that any ICT training for teachers should be focused on use of ICT for the purposes of teaching and learning. One principal questioned: "*To what extent are trainee teachers exposed to the use of ICT for teaching and learning? Use of Facebook, etc. does not equip teachers to use ICT for teaching and learning*." (P) A number of principals believed that training should be tailored to different subjects or curricular areas. Training on basic maintenance of ICT equipment was also specified as desirable by a small number of principals.

Some principals commented that there was **insufficient time available for professional development in the area of ICT**: "*Time is needed for constant up-skilling of teachers and sharing of ideas - Croke Park Hours already overcrowded.*" (PP) Other principals called for increased funding to be made available to schools for the purpose of creating training opportunities for staff, while still others commented on the issue of teachers **funding their own ICT training**: "*Primary schools are being left behind in this technological age. Teachers are expected to up-skill and pay for same*." (P)

6.5 Teaching and Learning

At primary level, 85 principals (13%) made 104 comments on ICT as it relates to teaching and learning. Thirteen post-primary principals (10%) made 15 comments on this topic, and three special school principals (10%) did so.

Of the comments made, a frequent theme was the **need to integrate ICT into teaching and learning**. One respondent wrote: *"Greater emphasis needs to be placed on using ICT for teaching and learning. Most teachers can use ICT - planes, bills, bookings, etc. but this doesn't translate to appropriate use of ICT in teaching and learning."* (P) Several principals believed that such integration has not yet occurred and offered a range of explanations as to why not. One primary principal wrote: "*ICT has never been fully embraced due to its absence as a subject on the Revised Curriculum*." (P). Another

argued that: *"When the Inspectorate demand to see ICT used effectively in classrooms then a large improvement will be seen to take place*." (P) A post-primary principal commented: "*Pedagogical understanding and support of ICT across all subject areas is lacking at present and not facilitating the excellent engagement there should be with students of all ability ranges."* (PP)

Other principals reported a perceived **need to evaluate the usefulness of ICT as a pedagogical tool**, admitting that they were as yet unconvinced of its value for teaching and learning. One primary principal wrote:

> *The question remains, are standardised scores in English and maths any better because of the introduction of ICT? Certainly, pupils may believe that they "enjoy" school more, but is the quality of education any better? Are there are any studies to prove that ICT has a significant impact on literacy and numeracy scores? Would investment in pupil: teacher ratio be of more benefit?* (P)

Such questions were also asked at post-primary level. One principal wrote:

> *ICT (e-learning) is an innovative technology. Its use and impact must be evaluated on an ongoing basis to determine its usefulness as a teaching and learning tool. It is too early to say whether our iPad initiative has impacted on student attainment.* (PP)

Other principals, particularly primary principals, went further and expressed **concern about the impact of ICT use on aspects of students' learning**. One primary principal commented:

> *Due to the extensive use by our students of ICT outside of school hours, and the decreasing levels of numeracy and literacy which go along with texting, use of social media and blogging sites, one would wonder about the advantages of too far of a move away from the basic teaching of writing, spelling and reading skills in the everyday classroom and/or support room*. (P)

In addition to concerns about literacy and numeracy, a range of other concerns about negative impact of ICT use on learning outcomes was expressed. One principal, for example, reported that: *"ICT can prove to be very distracting to other classes in a multi-class setting."* (P) Another principal commented: "*The job of teaching is becoming too complicated and the use of all this technology is doing very little for the education of children. Children are overrun by technology and are not being taught the practical things in life."* (P) Principals cautioned that ICT use would not be a panacea for literacy and numeracy difficulties: "*Use of IT equipment in classrooms is not the magic answer to all our Literacy & Numeracy concerns."* (P) Comments urging caution about reliance on use of ICT in classrooms were almost exclusively made by primary principals, suggesting that this is of greater concern to educators of younger children than those of older students. As one principal explained:

> *Our school is a junior school designated DEIS Band 1 and we feel that the younger children, despite living in a digital age, also need to learn through active engagement with the real world, i.e., books, toys and creative materials and we use Aistear to promote this type of learning. E-learning has a more limited place in our context.* (P)

Other principals made comments acknowledging the **value of ICT to teaching and learning** and reported that it is an important part of the educational experience of pupils in their schools. One

principal stated: "*We recognise that ICT is a very important and integral part of providing high quality teaching and learning in our school."* (P) Similarly: "*Technology can provide a huge richness to teaching and learning."* (P). Principals reported that teachers also saw the educational value of ICT and made use of it in both the planning and delivery of lessons: "*Overall… ICT has totally transformed the planning and preparation for teaching and learning in the school and has enabled us to jettison commercially produced workbooks*." (P) Another principal wrote: "*Tá na cláir idirghníomhacha go hiontach agus tá an fhoireann breá sásta iad a úsáid* [Interactive programmes are great and the staff are happy to use them]". (P)

A small number of principals suggested that **ICT should be integrated further into assessment procedures.** One primary principal commented: "*Standardised testing could be carried out on the laptops in our school which would make the marking much more appropriate and productive.*" (P) At post-primary level, one principal commented: "*The DES must move to examination of some subjects online to really make people realise that this is the way forward."* (PP).

Several principals reported a need for more information about, and access to, **digital resources which relate to the primary and post-primary curricula**. One primary principal wrote: *"Also, I would love to see a centralised bank of resources available for teaching each objective and each strand of the Irish Curriculum – with clear links to the exact Irish curriculum objectives."* (P) Several principals called for a list or database of useful websites to be made available to teachers: "*A database of useful websites for literacy and numeracy should be made available to teachers*." (P) Similarly: "*Researching and sourcing suitable digital content is very time consuming. More accurate recommendations of good quality links and software should be available*." (P). This was echoed at post-primary level: "*More direct support with regard to ideas/websites/plans/methodologies that are applicable to each subject area need to be more widely communicated to teachers to be used as tools in the teaching and learning environment.*" (PP) Principals discussed challenges in accessing indigenous educational digital content: "*There are a lot of software packages out there but it is difficult to find ones that are designed to support the Irish curriculum."* (P) Principals of scoileanna lán-Ghaeilge called for more **digital teaching and learning resources to be made available in the Irish language:** "*There is a shortage of suitable materials and support available for schools teaching through the medium of Irish"* (P).

6.6 ICT Census

At primary level, 68 principals (10.3%) made 70 comments (5.4%) comments about the ICT Census itself. Nine post-primary principals (6.9%) and four special school principals (13.3%) commented on aspects of the Census. Many comments were critical of the **length of the questionnaire** and the **length of time** which it took respondents to complete. One principal wrote: "*In order to complete this survey properly, it required 3.5 hours of my time (including preparation)...that is a huge chunk of my time. I would request that future surveys would not be so cumbersome.*" (PP) Principals were also critical of the **timing of the census** and comments described how busy schools were at the time of year at which the questionnaires were administered. A small number of principals **apologised for the late return of completed questionnaires**. Of these, a portion explained that **Internet problems in their schools had delayed their completion of the online survey**, with some principals indicating that the Internet service in their schools was so poor that they were obliged to complete the

questionnaire in their own homes and in their own time. Other **technical difficulties with the online survey** were also reported. Consequently, a small number of principals expressed a **preference for hardcopy questionnaires** in the future.

Some principals took the opportunity to express **confusion over what information was being sought** by specific questions or sets of questions on the survey form. Others, while clear on the information being sought, described **difficulty in accurately answering questions** and wished to emphasise the approximate nature of estimates which they provided.

Several principals commented that they resented having to respond to the survey, but had done so in the **hope that it would lead to positive change** in the area of ICT delivery in schools. A small number of principals reported that if such a change did not materialise, that they **would not be participating in any further studies of this kind**. One principal, for example, commented:

> *Let there be ACTION on all the areas highlighted, by professionals working in education, i.e. principals, in this survey. Priority areas should be noted and IMMEDIATELY ADDRESSED. Please don't let this survey become another annual survey to be completed, and/or a pointless waste of my administration day and my time, as a teaching principal, if positive outcomes and actions do not follow on from this. I will not complete the next one, if I feel that is the case.* (P)

6.7 Computing

Comments about computers and computing devices were made by 62 primary principals (9%), 11 post-primary principals (9%) and four special school principals (13%). Seventy comments on this topic were made by primary principals (5%), 15 by post-primary principals (5%) and four by special school principals (5%). Of these comments, many referred to the **ageing profile of the computer stock** in schools. One primary principal wrote: *"I feel all the IT resources are outdated and old. It frustrates the pupils to work on laptops that are so slow to load down information from the Internet because of age*." (P) Others referred to **high computer-pupil ratios** and to having **insufficient numbers of computers** (or other computing devices) to meet the needs of pupils and staff. A post-primary principal commented: "*Limited access to computers especially for specific subjects like DCG* [Design, Communications Graphics] - *leads to dropping of the subject in 5th year course*" (PP). Several principals recognised the **need to purchase new computers/devices** and expressed plans or desire to do so (without making any specific appeals for funding). A number of comments referred to **problems arising from malfunctioning or defunct equipment**. Finally, a small number of principals commented on a **lack of space available** in their schools in which to house computers and other ICT equipment.

6.8 ICT Coordinator

At primary level, 28 principals (4%) made 30 comments (2%) on the topic of ICT coordinating teachers. At post-primary level, eleven principals (9%) made 14 comments (5%) relating to ICT coordinators and two principals in the special schools category (7%) commented on this topic.

Typical comments described the impact which a **lack or loss of an ICT co-ordinating teacher** had on the use of ICT in schools. One principal wrote:

We do not have an ICT Coordinator; that post was vacated when a teacher retired. We now depend on the goodwill of a member of staff and this is not satisfactory. Moratorium has seriously affected our IT Planning. (PP)

Many principals made comments **advocating for ICT coordination to be a post of responsibility** in all schools: "*We need additional support in the form of a teacher who has specific responsibility for ICT. All staff in a primary school are too busy and occupied during the day to take this on*." (P)

Principals of schools who did have ICT coordinating teachers **praised the work done by these teachers**, although some called for **increased training of ICT coordinating teachers** and others called for **greater allocation of time for ICT coordination**. One principal argued:

Our ICT coordinator has considerable expertise in the area of pedagogy but as she has a full time teaching role, it is very difficult to harness the potential of this resource due to time constraints. Much of what she does is voluntary and time is a huge issue. Ideally the ICT coordinator's role in a school such as ours is a full-time position (without any official teaching duties) (P)

6.9 Time

Sixty primary principals (9%) made 70 comments (5%) on the impact of time constraints on ICT use in schools. Eleven post-primary (9%) made 12 comments (4%) and three special school principals (10%) provided five comments (6%) on this topic.

Typical comments in this category referred to the length of time required to plan and prepare in order to use ICT for lessons in the classroom, with principals reporting that those teaching have **insufficient time to carry out this planning and preparation successfully**. Additionally, several **principals described competing demands on their own time**, and the effect these had on the time which they could allocate to ICT-related issues: "*I know it's boring but time is still a big issue. And I mean time for me as a principal to lead, delegate, research, support, etc. the people in our school who would be interested in progressing our IT provision and usage."* (PP)

Teaching principals in particular commented frequently on time constraints. Principals described the demanding nature of **covering the curriculum** and the consequences of this for ICT use:

"*An fadhb is mór, dár linn, le TFC i scoileanna, ná nach bhfuil áit dó ar an gcuraclam. Ní féidir an t-am a chaitheamh air i gcónaí mar go bhfuil brú ort in áiteanna eile ar an gcuraclam. Bíonn ort an chuid ama ag caitheamh ag ullmhú agus ag foghlaim chun TFC a chur i bhfeidhim sa seomra ranga i gceart agus le chuile rud eile atá le déanamh taobh amuigh den seomra ranga, ní bhíonn a dhóthain ama againn chun an foghlaim agus an ullmhúchán seo a dhéanamh*. [It seems to us that the biggest problem in relation to ICT in schools is that there is no place for it on the curriculum. You can't always spend time on it because there's pressure on you in other areas of the curriculum. You have to spend considerable time preparing and learning in order to properly implement ICT in the classroom, and with all the other things to be done outside the classroom, there isn't the time for this learning and preparation to be done] (P)

Principals, most frequently at primary level, also described **'overload' from multiple initiatives** being introduced in schools at the same time. One principal wrote: "*Curriculum is broad and initiatives are many. An e-learning plan has to take its place in the queue with Literacy/Numeracy development, SSE, Child Protection issues, etc."* (P)

A final theme relating to the topic of time is that of the length of **time spent by teachers and principals on rectifying ICT problems** as they arise. This was described as making ICT use in schools particularly time-consuming and thus limiting the extent to which ICTs are utilised in the classroom and in the wider school: "*ICT tends to take up a lot of time with niggly problems*." (P)

6.10 Teachers

Forty six primary principals (7%) made 56 comments (4% of all comments made by primary principals) which referred to the role of teachers in relation to ICT use in their schools. Six post-primary principals (5%) made nine comments (3%) and four special school principals (13%) each made one comment on this topic.

A portion of these comments referred to the **low motivation** of some teachers to utilise ICT in their delivery of the curriculum: "*I regret to say that the biggest obstacle I experience is a lack of willingness from a large number of staff to go beyond the very basics in this area*." (PP) Others reported **low levels of teacher expertise** in relation to ICT and reported that this has had a dampening effect on the extent to which ICT is used, or used effectively, in their schools. Correspondingly, a number of principals discussed **low levels of teacher confidence** in using ICT: "*…a number of staff with a fear of ICT make harnessing the full potential of ICT very difficult*." (P) Some principals identified older teachers as those lacking confidence in their ICT skills. Other principals revealed that they themselves lacked confidence with respect to ICT and that this also impacted on aspects of ICT use and e-learning planning in their schools. One principal commented: "*Biggest problem I find is that I'm not confident in this area myself*." (P)

Other principals took the opportunity to **praise the effort, enthusiasm and commitment of teachers** in relation to ICT. For example: "*We are fortunate to have a young, competent staff who actively engage in effective ICT*." (P). Principals described cases where teachers, proficient in the use or maintenance of ICT resources, had **shared their skills or expertise** with less proficient members of staff, and principals expressed their appreciation for this. For example:

> *Having a teacher on staff who completed her Masters in IT in Education has facilitated our school in reaching Digital School Status and her generosity towards the rest of the staff has allowed us all to reach a reasonable to excellent level of proficiency. It is short sighted to withdraw qualification allowances as we need leaders to up-skill in different areas of education and bring these skills back to schools.* (P)

Principals also described instances where teachers needed to **use their own computers, devices and other ICT resources** in order to fill gaps in resources available in the school. Principals praised teachers for this, but regretted that this should be necessary: "*Apps tend to be bought by individual teachers with their own money - this SHOULD NOT be the case*." (P)

6.11 NCTE (now PDST- Technology in Education)

Thirty primary principals (4.5%) made thirty comments (2.1%) about the NCTE. Five post-primary principals (3.8%) and one special school principal also commented on this topic.

Principals' comments on the NCTE referred to a number of issues. Several principals made general **calls for increased guidance from the NCTE** in relation to ICT development in their schools. Others expressed a **desire for advice on specific aspects of ICT**, e.g. advice on which computing devices they should purchase. Other principals praised the helpfulness of NCTE staff and expressed **appreciation for NCTE support and guidance received** by their schools. One principal wrote: *"NCTE are very supportive and helpful whenever contacted."* (PP) A small number of principals were critical of the NCTE and expressed dissatisfaction with support provided by the Centre:

> *Having been denied the third tranche of a grant through not having spent tranche two "on time" (I was husbanding resources in anticipation of equipping an extra classroom the following year) I am somewhat sceptical about the priorities exhibited by your organization. I feel another glossy report coming on (to be downloaded of course).* (P)

A number of comments expressed concerns at a perceived **lack of an overall vision or structure for ICT development** in Irish schools, and commented that the PDST might play a role in providing this. For example, one principal commented:

> *Forget the Laissez Faire attitude to the adoption of ICT. Each school making their own decisions about how to develop ICT leads to lack of overall progress in the development of ICT. Provide at least a basic structure and direction and set of standards as to what is required and then allow schools scope to develop beyond this.* (P)

6.12 e-Learning Planning

Principals of 19 primary schools (3%), six post-primary schools (5%) and two special schools (7%) made comments on the topic of ICT planning. These comments typically referred to principals' **intentions to produce, revise or update an e-Learning Plan**. For example: "*We have a draft policy on ICT but we do need to establish a committee to look into this area which continues to evolve*". (PP) A small number of principals described **obstacles to e-Learning planning**, including insufficient training, time constraints, and difficulties identifying staff members to take responsibility for this. One principal wrote: "*I attended an e-Learning day in the local education centre about 2 years ago. However, due to time constraints and the fact that no other staff members were trained we never compiled our school plan*" (P). **Funding considerations** were also included as barriers to e-Learning planning. One primary principal explained her attitude towards ICT planning: "*It seems foolhardy to develop an e-learning plan when there is no budget to support it.*" (P)

6.13 Websites

Eleven primary principals and one post-primary principal commented on the topic of websites. **Plans to set up, or develop, school websites**, **difficulties or delays in doing so**, and the **discontinuation of school websites** were all issues mentioned by principals. A small number of principals expressed

frustration at blocked access to relevant websites. One principal wrote: "*Blocked websites are my greatest headache!*" (P)

6.14 Work in progress

Ten primary principals (2%), eight post-primary principals (6%) and one special school principal made comments describing work in progress related to ICT. Comments on this topic referred to issues such as ongoing work on the **installation of a wireless network** or **upgrading of broadband services**. Several principals explained that development of their ICT infrastructure and their ICT planning had been postponed pending the completion of ongoing **school building or refurbishment work**. Other ICT developments were mentioned by individual principals, such as plans to set up a computer room and recent purchases of computing devices for staff and for pupils.

6.15 Projects (external)

Very small numbers of primary (n=8) and post-primary principals (n=2) commented on ICT-specific projects in which their schools were involved, and/or other projects in which their schools were involved that included considerable ICT use on the part of pupils and staff. A variety of projects at local, regional, national, European and international levels were mentioned. Principals mentioned typing programmes, code writing projects, video-conferencing with schools in other countries, and links with Institutes of Technology and other third-level institutions on ICT-related projects. No special school principal commented on external ICT-related projects in which they were involved.

6.16 Network

A small number of comments were made by primary and post-primary principals who called for **advice on establishing local area networks** within their schools, and for **funds to be made available** for this purpose. Comments on **network problems** experienced in the school were also provided by a small number of principals.

6.17 Other

Comments in the 'Other' category (n=54, 3% of comments across all school categories) related to a wide range of topics. At primary level, these included reports on experiences of different software programmes, the impact of loss of special needs assistants on levels of ICT use in classrooms, suggestions for ways in which ICT could be used to improve and standardise school administration, barriers to ICT use due to school building and infrastructure issues, as well as the impact of pupils' home environments on their ICT skills.

At post-primary level, comments referred to miscellaneous issues such as the cost of electronic books, experiences of ICT training received from private companies, comparisons between ICT use and infrastructure in Ireland and those in other countries, and the need for more efficient, ICT-based, administration systems in schools.

In the special schools category, principals mentioned issues such as objections to procurement frameworks and the need to move away from the necessity to keep hard-copy records in schools.

Chapter 7: ICTs in Teaching and Learning: Teachers' Data

This chapter examines the results of the teacher survey, conducted in primary, post-primary and special schools as part of the ICT schools census. As noted in Chapter 3, this is the first time that teachers have been surveyed as part of the ICT census, so results represent baseline data. It was also noted in Chapter 3 that the response rates of teachers, and patterns of respondents across schools, mean that great care should be exercised in extrapolating the findings to the respective populations of teachers in primary, post-primary and special schools.[44] As explained in Chapter 3, for the analyses presented in this chapter, no sampling weights have been applied, and no comparisons of sub-groups are made (e.g. by school DEIS status or teacher gender).

The chapter is divided into eight sections, and, within each section, broad comparisons between teachers' responses in primary, post-primary and special schools are made. In the concluding chapter, teachers' responses are compared to those of principals (Chapter 5). Results in this chapter are discussed under the following headings:

1. General characteristics of teachers in the ICT Census
2. Teaching beliefs and practices
3. Teachers' confidence and skill levels in using ICTs
4. Teachers' access to and usage of ICTs
5. Teachers' perceived priorities and obstacles in using ICTs
6. Teachers' perceived impact of ICT in teaching and learning
7. Teachers' participation in and views on CPD in ICT
8. Teachers' use of digital content.

7.1 Characteristics of the Teachers in the ICT Census

Tables 7.1, 7.2 and 7.3 show the distribution of primary, post-primary and special school teachers, respectively, across demographic and school characteristics. Readers are referred to Tables 3.3, 3.4 and 3.5 in Chapter 3 for information on the population characteristics of schools, and to Tables 3.6 – 3.9 for the results of regression analyses that assess the representativeness of the teacher respondents.

Across all three categories of school, a majority of teachers are female (84% in primary schools, 61% in post-primary schools, and 81% in special schools). In the case of primary schools, respondents are evenly split across second and fourth classes, while in post-primary schools, 53% responded to the questionnaire with respect to second year, and 47% with respect to fifth year. Across all three categories of school, a majority of teachers – around 70% – were aged 40 or younger.

At primary school level, the under-representation of teachers in small schools (see Tables 3.3 and 3.8 in Chapter 3) is evident from the distribution of teachers across school enrolment sizes, given that the number of teachers asked to complete the census in each school was not dependent on school

[44] In Chapter 3, it was noted that the percentage of teaching principals was much higher in small schools (i.e. with 60 or fewer pupils enrolled), and some of these principals would have been asked to complete a school and a teacher questionnaire, which is likely to have resulted in lower teacher questionnaire return rates in small schools.'

size (e.g. 18% taught in small schools with 60 or fewer pupils, compared to between 25% and 28% in medium, large and very large schools). The under-representation of teachers in small post-primary schools is also evident in Table 7.2 (cf. Tables 3.4 and 3.6, Chapter 3).

At primary level, 81% of teachers were working in non-DEIS schools, 6% in DEIS Band 1 schools, 5% in DEIS Band 2 schools, and 8% in DEIS Rural schools (this distribution is very close to the distribution of schools across DEIS categories; see Table 3.3). At post-primary level, 28% of teachers were in schools in the DEIS programme (again similar to the population of schools; Table 3.4). In terms of language of instruction, 7% of primary school teachers were in all-Irish schools, while a little under 10% of teachers at post-primary level were in all-Irish or mixed language schools.

The distribution of teachers across schools by gender composition and sector is similar to the populations at both primary and post-primary levels (see again Tables 3.3 and 3.4). Note that the responses of teachers in senior colleges (Table 7.2, n = 14) have been kept in the database, although half of these respondents did not indicate the year level (second or fifth) on which they were basing their responses.

Table 7.1: Distribution of primary teachers responding to the ICT survey across various teacher and school characteristics

Characteristic	N	%	Characteristic	N	%
Gender of Teacher			*School Size*		
Male	455	16.2	Small (1 to 60 pupils)	512	18.1
Female	2357	83.8	Medium (61 to 120 pupils)	797	28.2
			Large (121 to 240 pupils)	819	28.9
Class Level Taught			Very large (more than 240 pupils)	703	24.8
2nd	1399	49.9	*School DEIS Status*		
4th	1404	50.1	Not in DEIS	2284	80.7
			DEIS Band 1	176	6.2
Teaching Principal			DEIS Band 2	145	5.1
Yes	350	12.7	DEIS Rural	226	8.0
No	2414	87.3	*School Language*		
			English or mostly English	2638	93.2
Age Range			All Irish	193	6.8
20-30	990	35.1	*School Gender Composition*		
31-40	994	35.2	All boys	200	7.1
41-50	496	17.6	Mixed	2489	87.9
51+	340	12.1	All girls	142	5.0

Table 7.2: Distribution of post-primary teachers responding to the ICT survey across various teacher and school characteristics

Characteristic	N	%	Characteristic	N	%
Gender of Teacher			*School Size*		
Male	430	38.9	Small (250 or fewer students)	128	11.5
Female	674	61.1	Medium (251 to 450 students)	311	28.0
Year Level Represented			Large (451 to 600 students)	228	20.5
2nd	564	53.0	Very large (600 or more students)	443	39.9
5th	500	47.0			
Age Range			*School DEIS Status*		
20-30	312	28.2	Not in DEIS	796	71.7
31-40	427	38.6	In DEIS	314	28.3
41-50	221	20.0			
51+	146	13.2	*School sector/gender composition*		
Main Subject Taught			Secondary mixed	174	15.7
Mathematics	127	11.4	Secondary girls	148	13.3
Business Studies	111	10.0	Secondary boys	229	20.6
Science	100	9.0	Vocational	367	33.1
English	96	8.6	Community and Comprehensive	178	16.0
Irish	69	6.2	Senior colleges	14	1.3
European Language	67	6.0			
Materials Technology	61	5.5	*School Language*		
Geography	55	5.0	English	1005	90.5
History	45	4.1	Irish or mixed	105	9.5
Home Economics	39	3.5			
Technical Graphics	34	3.1	*Fee Paying Status*		
Art, Craft, Design	29	2.6	Fee paying	73	6.6
Others	110	9.9	Non fee paying	1037	93.4
N/A or missing	186	16.8			

Table 7.3: Distribution of special school teachers responding to the ICT survey across various teacher and school characteristics

Characteristic	N	%	Characteristic	N	%
Gender of Teacher			*School Size*		
Male	20	19.4	20 or fewer students	15	14.2
Female	83	80.6	21 to 40 students	18	17.0
Age Range			41 to 60 students	19	17.9
20-30	22	21.4	61 to 80 students	20	18.9
31-40	43	41.7	81 or more students	34	32.1
41-50	20	19.4			
51+	18	17.4			

7.2 Teaching Beliefs and Practices

The purpose of the results shown in this section is to provide a broad overview of the beliefs and practices of teachers, from which a context may be drawn for the interpretation of subsequent sections.

Table 7.4 shows teachers' responses to a set of questions relating to their beliefs about the nature of teaching and learning for primary, post-primary, and special schools. The response patterns tend to be biased towards agree and strongly agree: over 80% of teachers in all three school categories agreed with four or five of the items. Overall, response patterns across the three categories of school are very similar, which may be unexpected. Of interest, perhaps, is that there is less agreement generally on the extent to which teachers feel that constructivist, student-initiated learning is effective, as well as perceived effectiveness of a quiet environment for learning.

Table 7.4: Distribution of primary, post-primary and special school teachers' responses to eight statements about the nature of teaching and learning

Statement	Primary		Post-primary		Special	
	Disagree / strongly disagree	Agree / strongly agree	Disagree / strongly disagree	Agree / strongly agree	Disagree / strongly disagree	Agree / strongly agree
Effective/good teachers demonstrate the correct way to solve a problem	14.9	85.1	13.7	86.3	13.5	86.5
My role as a teacher is to facilitate students' own inquiry	2.0	98.0	3.3	96.7	4.8	95.2
Students learn best by finding solutions to problems on their own	15.0	85.0	13.4	86.6	18.4	81.6
Instruction should be built around problems with clear, correct answers, and around ideas that most students can grasp quickly	28.6	71.4	21.2	78.8	25.2	74.8
How much students learn depends on how much background knowledge they have – that is why teaching facts is so necessary	35.5	64.5	34.7	65.3	44.7	55.3
Students should be allowed to think of solutions to practical problems themselves before the teacher shows them how they are solved	2.7	97.3	6.7	93.3	6.7	93.3
A quiet classroom is generally needed for effective learning	57.2	42.8	60.1	39.9	60.6	39.5
Thinking and reasoning processes are more important than specific curriculum content	18.2	81.8	18.4	81.6	10.6	89.4

Table 7.5 shows the averages of the frequencies with which teachers reported various teaching and learning activities in primary, post-primary, and special schools, respectively, with values ranging from 1 (never or almost never) to 5 (every lesson or almost every lesson). Thus higher values indicate higher frequencies. The individual frequencies associated with Table 7.5 are shown in Tables A7.1, A7.2 and A7.3 in the Data Appendix.

Table 7.5: Means and standard deviations for teachers' responses regarding frequencies of 20 selected teaching and learning activities, in primary, post-primary and special schools

	Primary		Post-primary		Special	
Statement	Mean	SD	Mean	SD	Mean	SD
At the beginning of the lesson I present a short summary of the previous lesson	3.59	1.06	3.99	1.05	3.49	1.34
I ask my students to suggest or to help plan classroom activities or topics	2.06	0.96	2.01	1.05	2.07	1.23
Students make a product that will be used by someone else	**1.55**	0.75	**1.63**	0.99	**1.43**	0.79
I review with the students the homework they have prepared	4.28	1.06	4.20	1.05	3.07	1.75
I ask my students to write an essay in which they are expected to explain their thinking or reasoning at some length	**1.90**	1.05	**1.90**	1.23	**1.53**	0.98
I check, by asking questions, whether or not the students have understood the subject matter	4.73	0.65	4.64	0.74	4.21	1.34
Students work in small groups to come up with a joint solution to a problem or task	3.15	0.93	2.96	1.12	2.59	1.42
I explicitly state learning goals/outcomes	3.37	1.21	4.07	1.04	3.51	1.43
I give different work to the students that have difficulties learning and/or to those who can advance faster	3.96	1.02	3.26	1.27	4.56	0.96
Students work on projects that require at least one week to complete	**2.24**	1.01	**2.39**	1.29	**2.42**	1.38
Students work in groups based on their abilities	2.74	1.16	2.10	1.20	3.44	1.57
Students hold a debate and argue for a particular point of view which may not be their own	**1.88**	0.92	**1.86**	1.04	**1.49**	0.82
Students give feedback on other students' work	**2.31**	1.02	**2.05**	1.13	**1.97**	1.11
Students use teacher feedback to revise their own work before receiving a final grade	**2.46**	1.18	**2.47**	1.31	**2.28**	1.38
Students choose how they will accomplish a task or how they will demonstrate what they have learned	**2.28**	1.07	**2.22**	1.20	**2.16**	1.21
I adjust the pace of instruction to respond to the students' levels of understanding	4.49	0.78	4.44	0.81	4.88	0.49
I adjust assignments for individual students based on their knowledge, skills or learning needs	4.03	1.03	3.39	1.31	4.81	0.56
I select topics, activities, or examples that are relevant to students' lives outside of school	3.75	0.98	3.79	1.15	4.43	0.83
Students work with members of the community or peers from outside the school on a class project	**1.80**	0.98	**1.61**	0.98	**1.99**	1.30
I check my students' exercise/copy books	4.82	0.49	4.14	0.98	4.24	1.37

Note. Response categories are 1=never or almost never, 2=in about a quarter of lessons, 3=in about half of lessons, 4=in about three quarters of lessons, 5=in all or almost all lessons.

Values greater than 3.5 (indicating relatively high frequency) are shaded in grey; values less than 2 (indicating relatively low frequency) are in bold.

Similar to the results shown in Table 7.4, the patterns of responses are generally consistent across the three categories of school. For example, teachers reported checking students' exercise or copybooks, checking understanding by asking questions, and adjusting the pace of instruction to respond to students' levels of understanding, very frequently in primary, post-primary and special schools. Teachers in special schools, however, reported adjusting assignments according to individuals' needs and selecting topics relevant to students' life outside school more frequently than teachers in primary and post-primary schools.

Some activities were very infrequent; a few of these not surprisingly so: for example, teachers in all three school types infrequently reported that students made a product to be used by someone else. The low frequency on engaging in teaching and learning activities such as having students debate topics and argue for a point of view that is not their own, asking students to write an essay and explain their thinking and reasoning at length, and working on a class project with members of the local community or peers from outside of the school, suggests a low emphasis on constructivist and/or group-based teaching practices. Peer-to-peer feedback and providing choice in task completion or demonstration of understanding were also relatively infrequent.

7.3 Teachers' Confidence and Skill Levels in Using ICTs

The teacher survey asked respondents to rate their own levels of confidence in using ICTs for specific purposes. Table 7.6 shows the means and standard deviations of their self-rated skill levels in each of 23 areas. Values range from 1 (no skill) to 4 (high skill level), so higher average scores indicate higher levels of skill. The individual frequencies associated with Table 7.6 are shown in Tables A7.4, A7.5 and A7.6 in the Data Appendix.

Across all three categories of school, teachers reported high levels of skill with the more basic ICT activities, such as word processing, using email, using the Internet to find educational resources, downloading/editing curriculum resources, and organising files into folders. However, in general, they were much less familiar or less skilled with tasks associated with 'Web 2.0' tools and social networking. It is worth noting that teachers' skill levels in working with spreadsheets and presentation software are noticeably lower than their skill levels in using word processing software, email, and using the Internet.

Note that these questions did not ask about teachers' levels of familiarity with various tasks that could be associated with providing technical support for computers, such as implementing software updates, installing new apps or software, identifying a virus and getting rid of it, or updating or re-setting login details.

7.4 Teachers' Access to and Usage of ICTs

This section examines first, whether and how often teachers have access to various digital equipment and resources; second, the frequency with which they use ICTs to support teaching and learning; third, the frequency of ICT use by their students, and lastly, their use of ICTs for assessment purposes.

Table 7.7 shows, for teachers in primary, post-primary and special schools, the frequency with which they access and use various ICT equipment and resources during class time. The 'frequently' and 'often/always' categories have been combined.

Table 7.6: Means and standard deviations for teachers' responses regarding perceived skill level for 23 ICT-related activities, in primary, post-primary and special schools

	Primary		Post-primary		Special	
Statement	Mean	SD	Mean	SD	Mean	SD
Producing a simple document using word processing software	3.71	0.59	3.81	0.51	3.85	0.41
Communicating with others via email	3.77	0.54	3.84	0.46	3.92	0.34
Using the Internet to find educational resources	3.78	0.48	3.86	0.41	3.88	0.36
Downloading images, software and other files from the Internet	3.63	0.65	3.74	0.59	3.80	0.55
Uploading images, software and other files to the Internet	3.20	0.93	3.41	0.91	3.62	0.71
Downloading and editing of curriculum resources	3.42	0.75	3.57	0.75	3.62	0.72
Editing and uploading of curriculum resources	3.06	0.97	3.29	0.95	3.42	0.94
Organising computer files into folders and sub-folders	3.44	0.85	3.60	0.77	3.66	0.71
Creating a basic spreadsheet	2.85	1.05	3.27	1.00	3.06	1.07
Creating a basic presentation incorporating images and simple animation	2.96	1.06	3.39	0.94	3.32	0.93
Creating a presentation incorporating video or audio	2.59	1.11	3.01	1.10	2.98	1.04
Contributing to an online blog or wiki	**2.16**	1.09	**2.41**	1.19	**2.38**	1.15
Creating and maintaining a website or blog	**2.03**	1.09	**2.22**	1.20	**2.01**	1.10
Participating in an online social network or forum	2.58	1.16	2.60	1.22	3.07	1.10
Creating materials to use with interactive whiteboard (IWB) software	2.58	1.07	**2.01**	1.16	2.72	1.05
Using ICT to record, edit and playback audio	**2.42**	1.09	**2.50**	1.18	2.80	1.07
Using a digital video camera	3.04	0.99	2.96	1.11	3.44	0.90
Editing a digital video recording	**2.26**	1.11	**2.36**	1.22	2.56	1.25
Using a computer programming language	**1.64**	0.92	**1.79**	1.08	**1.79**	1.08
Using social networking for educational purposes	**1.88**	1.03	**2.13**	1.18	**2.15**	1.20
Using other Web 2.0 tools (e.g., blogs, wikis)	**1.77**	0.98	**1.97**	1.11	**1.95**	1.03
Understanding of copyright and fair use issues	**2.48**	1.01	2.54	1.09	2.68	0.94
Understanding of safe and responsible use of the Internet	3.37	0.78	3.33	0.87	3.48	0.79

Note. Response categories are 1=none, 2=basic, 3=moderate, 4=high.
Values greater than 3.5 (indicating relatively high skill) are shaded in grey; values less than 2.5 (indicating relatively low skill) are in bold.

At each level, at least 90% of teachers reported that they had access to a computing teaching device such as a desktop computer or laptop always or often, with access at primary level almost universal (Table 7.7). Access to a digital projector was somewhat greater among teachers at post-primary level (95%) than at primary level (81%) or in special schools (67%). In contrast, teachers in primary schools (87%) and special schools (67%) have greater access to interactive whiteboards than teachers in secondary schools (30%). Other equipment, such as visualisers, digital cameras and video cameras are more accessible to teachers in primary schools and special schools, compared with their counterparts in secondary schools. Over 90% of teachers in each sector reported that they had access to online resources.

At all three levels, a large minority of students did not have regular access to individual computing devices (i.e., one-on-one student access). At primary level, 46% of teachers reported that individual

students in their classes never had access to a dedicated computing device, while 42% of teachers at post-primary level, and 31% in special schools reported likewise. At post-primary level, 32% of teachers reported that their students never had access to a shared computing device. Proportions at primary level (15%) and in special schools (8%) were considerably lower. It is unclear whether these data reflect a lack of willingness on the part of teachers to source computers (for example, by booking a computer room), or whether they relate to actual shortages of computing devices. However, teacher comments discussed in Chapter 8 suggest the latter. In addition, Chapter 8 raises issues in accessing computer rooms. Again, according to Table 7.7, 12% of post-primary teachers reported that, when their students were in dedicated computer room, they did not have access to a dedicated computer. Corresponding proportions reported by teachers in primary and special schools were 58% and 55% respectively. The estimate for primary schools may arise because smaller schools in that sector may have fewer computers in their computer rooms (where available) compared with larger primary schools and secondary schools.

Just 3% of teachers at primary level, 14% at post-primary level, and 27% in special schools reported that students were allowed to use their own devices (such as tablets, smartphones and cameras) often or always. This may reflect both the relatively recent access of students to affordable personal devices, and concerns in schools about use of mobile phones and access to Internet sites. Given that many students don't have access to their own devices to support their learning, it is perhaps not surprising that 78% of teachers at primary level, 65% at post-primary level, and 58% in special schools reported that students never had access to online resources on their mobile computing devices.

Almost 40% of teachers at primary level, 38% at post-primary level, and 19% in special schools reported that their students 'never' had access to dedicated computing devices to meet their learning needs. One third of teachers at primary level, 40% at post-primary level, and just 7% in special schools reported that their students never had access to the software and/or applications to meet their learning needs.

Teachers were asked how often they used ICTs for 23 different purposes during class time (Table 7.8). Purposes for which at least three quarters of teachers in at least one sector engaged with ICT often or always tended to relate to preparation for lessons and included:

- Presenting information or giving class instruction to pupils (80% of teachers in primary and post-primary schools, and 66% in special schools did this often or always)
- Using curriculum-related online resources for lesson preparation (75% in primary schools, 68% in post-primary schools, and 67% in special schools)
- Using applications such as word processing and presentation software to prepare resources for class (72% in primary schools, 81% in post-primary schools, and 75% in special schools)
- Using curriculum-relevant online resources to support teaching and learning (72% of teachers in primary schools, 63% in post-primary schools, and 66% in special schools)

Table 7.7: Teacher-reported access to 14 types of ICT equipment and resources during class time, in primary, post-primary and special schools (percentages of teachers)

	Primary			Post-primary			Special		
Resource	Never	Some-times	Often/ Always	Never	Some-times	Often/ Always	Never	Some-times	Often/ Always
I have access to a teaching computing device	0.6	1.0	98.4	2.0	1.8	96.2	4.8	3.8	91.3
I have access to a digital projector	14.9	4.4	80.7	2.9	2.3	94.8	26.7	5.9	67.3
I have access to an interactive whiteboard (IWB)	10.6	2.0	87.4	58.1	12.2	29.7	22.1	8.7	69.2
I have access to a visualiser	29.8	9.5	60.8	55.9	13.2	30.8	63.7	9.8	26.5
I have access to a digital camera	3.2	10.1	86.7	24.5	25.2	50.3	2.9	8.7	88.5
I have access to a video camera	33.7	15.6	50.7	37.3	21.8	40.9	22.5	12.7	64.7
I have access to online resources	1.9	4.2	94.0	3.9	4.1	92.0	1.0	4.9	94.2
Each student has access to a dedicated computing device	46.3	28.2	25.4	42.1	36.3	21.6	31.4	23.5	45.1
Students have access to a shared computing device	14.5	33.9	51.6	31.5	36.9	31.7	7.7	17.3	75.0
Students may use their own devices (e.g., tablets, smartphones, cameras) to support their learning	85.1	11.5	3.4	62.4	23.5	14.1	43.7	29.1	27.2
Students have access to online resources on their mobile computing devices	77.7	10.3	12.0	65.1	17.2	17.7	57.8	17.6	24.5
In a computer room setting, students have access to a dedicated computing device	58.0	12.1	29.8	12.2	11.8	76.0	55.3	4.9	39.8
My students have access to dedicated computing devices to meet their learning needs	39.0	20.1	40.9	38.3	17.5	44.1	19.2	17.3	63.5
My students have access to software and/or applications to meet their learning needs	33.3	22.0	44.6	39.8	19.1	41.1	6.8	20.4	72.8

Purposes not listed above, for which between 40% and 75% of teachers in at least one sector used ICTs sometimes or always, included several related to instruction and assessment:

- Conducting classroom demonstrations such as computer-based simulations and virtual labs (50% of teachers at primary level, 59% at post-primary level, and 47% in special schools)
- Creating multi-media resources, incorporating sound, video, images or other digital media for use in class (30% in primary schools, 43% in post-primary schools, and 43% in special schools)
- Supporting the development of higher-order thinking skills in students (38% in primary schools, 42% in post-primary schools, and 23% in special schools)
- Recording student work for assessment purposes, using equipment such as digital cameras/ digital video (26% in primary schools, 17% in post-primary schools, and 56% in special schools)
- Supporting a range of learning styles (41% in primary schools, 48% in post-primary schools, and 61% in special schools)

- Providing differentiated learning or own-pace learning to support the development of literacy (44% in primary schools, 36% in post-primary schools, and 64% in special schools).

Examples of purposes for which teachers used ICTs infrequently (fewer than 25% in any category of school) included several related to communication with parents and students, display of students' learning and collaboration with other teachers:

- Communicating with students (e.g., email) (3.5% of teachers in primary schools, 20% in post-primary schools, and 6% in special schools did so often or always)
- Communicating with parents by email (10% in primary and post-primary schools, and 9% in special schools)
- Communicating with experts, teachers in other locations, or other community members to enrich student learning (11% in primary schools, 22% in post-primary schools, and 14% in special schools)
- Publishing students' work online (11% in primary schools, 6% in post-primary schools, and 8% in special schools)
- Posting teaching or learning resources on the Internet for other teachers or students (7% of teachers in primary schools, 20% in post-primary schools, and 10% in special schools).

Hence, the purposes for which teachers most frequently use ICTs are mainly related to preparation for teaching or presenting material to students. Those purposes for which teachers use ICTs with moderate frequency include supporting students' development of higher-order thinking skills, providing differentiated learning, supporting a range of learning styles, and assessing students' learning. Purposes for which teachers use ICTs infrequently include several related to communication with parents, other teachers, and students.

While differences in purposes for which ICTs were used were relatively small across primary, post-primary and special schools, it is notable that greater numbers of teachers in special schools reported using ICTs for supporting students' learning styles, and for differentiating their learning to support the development of literacy and numeracy. Teachers in post-primary and special schools tended to use ICTs more frequently for assessment purposes than their counterparts in primary schools.

Table 7.8: Teacher-reported use of ICT for 23 various purposes during class time and in preparation and planning activities, in primary, post-primary and special schools

	Primary			Post-primary			Special		
Resource	Never	Some-times	Often/ Always	Never	Some-times	Often/ Always	Never	Some-times	Often/ Always
Present information or give class instruction to students	1.4	18.5	80.1	3.4	16.9	79.7	15.5	19.1	65.5
Conduct classroom demonstrations (e.g., computer-based simulations, virtual labs)	17.9	31.6	50.4	14.8	26.3	58.9	29.1	23.6	47.3
Use curriculum-relevant online resources for lesson preparation (e.g., websites, blogs and wikis)	2.4	23.0	74.6	5.0	27.5	67.6	13.6	19.1	67.3
Use applications such as word processing and presentation software to prepare resources for class	4.6	23.0	72.3	4.4	14.5	81.1	12.7	12.7	74.5
Create multimedia resources, incorporating sound, video, images or other digital media for use in class	30.5	39.8	29.7	23.0	34.1	42.9	28.2	29.1	42.7
Use curriculum relevant online resources to support teaching and learning (e.g., websites, blogs and wikis)	4.4	24.0	71.6	6.8	30.1	63.1	15.5	18.2	66.4
Communicate with students (e.g., email)	88.1	8.3	3.6	53.3	26.7	20.0	89.1	4.5	6.4
Collaborate with experts, teachers in other locations, or other community members to enrich student learning	54.5	34.9	10.6	39.1	38.9	22.1	49.1	37.3	13.6
Publish students' work online	58.8	30.2	11.0	81.2	13.1	5.8	77.3	14.5	8.2
Support the development of higher order thinking in students	14.0	47.6	38.4	18.3	39.5	42.2	32.7	44.5	22.7
Post teaching or learning resources on the Internet (e.g., on a blog or wiki) for other teachers or students	77.9	14.6	7.4	59.8	20.6	19.6	77.3	12.7	10.0
Use social networks in teaching and learning	78.7	14.0	7.2	72.0	16.5	11.6	74.5	16.4	9.1
Record student work for assessment purposes (e.g., digital camera, digital video)	28.5	46.0	25.5	53.7	29.5	16.8	18.2	26.4	55.5
Support assessment of learning (summative assessment)	30.3	46.2	23.4	29.2	37.9	32.9	27.3	37.3	35.5
Support assessment for learning (formative assessment)	31.0	46.7	22.3	29.3	35.6	35.1	27.3	41.8	30.9
Support student-to-student peer assessment	63.1	27.3	9.6	49.7	28.5	21.8	73.6	14.5	11.8
Support collaboration between students for learning (e.g., live chat, online forums, school VLE)	88.8	8.2	3.0	77.7	11.4	10.9	81.8	12.7	5.5
Support students to reflect on their own learning	44.3	39.3	16.4	37.4	31.3	31.3	50.9	27.3	21.8
Support a range of student learning styles	15.5	43.4	41.2	16.3	35.3	48.4	16.4	22.7	60.9
Provide differentiated learning or own-pace learning to support the development of literacy	13.4	42.9	43.8	27.1	36.9	36.0	16.4	20.0	63.6
Provide differentiated learning or own pace learning to support the development of numeracy	11.9	41.9	46.2	33.3	34.1	32.6	18.2	20.9	60.9
Support the learning of students with special educational needs	14.0	34.4	51.6	20.7	32.4	47.0			
Communicate with parents (e.g., by email)	73.3	17.0	9.7	71.7	18.6	9.7	71.8	19.1	9.1

Table 7.9 broadly confirms the patterns that were observed in Table 7.8. Here, 85% of teachers in primary schools, 90% in post-primary schools, and 87% in special schools reported that they used ICTs to prepare for class often or always, while over 80% in each sector reported using ICTs with similar frequency during class time. Use of ICTs by students during lessons was less frequent, with one-third of teachers in primary schools, just under one-quarter in post-primary schools, and slightly over one-half in special schools reported that this happened often or always. At post-primary level, over a quarter of teachers reported that their students never used ICTs during class time. Teachers in post-primary schools reported that ICTs were used more frequently by their students for homework or study (22% said this happened often or always) compared with teachers in primary schools (11%) and special schools (7%).

Table 7.9: Teacher-reported frequency of ICT usage by themselves and their students, in primary, post-primary and special schools

	Primary			Post-primary			Special		
ICT used…	Never	Some-times	Often/ Always	Never	Some-times	Often/ Always	Never	Some-times	Often/ Always
By me, in preparing for my classes	0.6	14.1	85.3	0.8	9.7	89.5	1.0	11.9	87.1
By me, during class time	1.1	16.7	82.1	2.5	16.2	81.3	3.0	16.8	80.2
By my students, during class time	9.0	58.3	32.8	27.6	49.4	23.0	7.9	38.6	53.5
By my students, for homework or study (as directed by me)	33.3	55.7	11.0	22.4	56.1	21.5	63.4	29.7	6.9

Teachers were also asked to indicate the frequency with which they or their students used ICTs for 16 learning-related activities (Table 7.10). Activities that were carried out often or always by at least one-third of teachers in at least one sector were:

- Reinforcing and practicing routine skills and procedures (36% of teachers in primary schools, 23% in post-primary schools, and 62% in special schools)
- Finding information on the Internet (teacher-directed) (45% in primary schools, 43% in post-primary schools, and 49% in special schools)
- Carrying out research on the Internet (student-led) (32% in primary schools, 38% in post-primary schools, and 35% in special schools).

At number of ICT-based activities were also implemented infrequently in classrooms (i.e., at least half of teachers in one or more sectors never used them). These included:

- Analysing data or information (49% of teachers in primary schools, 49% post-primary schools, and 61% in special schools never used them)
- Using e-books (53% in primary schools, 74% in post-primary schools, and 51% in special schools)
- Creating presentations using a range of media (66% in primary schools, 54% in post-primary schools, and 51% in special schools)
- Working with students or adults from outside class (e.g., students in other schools, adult mentors) (88% in primary schools, 84% in post-primary schools, and 86% in special schools).

- Creating simulations or animations of a system or abstract concept (85% in primary schools, 77% in post-primary schools, and 78% in special schools).

Hence, while learning activities such as reinforcing and practicing routine skills and finding information on the Internet, whether teacher- or student-led, were practised relatively frequently, other more higher-order activities, such as analysing data, creating presentations, and working with students or adults outside the classroom featured much less frequently.

Table 7.10: Teacher-reported use of ICT in 16 various learning activities with their students, in primary, post-primary and special schools

	Primary			Post-primary			Special		
Learning activity	Never	Some-times	Often/ Always	Never	Some-times	Often/ Always	Never	Some-times	Often/ Always
Reinforce and practice routine skills and procedures	12.2	52.1	35.7	30.7	46.3	23.0	12.9	24.8	62.4
Submit homework	81.3	16.1	2.6	64.5	25.5	10.0	88.1	9.9	2.0
Use e-books	53.0	31.7	15.2	74.3	16.9	8.9	50.5	33.7	15.8
Find information on the Internet (teacher directed)	8.3	46.5	45.2	8.4	48.3	43.2	28.7	22.8	48.5
Carry out research on the Internet (student led)	21.9	46.1	32.0	14.7	46.9	38.4	38.6	26.7	34.7
Publish and present work online	69.4	25.0	5.7	79.4	14.5	6.1	77.2	13.9	8.9
Work with spreadsheets and databases	79.0	17.7	3.3	65.5	26.8	7.8	75.2	14.9	9.9
Use datalogging tools (e.g., for weather/environment)	74.4	22.2	3.4	79.2	15.8	5.0	78.2	16.8	5.0
Analyse data or information	49.3	44.5	6.1	48.7	38.6	12.7	61.4	31.7	6.9
Create presentations using a range of media (e.g., podcast, video)	65.9	27.8	6.3	54.3	32.5	13.2	50.5	35.6	13.9
Use simulations or animations to explore a system or abstract concept	69.9	24.1	6.0	60.9	25.9	13.1	62.4	25.7	11.9
Create simulations or animations of a system or abstract concept	85.3	12.3	2.5	77.4	16.8	5.8	78.2	11.9	9.9
Use social networks for school related learning activities	92.2	6.2	1.7	77.3	15.6	7.1	90.1	6.9	3.0
Collaborate with peers from class through email, videoconferencing, or online forums	91.6	6.6	1.8	75.8	17.1	7.0	85.1	11.9	3.0
Work with students or adults from outside class (e.g., students from other schools or adult mentors)	87.6	10.8	1.6	83.5	12.5	4.0	86.1	11.9	2.0
Give feedback to peers or assess other students work	78.8	17.7	3.5	71.8	20.6	7.7	81.2	14.9	4.0

Teachers also reported on the frequency with which they used ICTs for various assessment activities. In general, ICTs were not used widely for assessment purposes. For example, just 9% of teachers in primary schools, 18% in post-primary schools, and 16% in special schools reported that their students gathered evidence of learning using an e-Portfolio approach sometimes or more often (Table 7.11). Similarly, 82% of teachers in primary schools, 79% in post-primary schools, and 70% in special schools reported that their students never took a test digitally, with feedback on their performance.

There is some evidence of a greater use of ICTs for assessment purposes in special schools. For example, 67% of teachers in special schools, compared with 45% in primary schools and 39% in post-primary schools, reported that they used a variety of digital tools to assess students' work sometimes or more often. Similarly, 49% of teachers in special schools, compared with 29% in primary schools and 31% in post-primary schools, reported that they use digital tools to provide feedback to students on their learning sometimes or more often.

Table 7.11: Teacher-reported use of ICT for 10 various assessment activities during class time, in primary, post-primary and special schools

	Primary			Post-primary			Special		
Assessment activity	Never	Some-times	Often/ Always	Never	Some-times	Often/ Always	Never	Some-times	Often/ Always
My students gather evidence of learning using an e-Portfolio approach	91.3	6.9	1.8	81.6	12.3	6.0	84.2	11.9	4.0
My students submit their work as an e-Portfolio	94.3	4.5	1.1	84.6	11.2	4.2	94.1	3.0	3.0
My students use a range of ICT tools to gather evidence of learning	52.2	39.6	8.2	40.5	42.9	16.6	45.5	36.6	17.8
I use a variety of digital tools to assess students' work	55.5	37.0	7.5	61.0	28.8	10.2	32.7	45.5	21.8
I use digital tools to provide feedback to students on their learning	71.2	24.8	4.0	69.0	23.1	8.0	51.5	38.6	9.9
My students take a test digitally, without feedback on their performance	87.6	10.8	1.5	89.6	7.3	3.1	88.1	8.9	3.0
My students take a test digitally, with feedback on their performance	81.9	14.5	3.5	78.8	14.9	6.3	70.3	20.8	8.9
My students submit essays, reports or projects in digital format	67.7	26.4	5.9	60.9	29.1	10.0	72.3	17.8	9.9
My students' marks are recorded in an digital grade book or spreadsheet	65.4	21.1	13.5	55.7	15.1	29.2	84.2	5.9	9.9
My students' performance is analysed digitally (e.g., the distribution of performance of the class, or areas of strength and weakness in a particular area) and my class/lesson planning is based on this	62.8	25.3	11.9	69.9	16.4	13.7	83.2	6.9	9.9

7.5 Teachers Perceived Priorities and Obstacles in Using ICTs

Table 7.12 shows the percentages of teachers in primary, post-primary and special schools who gave a rating of 'Very High Priority' to 13 areas of ICT. Tables A7.7, A7.8 and A7.9 show the frequencies of the four response categories (very low priority, low priority, high priority, very high priority) for primary, post-primary and special school teachers, respectively.

The three highest ranked priorities in each sector, with 40-50% of teachers rating them as very high priority, were access to high-quality broadband via the school (fixed) network, access to high-quality broadband via the school wireless network, and technical support to ensure that ICT equipment is always working.

Between 20% and 30% of teachers in each sector allocated a very high priority to such activities as accessing curriculum-related online digital content/resources, accessing a wider range of online tools and applications, and accessing a dedicated computing device for lesson preparation and for use in class. Marginally fewer teachers in primary and post-primary schools (19%), but more in special schools (27%) identified student access to mobile computing devices as a very high priority.

Activities such as access to a virtual learning environment and access to ICTs to communicate with parents were identified as being very important by fewer than 10% of teachers in each sector.

Table 7.12: Percentages of teachers reporting that ICT activities are very high priorities, in primary, post-primary, and special schools

Priority area	Primary	Post-primary	Special
Access to ICT-related CPD	9.0	15.4	22.2
Access to curriculum-related online digital content/resources	23.0	23.9	27.0
Access to a wider range of online tools and applications	20.0	23.9	20.8
Access to an online network of teachers in a similar context to my own, to share ideas, resources and for opportunities to collaborate	12.3	20.3	18.8
Access to a dedicated computing device for lesson preparation and for use in class	22.1	27.2	28.0
Access to other suitable ICT equipment in class	23.0	27.2	33.7
Access to high quality broadband via the school network	42.8	43.4	46.0
Access to high quality broadband via the school wireless network	42.3	45.9	44.6
Student access to mobile computing devices	19.2	19.4	26.7
Access to ICT equipment, software and applications for students with special educational needs	28.8	27.2	---
Access to a virtual learning environment (VLE)	10.0	16.1	16.5
Access to ICT to communicate with parents	5.5	8.6	9.0
Technical support to ensure that ICT equipment is always working	44.5	49.6	48.0

Note. Dark grey shading is used where 40% or more of teachers selected a category as high priority, and light grey shading is used where 20-40% of principals selected a category as high priority.

Teachers were asked to select the six most significant obstacles (from a list of 17-18) to the effective use of ICT to support teaching and learning, and to rank these from 'most significant' to 'sixth most significant'. It should be noted, unlike school principals (Chapter 5, Table 5.7), teachers were not directed to set aside concerns about funding in ranking obstacles. Table 7.13 shows the mean rating and rank of each obstacle in primary, post-primary and special schools. Higher rating scores imply

higher, or more pressing, obstacles. The obstacles were then ranked from highest to lowest in each school category. The six top-rated obstacles in each category are highlighted.

Table 7.13: Mean ratings and ranks of obstacles to using ICTs to support teaching and learning as reported by teachers, in primary, post-primary and special schools

	Primary		Post-primary		Special	
	Mean rating	Rank	Mean rating	Rank	Mean rating	Rank
My own low level of ICT skills	0.828	12	0.785	13	1.137	6
My own low level of confidence regarding the use of ICT	0.949	11	0.699	15	0.912	10
My own low level of knowledge of how to use ICT effectively in teaching and learning	1.096	8	0.805	12	0.941	9
My own insufficient awareness of suitable ICT-related CPD opportunities	0.853	13	0.911	9	0.755	12
My own insufficient access to suitable ICT-related CPD opportunities	0.669	15	0.680	16	0.853	11
My own insufficient awareness of suitable digital content	1.138	7	0.704	14	1.196	5
My own insufficient access to suitable digital content	0.642	17	0.391	17	0.480	16
My own insufficient access to ICT	0.340	16	0.369	18	0.431	17
Insufficient access to ICT for students	1.411	5	1.414	5	0.775	13
Insufficient access to high quality broadband	1.060	9	0.908	10	1.010	7
Age of computing devices	1.342	6	1.236	8	1.471	4
Insufficient levels of technical support	1.619	3	1.261	7	1.583	3
Insufficient time for planning and preparation	1.829	2	1.643	2	1.598	2
Insufficient levels of pedagogical support	1.003	10	0.899	11	0.980	8
Blocked access to relevant websites	1.573	4	1.322	6	1.637	1
Difficulties accessing computer room	0.808	14	1.494	4	0.735	14
Pressure to cover the prescribed curriculum	2.272	1	--	--	--	--
Pressures relating to State examinations	--	--	1.920	1	0.549	15
Timetabling arrangements	--	--	1.510	3	0.775	13

Note. Higher rating scores imply more significant challenges. Most, second most and third most significant obstacles are shaded in dark grey, while fourth, fifth and sixth most significant are shaded in light grey.

Among teachers in primary schools, pressure to complete the curriculum was identified as the most serious obstacle to implanting ICTs to support teaching and learning. Insufficient time for planning and insufficient levels of technical support were the second and third highest-ranked obstacles, while blocked access to relevant websites, insufficient access to ICT for students, and age of computing devices also featured in the top six obstacles identified by teachers in primary schools.

The highest ranking obstacles identified by teachers in post-primary schools all related to lack of time, including pressure relating to the State Examinations, insufficient time for planning and preparation, and timetabling arrangements. Other high-ranking obstacles at this level included difficulties in accessing the computer room, insufficient access to ICTs for students, and blocked access to websites. Insufficient levels of technical support ranked just seventh in this sector.

Teachers in special schools identified blocked access to relevant websites as the main obstacle to using ICTs to support teaching and learning. Insufficient time for planning and preparation, and insufficient levels of technical support ranked second and third, respectively. Teachers in special

schools also raised age of computing devices (fourth most serious obstacle), their own insufficient awareness of suitable digital content (fifth) and their own low levels of ICT skills. Hence, teachers in this sector are unique in pointing to personal as well as structural obstacles to use of ICTs to support teaching and learning.

7.6 Teachers' Perceptions of the Impact of ICT on Teaching and Learning

Tables 7.14, 7.15 and 7.16 (primary, post-primary and special schools, respectively) show teachers' responses to a question that asked them what impact, in their view, ICTs had on various aspects of teaching and learning. Across the three tables, it can be inferred that the perceived impact of ICTs is overwhelmingly positive, though there is some variation across areas of teaching and learning, as well as across category of school. For example, the most marked increases arising from use of ICTs were reported in the areas of student interest and engagement, range of teaching methodologies, and amount of lesson planning and preparation, while there were less marked increases in the performance of students on tests and on homework.

Across school categories, post-primary teachers were less likely to perceive an increase in their ability to improve literacy and numeracy across the curriculum, than teachers in primary and special schools. Also, teachers in special schools were much less inclined to report increases in students' performance on tests and homework assignments than teachers in primary and post-primary schools.

Table 7.14: Percentages of teachers reporting that ICT has had a positive impact (increase), no impact, or a negative impact (decrease) on various aspects of teaching and learning – primary schools

Area	Decrease	No Change	Increase
The range of teaching methodologies I use	1.2	11.8	87.0
The amount of planning and preparation for lessons	3.7	15.9	80.4
The depth of subject matter knowledge covered	0.8	15.3	83.9
My ability to address the needs of lower-achieving students	1.0	24.3	74.7
My ability to address the needs of higher-achieving students	0.9	18.5	80.6
My ability to improve literacy across the curriculum	0.7	18.2	81.1
My ability to improve numeracy across the curriculum	0.7	14.7	84.7
My ability to meet the needs of students with special educational needs (SEN)	0.7	39.1	60.2
Students' levels of interest and engagement	0.7	9.0	90.3
The depth of questions asked by students	0.8	32.5	66.7
The relevance of questions asked by students	1.5	38.8	59.7
The quality of students' responses to questions I ask.	1.3	36.5	62.2
The levels of positive interaction among students during classes	1.2	26.4	72.4
The performance of students on standardised tests	1.0	56.5	42.5
The performance of students on other tests	1.0	54.3	44.7
The performance of students on homework assignments	2.3	57.4	40.3
The ability of students to work independently	3.2	41.5	55.3
The willingness of students to source additional materials	1.7	20.3	78.0

Table 7.15: Percentages of teachers reporting that ICT has had a positive impact (increase), no impact, or a negative impact (decrease) on various aspects of teaching and learning – post-primary schools

Area	Decrease	No Change	Increase
The range of teaching methodologies I use	1.3	12.3	86.3
The amount of planning and preparation for lessons	3.5	15.2	81.3
The depth of subject matter knowledge covered	0.9	23.6	75.6
My ability to address the needs of lower-achieving students	1.5	27.0	71.5
My ability to address the needs of higher-achieving students	1.2	22.7	76.1
My ability to improve literacy across the curriculum	1.1	31.5	67.4
My ability to improve numeracy across the curriculum	1.4	40.1	58.5
My ability to meet the needs of students with special educational needs (SEN)	1.0	44.5	54.4
Students' levels of interest and engagement	1.7	15.1	83.2
The depth of questions asked by students	2.4	38.8	58.8
The relevance of questions asked by students	3.0	41.4	55.5
The quality of students' responses to questions I ask.	2.6	39.3	58.1
The levels of positive interaction among students during classes	2.1	28.9	69.0
The performance of students on standardised tests	1.6	50.8	47.6
The performance of students on other tests	1.9	47.1	51.0
The performance of students on homework assignments	3.5	44.5	52.0
The ability of students to work independently	4.5	38.2	57.3
The willingness of students to source additional materials	3.6	31.4	65.0

Table 7.16: Percentages of teachers reporting that ICT has had a positive impact (increase), no impact, or a negative impact (decrease) on various aspects of teaching and learning – special schools

Area	Decrease	No Change	Increase
The range of teaching methodologies I use	0.0	15.0	85.0
The amount of planning and preparation for lessons	5.0	16.0	79.0
The depth of subject matter knowledge covered	0.0	27.0	73.0
My ability to address the needs of lower-achieving students	0.0	17.0	83.0
My ability to address the needs of higher-achieving students	0.0	22.0	78.0
My ability to improve literacy across the curriculum	1.0	16.0	83.0
My ability to improve numeracy across the curriculum	1.0	20.2	78.8
Students' levels of interest and engagement	1.0	8.0	91.0
The depth of questions asked by students	1.0	48.5	50.5
The relevance of questions asked by students	2.0	48.5	49.5
The quality of students' responses to questions I ask.	1.0	37.4	61.6
The levels of positive interaction among students during classes	2.0	32.0	66.0
The performance of students on standardised tests	2.0	83.8	14.1
The performance of students on other tests	2.0	65.0	33.0
The performance of students on homework assignments	3.1	69.1	27.8
The ability of students to work independently	1.0	32.3	66.7
The willingness of students to source additional materials	1.0	52.5	46.5

7.7 Teachers' Participation in, and Views on, Professional Development in ICT

Over the previous two years (including the year of the survey), teachers in primary schools reported having attended around 10.2 hours of professional development (CPD) in total *in the area of ICTs*, which is similar to the figure for special schools (10.3 hours). Teachers in post-primary schools reported attending just 6.1 hours of ICT-related CPD in this time. Around one-fifth of teachers in each school category reported not having participated in any CPD over the past two years (Table 6.17). At least some of the teachers reporting no CPD hours may be newly- or recently-qualified. For example, 37% of primary teachers reporting no CPD hours qualified in 2006 or after.

Table 7.17: Average number of hours of participation in ICT-related CPD over the past two years, and percentages of teachers reporting no CPD hours – primary, post-primary and special schools

	Mean	SD	% with no hours CPD
Primary	10.24	9.27	19.2
Post-primary	6.12	7.04	20.7
Special	10.28	9.88	19.2

Teachers were also asked to indicate the areas included in the CPD that they undertook. This information is shown in Table 7.18. Note that the responses to this question include teachers who indicated that they had not undertaken CPD during the past two years.

At primary level, up to two thirds of teachers had undertaken CPD in the areas of equipment use (66%), using ICT as a tool across the curriculum (56%), and using ICT to support the development of literacy and numeracy (54%) (Table 7.18). At post-primary level, about half of teachers had undertaken CPD in the areas of equipment use and how to use ICT as a tool across the curriculum. CPD undertaken by teachers in special schools was most commonly reported in these same two areas (equipment: 60%; cross-curricular tool: 41%). Across all three categories of school, teachers reported less frequent participation in CPD involving assessment for and of learning, planning and implementing e-Learning, and more advanced ICT skills (such as blogging, web design and computer programming).

Table 7.18: Percentages of teachers reporting participation in CPD in a range of areas over the past two years – primary, post-primary and special schools

Area	Primary	Post-Primary	Special
Basic ICT skills (including word processing, presentation software and Internet use)	37.4	33.6	23.7
More advanced ICT skills (including blogging, website design, computer programming and other applications)	26.7	28.0	23.7
Digital media skills (including the use of digital video and audio)	33.0	24.2	33.0
ICT skills needed to use the school's ICT equipment (e.g., interactive whiteboards, digital projectors, laptops)	66.0	49.4	59.8
ICT skills needed to use new ICT/mobile devices (including my own devices and those brought to school by students)	23.9	27.4	28.9
How to use ICT as a teaching and learning tool across the curriculum (including its application to specific subject areas)	55.7	51.7	41.2
How to use ICT to support the development of key skills (e.g., literacy and/or numeracy)	54.2	35.3	36.1
How to use ICT to support special educational needs	28.7	20.9	42.3
How to use ICT to support assessment of learning	21.6	23.5	12.4
How to use ICT to support assessment for learning	20.4	25.4	13.4
Planning and implementing e-Learning in your school/classes	24.3	29.1	18.6

Note. Includes responses of teachers not undertaking CPD in the past two years.

Table 7.19 shows the type of CPD undertaken over the past two years (again, like Table 7.18, this factors in responses of teachers not undertaking CPD in the past two years). Across all three categories of school, the most common forms of CPD undertaken were self-directed and informal (43-49%), in-school CPD during additional hours (44-56%), and CPD in external venues during term-time (33-46%). Post-primary teachers were less likely than teachers in primary and special schools to have participated in a face-to-face summer course, but more likely to have participated in informal, peer-to-peer CPD. As might be expected, relatively low percentages of teachers reported participating in formal third-level courses (5-11%). Observation visits to other schools were also relatively uncommon (7-12%).

Table 7.19: Percentages of teachers reporting participation in various formats of CPD over the past two years – primary, post-primary and special schools

Format	Primary	Post-Primary	Special
ICT-related CPD provided in my school during additional/Croke Park hours	43.7	56.1	46.4
ICT-related course provided in the school but outside required hours of attendance (i.e. not including additional/Croke Park hours)	23.0	32.4	22.7
ICT-related CPD provided in my school during the school day	8.1	20.6	15.5
ICT-related course in an external venue (such as in an education centre) during term-time	32.8	45.5	33.0
Online course on ICT in teaching and learning during term-time	15.5	13.7	16.5
A face-to-face summer course on ICT in teaching and learning	25.6	6.7	16.5
An online summer course on ICT in teaching and learning	40.1	4.7	42.3
Informal CPD on the use of ICT in teaching and learning provided on a peer-to-peer basis in the school	37.3	43.9	38.1
Formal mentoring/peer coaching on the use of ICT in teaching and learning	12.6	18.3	4.4
Self-directed, informal CPD in ICT (e.g., by utilising materials for self-tuition, demonstration videos, online communities, etc.)	43.4	49.0	48.5
Formal, accredited third level course (e.g., Post-grad diploma, Masters)	5.4	7.8	11.3
Observation visits to other schools	8.8	7.0	12.4

Note. Includes responses of teachers not undertaking CPD in the past two years. Shading indicates most highly-endorsed formats in each school category.

Teachers were also asked which areas of ICT, in their view, should be prioritised for CPD. Table 7.20 shows their responses. The figures in the table represent the percentages of teachers indicating that a specific area was their first, second or third priority out of the list of 12 areas.

The first observation that can be made on the basis of teachers' responses is that there are no specific areas with particularly high or particularly low priority endorsements. This implies that teachers have wide and varied skills and needs in these areas. Indeed, this issue comes across quite strongly in some of the teachers' comments, discussed in Chapter 8. Although CPD on basic ICT skills receives lower percentages of priority endorsements across primary, post-primary and special school teachers, the percentages (ranging from 10-14%) still indicate a substantial minority.

Areas that received higher rates of priority endorsement include more advanced ICT skills (28-37%), using ICT as a tool across the curriculum (38-46%), using ICT to support the development of key skills (32-47%), and ICT skills needed to use the school's own equipment (24-33%). Some of the variations across school category are likely to be related to the age groups of the children (e.g. higher emphasis placed on development of key skills such as literacy and numeracy at primary level than at post-primary level or in special schools).

Table 7.20: Percentages of teachers indicating that each of 12 CPD areas is their first, second or third priority – primary, post-primary and special schools

Priority Area	Primary	Post-Primary	Special
Basic ICT skills (including word processing, presentation software and Internet use)	12.8	14.3	10.0
More advanced ICT skills (including blogging, website design, computer programming and other applications)	31.5	37.4	28.0
Digital media skills (including the use of digital video and audio)	23.5	22.5	20.0
ICT skills needed to use the school's ICT equipment (e.g., interactive whiteboards, digital projectors, laptops)	33.1	24.4	30.0
ICT skills needed to use new ICT/mobile devices (including my own devices and those brought to school by students)	12.7	18.5	20.0
How to use ICT as a teaching and learning tool across the curriculum (including its application to specific subject areas)	46.3	42.8	38.0
How to use ICT to support the development of key skills (e.g., literacy and/or numeracy)	47.1	30.6	32.0
How to use ICT to support assessment of learning	22.9	15.4	13.0
How to use ICT to support assessment for learning	19.0	18.5	15.0
How to use ICT to support special educational needs	20.6	18.3	54.0
The use of ICT to support Department of Education and Skills priorities/requirements (e.g., school self-evaluation and school improvement)	13.6	28.4	16.0
Incorporation of ICT for teaching and learning in ALL CPD provided for teachers (as distinct from ICT-specific CPD)	13.5	21.5	22.0

Shading indicates most strongly endorsed areas of CPD in each school category.

Asked about the suitability of various formats of CPD (Table 7.21), a majority of the formats were deemed suitable or very suitable by a majority of respondents in all three categories of school. It is worth noting that high percentages of teachers rated a variety of formats as suitable, indicating considerable flexibility. For example, 77-82% of teachers indicated that bringing in an external tutor to the school using the school's own equipment would be suitable or very suitable; 81-85% favoured CPD during additional/Croke Park hours; and 68-74% indicated that online CPD with which they could engage independently would be suitable or very suitable.

Table 7.21. Percentages of teachers indicating that a range of formats and times for CPD would be suitable or very suitable – primary, post-primary and special schools

Format/Time	Primary	Post-Primary	Special
Bringing in an external tutor to enable formal CPD to take place in the school (using the school's own equipment)	79.0	77.4	82.0
Supporting/encouraging my attendance at formal CPD in external venues (such as in the education centres)	63.1	71.8	80.0
Informing me about online CPD that I can engage in independently	68.2	70.7	74.0
Enabling access to online CPD that I and my colleagues can engage in as a school group	66.0	67.9	66.7
Upskilling of an ICT coordinating (or other) teacher to enable him/her to provide support to me and my colleagues	61.8	74.2	69.8
Informal CPD on the general pedagogical use of ICT provided on a peer-to-peer basis (e.g., by members of an e-Learning/ICT coordinating team)	50.7	62.1	60.6
Informal CPD on the subject specific pedagogical use of ICT provided on a peer-to-peer basis (e.g., by members of an e-Learning/ICT coordinating team)	50.0	65.0	61.9
Supporting my own self-directed, informal CPD in ICT (e.g., by utilising materials for self-tuition, demonstration videos)	52.4	61.7	66.0
During additional/Croke Park hours	82.9	85.2	81.0
During the school day (without reducing class contact/tuition time)	27.9	39.0	30.2
Outside of school/additional hours (term-time)	24.8	25.8	37.8
In summer	46.9	13.3	48.5

7.8 Teachers' Use of Digital Content

One section of the teacher questionnaire asked respondents to indicate their usage of, and views on a range of digital content. Table 7.22 shows the levels of importance ascribed to a range of content types by teachers in primary, post-primary and special schools. In general, digital content was ascribed high importance by teachers, with over 75% indicating presentations and teaching materials, whether created or downloaded, as well as digital content for display or use in class, were of high importance. Less importance, however, was ascribed to e-books and CD-ROMS or DVDs. The latter finding may relate to the costs, availability, and/or relevance of these resources to teachers' work.

Table 7.22: Level of importance ascribed by teachers to various forms of digital content in teaching and learning – primary, post-primary and special schools

	Primary			Post-primary			Special		
Type of digital content	Low	High	N/A	Low	High	N/A	Low	High	N/A
Presentations/teaching materials created by me	17.9	76.7	5.4	7.2	89.4	3.4	8.9	87.1	4.0
Presentations/teaching materials downloaded from the Internet	8.6	90.2	1.3	16.2	82.0	1.8	7.9	92.1	0.0
Websites with relevant digital content displayed to the class (e.g., text, video, animation, or interactive games)	7.6	90.5	1.9	14.7	82.4	2.9	8.9	88.1	3.0
Learning materials for the students printed and/or downloaded from the Internet (e.g., worksheets)	17.4	81.2	1.4	19.2	78.8	2.0	14.9	80.2	5.0
E-books	37.2	50.6	12.2	48.6	37.9	13.6	39.0	44.0	17.0
CD-ROM/DVD	29.5	68.5	2.1	39.0	55.2	5.8	36.0	61.0	3.0

Table 7.23 shows, for teachers in primary, post-primary and special schools, the types of digital content that they create, and whether they would like to learn more about each. The results indicate that teachers most frequently create presentations, documents, spreadsheets, photographs and graphics, and that about two fifths to one-half of teachers would like to learn more about these forms of digital content. The creation of animation or video clips was less common (but more common in special schools), and a majority of teachers wanted to learn more about animation and video clips. Audio clips and podcasts were less frequently created by teachers, though again, many teachers indicated that they would like to learn more about these (60% of primary teachers, 49% of post-primary teachers, and 38% of teachers in special schools).

Table 7.23: Percentages of teachers creating various forms of digital content, and percentages indicating their interest in learning more about them – primary, post-primary and special schools

Primary	Create, happy with what I know	Create, would like to learn more	Do not create, not interested in learning more	Do not create, interested in learning more
Presentations/documents/spreadsheets	32.0	46.0	5.6	16.5
Photographs/graphics	22.0	49.3	5.9	22.8
Animations/video clips	5.7	25.5	14.9	53.9
Audio Clips/podcasts	3.8	17.3	18.8	60.1
Post-primary				
Presentations/documents/spreadsheets	49.4	40.1	3.1	7.5
Photographs/graphics	28.4	37.6	10.5	23.5
Animations/video clips	10.2	27.8	17.1	44.8
Audio Clips/podcasts	7.9	20.2	22.7	49.1
Special				
Presentations/documents/spreadsheets	37.0	50.0	7.0	6.0
Photographs/graphics	35.4	48.5	6.1	10.1
Animations/video clips	12.9	36.6	14.9	35.6
Audio Clips/podcasts	6.0	33.0	23.0	38.0

Teachers were also asked about their views on sharing digital resources (Table 7.24). Their views are, overall, very positive. For example, in excess of 90% of teachers agreed that sharing digital resources can save time and money and can improve the design of the resources and the planning involved. Similarly, a large majority (in excess of 80%) disagreed that they were reluctant to share resources, or that they did not want others to modify their resources. Nonetheless, a significant minority of teachers did not hold positive views on the sharing of resources: for example, 14-25% indicated that they were reluctant to share resources that they had spent a long time preparing, and this reluctance is evident in some of the comments described in Chapter 8. Fewer teachers in primary schools (66%) than in post-primary (82%) or vocational schools (78%) indicated that they already shared resources (25% of teachers in primary and special schools, and almost 40% in post-primary schools). Concern over copyright issues was also lower than might have been expected.

Table 7.24: Percentages of teachers agreeing and disagreeing with various statements about the sharing of digital resources – primary, post-primary and special schools

	Primary		Post-primary		Special	
Statement	Disagree	Agree	Disagree	Agree	Disagree	Agree
Sharing resources can enhance my reputation as a teacher	22.0	78.0	19.5	80.5	15.0	85.0
Sharing resources can enhance the reputation of the school	16.2	83.8	15.2	84.8	12.9	87.1
Sharing resources can improve the design of the resource and the planning process involved	5.9	94.1	5.5	94.5	6.0	94.0
I'm reluctant to share resources that I have spent a long time preparing	86.0	14.0	74.6	25.4	84.0	16.0
My resources are good quality and I would be happy to share them	24.9	75.1	18.4	81.6	18.0	82.0
I am concerned over copyright issues if I share my resources	74.5	25.5	60.3	39.7	76.0	24.0
I want to be acknowledged as the author of any resources I share	61.9	38.1	46.1	53.9	52.5	47.5
I do not want others to modify my resources	82.9	17.1	75.7	24.3	83.8	16.2
Staff already share resources within my department/school	34.2	65.8	18.0	82.0	22.0	78.0
Sharing resources can save time and money	2.5	97.5	4.3	95.7	5.0	95.0

Teachers' use of websites was also explored. Table 7.25 shows the frequency with which teachers reported using Scoilnet and other Internet sites for teaching and learning. There are marked differences between teachers in primary, post-primary and special schools in their usage of Scoilnet, with more frequent usage at primary level. Frequency of using other websites was broadly similar across primary, post-primary and special school teachers.

Table 7.25: Percentages of teachers reporting frequency of using Scoilnet and other websites for teaching and learning – primary, post-primary and special schools

	Never	Sometimes	Frequently	Usually/Always
Use of Scoilnet				
Primary	4.0	40.9	44.1	10.9
Post-primary	21.9	53.4	21.3	3.4
Special	15.8	50.5	22.8	10.9
Use of other websites				
Primary	0.8	13.0	52.0	34.1
Post-primary	3.2	23.5	49.8	23.5
Special	3.0	16.2	43.4	37.4

Finally, teachers were asked whether they had heard of Open Educational Resources (OER). A majority (69-74%) had not heard of OER, while about 20% had heard of them but were not clear what they meant (Table 7.26).

Table7.26. Levels of familiarity of teachers with OER – primary, post-primary and special schools

	Primary	Post-primary	Special
Have never heard of OER	73.8	69.0	72.7
Heard of OER, not clear on its meaning	20.8	19.5	19.2
Heard of OER, do not agree with its underpinnings	0.4	1.3	1.0
Know what OER means, and support it	5.0	10.3	7.1

7.9 Conclusions

This chapter presented the results from the teacher survey, conducted as part of the 2013 ICT schools census. Only quantitative (pre-coded, numeric) responses were considered. Chapter 8 describes the content of the comments provided by teachers, and as such, the results presented in Chapters 7 and 8 complement one another. The concluding chapter brings together all key findings, comparing the views of both teachers and principals in this study, as well as placing them in international context.

Overall, teachers' responses here indicate that very positive views are held about using ICTs in teaching and learning, yet this is accompanied by significant obstacles to successful implementation, both in terms of ICT infrastructure and support for its maintenance, and competing time pressures. We also found that teachers have very varied levels of strengths and needs relating to ICTs, which suggests that CPD for ICT will need to be flexible and tailored moving forward. Taken with the relatively low endorsement of student-led, constructivist and interactive teaching and learning practices in general, it would seem that addressing teachers' needs in this area must be multifaceted and systemic, and viewed as an ongoing process.

Chapter 8: Key Issues Identified by Teachers

This chapter provides an overview of the main issues identified in written comments provided in response to an open-ended question on the teacher questionnaire. As in the school questionnaire, the final question on the teacher questionnaire provided respondents with the opportunity to make *any additional comments (including any ICT-related priorities)* which they wished to provide. These comments were analysed using the same content analysis method used to analyse principals' responses (an account of this method is provided in Chapter Three). The analysis revealed the presence of fourteen major topics, with each topic comprising a number of distinct, but related, themes. A summary of these topics and their themes forms the basis of this chapter.

Overall, 1091 teachers made 2524 comments in response to this open-ended question. At primary level, 1686 comments were made by 765 teachers from 677 schools on ICT-related issues in school. At post-primary level, 293 teachers from 202 schools made 669 comments in response to this question. In the special schools category, 33 teachers from 24 schools made 69 comments. The distributions of comments made by primary, post-primary and special school principals are presented in Tables 8.1, 8.2 and 8.3, respectively. Participants' comments relating to each of the main topics are then summarised in turn. Phrases which capture the meaning of main themes are highlighted in bold font. These themes are illustrated by sample participant quotes. Primary teacher quotes are identifiable by (P), post-primary by (PP) and special school by (S). English translations are provided for comments made in Irish. It is important to note that comments can only be considered as representing the views of those teachers who made them. Teachers who elected not to respond may have different experiences and priorities than those whose comments are discussed here. It is also important to note that, as mentioned in previous chapters, the samples of teachers who responded to the survey may not be representative of their populations.

Table 8.1: Distribution of comments made by primary school teachers, by topic

Topic	Number of Schools	Percentage of Schools*	Number of Comments	% of Comments
ICT Resources	184	27.2	250	14.8
Teaching and Learning	183	27.0	223	13.2
Teacher Attitudes, Skills and Practices	161	23.8	193	11.4
Professional Development	145	21.4	174	10.3
Time (lack of)	116	17.1	153	9.1
Internet	137	20.2	152	9.0
Technical Support and Maintenance	104	15.4	138	8.2
Funding	99	14.6	120	7.1
ICT Survey	85	12.6	98	5.8
Websites	40	5.9	40	2.4
Frequency of ICT use	23	3.4	25	1.5
Advisory Support	20	3.1	23	1.4
Ways in which ICTs are used	21	3.0	21	1.3
ICT Coordinator	16	2.4	17	1.0
Other	52	7.7	59	3.4
Total Comments	-	-	1686	100

*Denominator is the number of schools where at least one teacher made a comment on a given topic.

Table 8.2: Distribution of comments made by post-primary school teachers, by topic

Topic	Number of Schools	Percentage of Schools	Number of Comments	Percentage of Comments
Teaching and Learning	81	40.1	113	16.9
Professional Development	88	43.6	107	16.0
Teacher Attitudes, Skills and Practices	62	30.7	80	12.0
ICT Resources	53	26.2	71	10.6
ICT Survey	41	20.3	59	8.8
Technical Support and Maintenance	31	16.3	47	7.0
Time	36	17.8	42	6.3
Funding	32	15.8	40	6.0
Internet	27	13.4	35	5.2
ICT Coordinator	11	5.4	12	1.8
Websites	9	4.5	9	1.3
Frequency of ICT use	8	4.0	8	1.2
Ways in which ICTs are used	7	3.5	8	1.2
Advisory Support	4	2.0	4	0.6
Other	32	15.8	34	5.0
Total Comments	-	-	669	100

Table 8.3: Distribution of comments made by special school teachers, by topic

Topic	Number of Schools	Percentage of Schools	Number of Comments	Percentage of Comments
Teaching and Learning	12	50.0	15	21.7
ICT Survey	8	33.3	9	13.0
Professional Development	8	33.3	8	11.6
Teacher Attitudes, Skills and Practices	2	8.3	7	10.1
ICT Resources	6	25.0	6	8.7
Funding	4	16.7	5	7.2
Tech Support and Maintenance	3	12.5	3	4.3
Time	2	8.3	2	2.9
Advice	1	4.2	2	2.9
Other	11	45.8	12	17.4
Total Comments	-	-	69	100

8.1 ICT Resources

The level of ICT resourcing in schools was the most frequent topic mentioned by primary school teachers. Teachers from 184 schools (27%) made 250 comments (15%) which directly related to ICT resources. ICT resources were the fourth most frequently-mentioned topic at post-primary, with teachers from 53 schools (26%) providing 71 comments (11%), and the fifth most frequent among special school teachers (with teachers from six special schools (25%) each making a comment on this topic).

The most common comments on this topic related to teachers' **reports of insufficient ICT resources in their classrooms and/or in their schools**. Teachers referred to high pupil-computer ratios and also to a lack of teacher access to ICT equipment. These comments were made without direct appeals for funding; those which explicitly did so are covered in section 8.8. The following comment, made by a post-primary teacher, is typical of responses relating to this theme:

> *…the facilities in the school HUGELY disadvantage the teaching and learning I can provide to my students. I cannot implement my favoured pedagogical approaches of inquiry-based leaning, discovery learning, independent learning, assessment for learning, SEN learning needs and collaborative learning. Having recently come through teacher training where much focus is centred on ICT in education, I sadly cannot implement any of this in my current school due the lack of basic facilities. I feel this is a disappointing step backwards. It is not acceptable that I cannot implement the pedagogies that my training has been centred on. (PP)*

At primary level, teachers also frequently made comments which emphasised perceived shortcomings in the ICT infrastructures in their schools. Many of these comments included teachers' accounts of the ICT equipment which they do have access to, and arguments that this falls short of what they actually require in order to integrate ICT successfully into their classes. Others mentioned specific types of ICT equipment which they would like to have, but did not have access to. For example, one teacher wrote:

> *I do not have an IWB in my class and feel I am at a huge disadvantage as a result. Only 3 in our school. Three mainstream classrooms do not have an IWB and there's no money to buy them. Therefore a lot of the topics in this questionnaire are not relevant to my particular situation, unfortunately. (P)*

Indeed, many teachers commented that they were limited in the extent to which they could incorporate ICT into their daily teaching, with a lack of ICT equipment posited as the primary reason for this. One teacher, for example, wrote that:

> *The problem with ICT in primary schools is the lack of ICT resources in schools e.g. not enough computers, no computer room, one PC in a room with 30 children, poor quality broadband and children who have no access to ICT at home. Every primary school pupil should have access to a computer room in school. One interactive whiteboard is not sufficient for 30 pupils and as a teacher it is impossible to find the time to teach the basic ICT skills with one computer and no dedicated ICT time in the primary school curriculum. I feel that without the basic equipment how is a teacher expected to improve ICT skills in pupils? (P)*

This teacher mentioned that a lack of pupil access to computers at home meant that lack of pupil access at school was particularly problematic. This concern was echoed by several other teachers. For example, one primary teacher explained that while her school has interactive whiteboards for teachers' use, there is no ICT equipment available for use by pupils who also have little exposure to computers outside of the school setting:

> *While my school does have IWBs, it currently does not have ANY children's computers. This means that while the majority of lessons are prepared and taught using technology, the children are not getting to directly use ICT as part of their daily lives. Being a disadvantaged school most children would not have access to a home computer either – this is something that needs to be addressed as a priority. (P)*

Other teachers described the levels of ICT resourcing which they believed would be required in order to attain the frequency and quality of ICT use which they believe to be desirable, and expected of them. One primary teacher, as an example, wrote:

> *Tá níos mó ríomhairí ag teastáil i ngach seomra ranga. Níl mé in ann scileanna a mhúineadh do gach mac léinn gan i bhfad níos mó ríomhairí/tabléidí a bheith sa seomra… Theastódh 10 ríomhaire sa rang in ndáiríre le bheith éifeachtach.* [More computers are needed in each classroom. I cannot teach skills to all pupils until there are more computers/tablets in the room. In fact, there would need to be 10 computers in the room to be effective.] (P)

Several teachers described that, in the context of limited ICT resources, use of **ICT had become confined to very specific uses, rather than being widely integrated into the educational lives of pupils**. For example, one primary teacher commented: *"With only one laptop in a classroom of 26 pupils, it is not feasible for the pupils to use ICT in our small school setting. It is used in a one-to-one setting with pupils with SEN."* (P)

Another theme, particularly prevalent among post-primary teachers' comments, related to **difficulties in accessing ICT resources which schools *do* have**. For example, one teacher wrote:

> *We have two well-equipped computer rooms in our school but students have very little access to these as they are mainly timetabled for adult courses and for specific computer/ECDL classes. This gives other teachers who wish to carry out research or project work no or very limited access to rooms. This is proving to be a huge issue. (PP)*

Similarly, as another post-primary teacher explained, since ICT equipment is integral to certain post-primary subjects, it is often not available for use across other subjects:

> *I would love to be able to access the computer room on a regular basis but as there is only one in the school and it is pre-booked by certain classes, like Computers, Enterprise and LCVP; it often proves impossible to book. I find this very disheartening. (PP)*

Another recurrent theme in the data related to the **age of ICT resources** which are present in schools. Reports of old ICT equipment were also frequently accompanied by descriptions of how many of these resources are **unreliable, slow, or prone to malfunction**. For example, one primary teacher wrote:

> *A serious lack of access to current, up-to-date ICT is a huge problem in my class. The computers are ancient and slow and hardly worth turning on…The whiteboards can be really unreliable and often have to wait long times for repairs. I have been without my projector for six months last year and three months this year. This is unacceptable and unworkable in modern Irish classrooms. Then, by the time I get it back I have no interest in using it in case it just breaks again, or I have just got used to not incorporating it because it has been gone so long. I have a high number of special needs in my class and ICT can greatly help them concentrate and pick up topics because they are visual learners. Due to ICT not being up to scratch their learning is definitely hindered. I love using PowerPoints and video clips but most of the time I can't because the board isn't working or the Internet is slow or down.*

Such issues were also mentioned at post-primary level. One teacher, for example, explained:

> *I have no access to ICT in SPHE. There is a Smart Board, which doesn't work. My Guidance laptop does not support data projection. General access laptops are not available or not working. Class periods are too short and students' behaviour means that ICT frequently gets damaged or broken. I only use ICT for personal preparation of classes, occasionally.* (PP)

Teachers described their frustration when ICT equipment failed to work as expected:

> *The main problem in my area in DCG* [Design and Communication Graphics] *is that the computers are not up-to-date or powerful enough to run the latest software, causing them to crash, creating a stressful environment in a lesson for both student and teacher, especially if the student is halfway through a project and loses their work.* (PP)

Others outlined that having ICT resources which do not work is tantamount to having no such equipment at all. One teacher commented, for example: *"Although our school has a number of laptops, they are not functioning correctly and currently are of very little use to me or the students."* (P)

Perhaps as a result of the various issues outlined above, another frequent theme in teachers' comments was **use of their own personal resources** to plug gaps in the ICT infrastructure available to them at school. One post-primary teacher, for example, wrote:

> *All of these notions of ICT driven teaching and learning are admirable, but for me, and the students in my school, there simply is not sufficient access to working, non-obsolete computers, nor is there access to reliable broadband services - so all of this is redundant until we have this as a minimum. I use my own laptop, my own mobile broadband and my own printer to support my students' learning.* (PP)

Similarly, another post-primary teacher commented: *"I have often had to depend on the 3G from my phone to get by. I always bring both my laptop and my iPad to school every day."* (PP) This was reported as having a financial cost for some teachers, e.g.: *"I am constantly buying resources out of my own money and get reimbursement only when I hunt it down, that is, if I have the patience"* (P) This practice, of teachers having to use their own ICT devices, was described as being unacceptable and unfair to teachers: *"Teachers frequently end up bringing in their own portable Internet in order to use resources with the children which is a very unfair burden on teachers."* (P)

Less frequent themes in this topic related to **a lack of space in schools/classrooms** within which computers and other ICT equipment could be stored, and **expressions of satisfaction with ICT infrastructure** in schools. A number of teachers also argued that **student-owned devices should be permitted for use in class**, something which was reported as being presently prohibited in some schools.

8.2 Teaching and Learning

ICT as it relates to teaching and learning was a very frequent topic in the primary, post-primary and special school categories. Teachers from 183 primary schools (27%) provided 223 comments (13%) on this subject. At post-primary level, teachers from 81 schools (40%) made 113 comments (17%) on the role of ICT in teaching and learning. In the special schools category, teachers from 12 schools (50%) made 15 comments (22%) which related to this topic.

Many teachers opened their responses to the open-ended question with an acknowledgement of the **benefits of ICT use to teaching and learning**. Several teachers reported that ICT had improved their teaching practice and many mentioned that incorporating ICTs into lessons increased student engagement in those lessons. Others commented that they believed that ICT use would improve their ability to plan and deliver lessons and would improve student outcomes, if they had the resources necessary to make this possible. Indeed, the majority of teachers who conveyed attitudes towards ICT use in schools were positively disposed towards it. For example, one primary teacher commented:

> *Using ICT in the classroom is a very effective learning and teaching tool for both teachers and children. It is an excellent planning resource for teachers to help plan effectively and efficiently. Endless resources can be discovered with the use of ICT for all subjects which encourages and excites children of all ages to engage in learning. ICT has endless benefits and should always be evident in classrooms.* (P)

Post-primary teachers made similar comments. Typical comments on this theme included: *"I feel that ICT should be a cornerstone of education in the future as it promotes so many different types of learning skills and development."* (PP) Similarly: *"ICT has become crucial in engaging young people in learning and the more entwined it becomes in education, the better."* (PP)

Teachers were not, however, unanimous in these beliefs. Several expressed concern about newer methodologies and technologies replacing more traditional teaching methods. One primary teacher, for example, wrote:

> *I teach 2nd class and don't want to concentrate too much on digital resources. Much of what we learn is around us. Children of 7/8 need experiences in the world around them rather than digital talk and chalk*. (P)

For some teachers, this attitude appeared to be linked with the way in which they themselves received their initial teacher education, and their own acknowledged lack of experience in using ICT in the classroom. For example, one post-primary teacher wrote:

> *On a personal level, I trained in the 20th century, none of my training involved using ICT in my classroom. It is not a medium I am comfortable with and I am left feeling that my type of teaching and 30 years + teaching experience are somehow not quite good enough, yet the children in my class can all read, write and compute really well and are socially doing fine.* (P)

Others believed that ICT use was being hailed in some quarters as a panacea to problems in Irish education, a conviction which they believed to be misguided. For example, one post-primary teacher wrote that:

> *Pushing the use of ICT is not going to solve the problems with the Irish education system. ICT for the sake of ICT is a waste of precious time. Students sit a written exam, time spent teaching IT skills like drawing graphs in MS Excel etc. may be novel or 'fun' but is irrelevant at the end of the day.* (PP)

Other teachers went further than expressing this by stating their beliefs that excessive emphasis on ICT in schools could actually be to the detriment of pupils' learning outcomes.

> *I understand there is a huge drive to develop ICT in primary schools, and huge pressure on teachers to incorporate ICT in planning. I have a sister with special needs who spent years learning ICT skills at school, and who now has no idea how to work a computer, or read or write. All because her teacher loved computers. I have seen huge efforts made to encourage children to complete numeracy and literacy tasks online. These are the same children that I am now having to do extra work with, use concrete materials with, to ensure they catch up on learning. All the while I have to incorporate ICT in everything. I think we will one day realise that secondary school is early enough to begin ICT. I am a young teacher and I can see clearly the benefits of the old teaching methods: practical, concrete work. For now we will continue entertaining the idea of ICT.* (P)

This featured as a common subtheme, which was particularly noticeable among the comments of primary level teachers: Other examples include: "*While young subs are very computer literate, they are neglecting the basics which returning teachers must make up on their return to class*" (P), and:

> *I think that children spend far too long in front of TV screens/computer games etc. at home to the detriment of literacy levels! I think there are too many schools where ICT is overused and I have concerns about this.* (P)

Despite this (minority) viewpoint, many teachers in fact argued that **ICT needs to be further integrated into teaching and learning**, as opposed to technologies being used solely for planning or administrative purposes. In order to meet this goal, teachers commented that they needed increased **information about, and access to, digital resources to support children's learning**. Most argued that these should be designed for use in the Irish education system, and should relate to each subject or curricular area. One post-primary teacher, as an example, commented:

> *The problem with trying to find resources online is that there are too many! You could spend hours searching through resources with only pieces of what you really need (particularly as most maths resources come from American websites). I think a subject specific resource website (for Irish schools) where teachers could upload into the specific area of the course would work well. Also the ability to rate a resource would be helpful to quickly choose the most suitable/best presented resource if there are multiple duplicates*. (PP)

Several post-primary teachers made calls for increased availability of online or other digital resources which relate to the subjects that they teach. The following comment is a typical example of this:

> *Would like to see an Irish geography website with teaching resources for the Irish curriculum. Would also like to see similar for history. I really think there is a huge gap for an Irish-based*

website, to include animations for geography, essay writing skills, sample answers, online quizzes and extra resources for students. (PP)

Primary teachers also commented on this issue. For example, one teacher argued that: *"Access to free software thematically presented in line with the Irish curriculum would greatly enhance teaching, learning and assessment.*" (P). In addition to software, other teachers highlighted a desire for access to online digital resources which relate to the Irish primary curriculum. One teacher, for example, wrote:

I believe I would regularly use and contribute to an online platform that mapped resources to specific curriculum content objectives. These would need to be sub-grouped as per the type of resource they are, e.g., worksheets, photos, video, web links etc. (P)

A number of teachers highlighted the **scarcity of resources available in the Irish language**. One teacher of an Irish-medium primary school commented, for example: *"Our biggest difficulty is that there are not enough websites in Irish. The children are not permitted to use the resources in English language*." (P) Another teacher commented on how this issue impacted upon her: *"One area of concern is the unavailability of Irish (Gaeilge) resources: online programmes and software, plus the amount of personal time involved in translating the stuff to Irish."* (P) Others emphasised the **lack of resources tailored for use with pupils with special educational needs**. One teacher wrote, for example: *"I require more ICT programmes and support, for SEN children in particular." (P)*

Other, less frequent themes in this topic related to **the lack of integration of ICT into assessment procedures**. A subtheme of this related to teachers commenting that they could not assign homework which required computer access, as a proportion of pupils did not have such access in the home. One post-primary teacher commented, for example:

Working in a DEIS school it is increasingly apparent that Internet access at home cannot be taken as a given. This means the idea of the 'flipped classroom' is beyond use as an approach. It also means that use of a VLE in a genuine interactive manner with students cannot be presumed upon. (PP)

A small number of teachers called for close **evaluation of the effects of ICT use in schools on pupil outcomes**, while others expressed **uncertainty about the future direction of ICT in Irish education**.

8.3 Teacher Attitudes, Skills and Practices

At primary level, teachers from 161 schools (27%) provided 193 comments (11%) on this topic, which covered teachers' attitudes to ICT, levels of ICT skills among teachers, and teacher practices in relation to ICT. Teachers from 62 post-primary schools (31%) commented 80 times (12%) on this topic, and teachers from two special schools (8%) made seven comments (10%) directly related to this topic.

Frequently, comments relating to this topic made reference to the **low ICT skills of teachers**. Most teachers commented on their own limited proficiency in the area of ICT. One primary teacher, for example, wrote: *"I feel that my basic level of ICT skills mean I don't use the technology in my school to its best advantage."* (P). Several teachers commented that the act of completing the ICT Census

had made them aware, or reinforced their awareness, of their lack of ICT expertise. One teacher, for example, commented:

> *Doing this survey has reinforced my ICT inadequacies. I would like to know more and make more use of what is available. I usually feel overwhelmed at ICT courses and don't benefit from them because it's generally assumed I know more than I actually do. In-school support would be great but I would only progress slowly. I would welcome being upskilled as I am floundering and reluctant to use ICT in case I encounter technical problems I can't sort out. I fear losing the focus and attention of the class and so take the safe and reliable option.* (P)

Teachers commented that they feared that their pupils were missing out as a result of their own perceived shortcomings in the area of ICT. One primary school teacher wrote, for example:

> *There is a huge divide in the level of engagement with ICT and its use and effectiveness in the classroom. I want to be doing better but feel that my lack of knowledge and knowhow is impeding me and then the children in my class. We don't have a path ahead for ICT. We're using it, bopping along, but without any clear direction.* (P)

Age appeared to play a role in teachers' appraisal of their own ICT skills. One primary teacher wrote: *"As someone who has left third-level education a long time ago, I feel at a disadvantage to younger colleagues who have received the benefit of e-learning in school."* (P)

Similar issues arose among post-primary teachers. One respondent, for example, explained:

> *I realise that using ICT is of value, but as a working parent I do not have the time needed to develop my skills in this area. I am of a generation to be slow to adapt to technology, not that I am against it… My most usual default setting for using computers to do school work is to ask one of my children to help!* (PP)

While these comments all refer to teachers' *own* ICT skills, other comments referred to a perceived lack of ICT expertise in other teachers, or more generally in teachers as a group. Age also featured as a subtheme in these comments. One post-primary teacher wrote:

> *I think in general the overall ability to teach using ICT is reflected in the age of the teacher. The basic computing skills are needed for the older teachers. Many of them are reluctant to learn new ways now as they are established teachers and have their way of doing things. However if they were shown the basics they might learn to use it in class effectively.* (PP)

Another teacher described her experience as follows:

> *Some teachers cannot use WORD, or have trouble with basic Internet use and email, and older teachers are especially reluctant to upskill. They expect the younger teachers to embrace all this new technology. Basic training for older teachers should be a priority before launching all of these new ideas.* (PP)

Nonetheless, lack of ICT expertise was not confined to older teachers, as highlighted in the following comment from a younger post-primary teacher:

> *I feel that the emergence of ICT as a central resource in the classroom has been so sudden that many teachers are insufficiently trained in many areas. I am only 28 but I definitely feel that I have a lot to learn when it comes to ICT. I tend to use ICT in a few ways only, e.g. basic flipcharts, interactive activities on websites and educational video clips. I would like to be able to involve the pupils more in the use of ICT.*

A closely-related theme is that of **low teacher confidence in using ICT resources.** Teachers described feelings of wariness and trepidation about using ICT equipment. For example, one primary teacher wrote: "*Since the interactive whiteboards have been installed in our classrooms, I'm embarrassed that I still feel intimidated in using them. Although I use it daily it is at a very simple level."* (P).

Comments about lacking confidence were also made by post-primary teachers. For example: "*I am aware of my own lack of confidence in the use of ICT."* (PP)

Another common theme in this section relates to **low motivation** in relation to incorporating ICT into teaching and learning, **and/or low teacher morale** impacting on teachers' willingness to do so. One primary teacher, for example, offered the following comment on the lack of interest in ICT among teachers in her school:

> *Tá scileanna an-mhaith TEC agamsa agus tá mé óg, agus suim agam san ábhar seo. Bíonn drogall ar múinteoirí nár fhás aníos leis an dteicneolaíocht foghlaim faoi. Fágann siad faoi na múinteoirí eile é. Cuirtear uaireanta Croke Park amú ag iarraidh rudaí a mhúineadh nách bhfuil suim ann. Caitear mo chuid ama amú ag réiteach rudaí le haghaidh na huaireanta CP freisin. Níl suim ag an chuid múinteoirí rudaí breise a dhéanamh a thuilleadh, ta an t-airgead gearrtha, tá daoine faoi bhrú airgeadais, agus tá sé ag cothú droch mheon sa scoil*. [I have very good ICT skills, I am young, and I have an interest in this area. There's reluctance from teachers who didn't grow up with technology to learn about it. They leave it to other teachers. Croke Park hours are wasted trying to teach things that there's no interest in. My time is wasted preparing things for the CP hours as well. Teachers are not interested in doing more; the money is cut, people are under financial pressure, and it is fostering a bad attitude in the school.] (P)

Other teachers acknowledged their own lack of motivation to adopt ICT-centred practices, as illustrated in the following comment:

> *I have no great interest in computers in general. I find that my personality and affinity with my classes more than makes up for any shortcomings I have in ICT, and my grades reflect this in state exams in the different schools I have been in. I didn't become a teacher to be an ICT expert, but rather to be one with the students in preparing for their exams and life ahead.* (PP)

Other comments referred more generally to low morale among teachers, and the potential dampening effect which this may have on the levels of integration of ICT by teachers: *"Morale is poor among exhausted primary teachers. Get the basics improved and morale will improve and then teachers will tackle with enthusiasm the improvements you want*." (P)

This issue was also echoed among post-primary teachers, for example:

> *Class sizes, discipline, pay cuts and the effect of austerity on families has sapped any remaining shred of support for so called worthwhile educational initiatives. The DES need teachers to "buy in".....stripping key resources and supports from pupils and teachers saps morale and builds resentment. Teachers right now are now further than ever away from the reform agenda.* (PP)

Nonetheless, another theme which featured in this topic was teachers' reports that they were **confident in their ICT skills**. Of those who made such comments, several mentioned qualifications which they possessed in ICT-related areas, or experience of working in sectors which involved ICT use prior to their qualification as teachers.

It is clear from the comments that there is considerable variation in the ICT skills of teachers. Consequently, a number of teachers made comments about knowledge and skills sharing among staff members in their schools, with those more experienced in ICT use providing guidance and support to those less experienced. For example, one primary teacher commented:

> *As an older teacher, my priority over the last couple of years has been to become computer literate. The single most effective learning tool I have is one-to-one informal tutoring on a need-to -know basis, kindly provided by my S.N.A. and other teachers in the school.* (P)

A related, but more frequently occurring, theme was that of **the sharing of digital resources within, or between, schools**. The creation and sharing of resources formed the basis of the content for Questions 29-32 on the teacher questionnaire, and thus immediately preceded the open-ended question on the survey form.

A small number of teachers commented that they were already successfully sharing resources with other teachers. One primary teacher wrote: *"I share resources which I have created and resources which I find on the Internet with other teachers almost every day."* (P) Another simply stated: *"I happily share and search for resources online"* (P)

Satisfaction with current sharing practices, however, was a minority view. Many teachers argued that the sharing of resources is important and should be undertaken in a more formalised, structured way than is currently the case. One post-primary teacher, for example, commented that: "*We need to get teachers connected in a formal online environment. We are all individually reinventing the wheel in each of our own schools – we need to work smarter, not harder!* (PP)" Another post-primary teacher commented: "*More encouragement of the sharing of resources nationally needs to be given. Ireland needs a website similar to www.tes.co.uk"* (PP).

Other teachers offered suggestions as to what form such a sharing platform should/could take. One teacher, for example, wrote:

> *An Irish forum for sharing resources would be great. I think if it was anonymous more people would sign up, not everyone would be worried about getting credit for their resources. Copyright is always a worry with sharing presentations as I often download pictures/video/sound clips from the Internet which I'm not sure about.* (PP)

Primary school teachers also offered such suggestions. One teacher, for example, wrote:

> *Best ways to learn from other teachers is by watching short videos. These videos should be accessible on one website, a 'one stop shop'. A website for video demonstrations of others teachers using ICT effectively. There should be a searchable database of video demonstrations and subject related presentations. A national sharing database and forum for primary teachers. It needs to be extremely easily accessible, with uncomplicated navigation of the site. It needs to be comprehensive in order to be successful.* (P)

Many teachers commented that they were positively disposed towards sharing resources and expressed intentions to engage more in this practice in the future. For example, one primary teacher wrote: "*I feel I could encourage pooling of resources more in our school. We started with great enthusiasm but have let it slide".* (P) Another primary teacher commented: "*I am so wrapped up in preparing and presenting my own classes that I have never had time to consider sharing or borrowing resources from others. Filling in this questionnaire has given me food for thought! Thank You."* (P). These comments appear to suggest that sharing of ICT resources is not something that will evolve naturally within these schools, but rather that deliberate effort is required to make this common practice. This is also reflected in the following comment from a primary teacher: "*There also isn't a culture in general for sharing ICT resources within the school that teachers have created themselves. Teachers are excellent at sharing other resources."* (P)

Many teachers were less enthusiastic about the sharing of resources and offered a variety of explanations as to why. Lack of confidence in teacher-designed resources was a recurrent subtheme. One primary teacher wrote: "*I'm not overly confident using ICT in the classroom and would be afraid to share my resources for that reason."* (P) Similarly, a post-primary teacher commented: "*The only problem in my school, in my opinion, is that not all teachers are confident enough to use it* [ICT] *and that therefore makes the sharing of resources difficult."* (PP) Concern about the quality of resources produced by individual teachers is also evident in the following comment from a post-primary teacher: "*I would be more comfortable sharing my resources if there was a facility to check said resource and provide private feedback regarding quality. This would allow me to improve the resource before it became published.*" (PP)

Other teachers questioned the usefulness of sharing resources which have been created for a particular class group. One post-primary teacher wrote, for example:

> *Resources developed/tailored for a particular class group may not be as useful if shared with a similar group. Resources have to be almost bespoke to be most effective - I use three different presentations for the same year group depending on ability.* (P).

Other teachers argued that resource sharing would not be particularly relevant or useful to them, as the following comment exemplifies:

> *On question 28, 29, 30, it may appear that I am reluctant to create or share resources, but the reality is that I generally prefer the children to engage in the creation of resources for each other so very little of the content is mine. I have found when given a model children's creativity is stifled so I prefer to give guidance and an expected outcome without a model. As this is the children's own work it often contains small mistakes and unless the objective was to share it with a different class, the content stays in the classroom.* (PP)

Reluctance to be involved in resource sharing can also be seen in the following quote from a primary school teacher:

> *I agree with many things in your survey but unfortunately while I agree that sharing resources can enhance both a school and a teacher's reputation I as a teacher would not wish to participate in this as I do not wish to compete against my co-workers.* (P)

Other teachers objected to sharing their resources as they believed that: "*Sharing of resources can end up being an unfair activity.*" (PP) Some respondents commented that they had previous experience of this unfairness. One post-primary teacher wrote: "*Have had bad experience with "sharing resources"- I got nothing useful back in return."* (PP) Such objections were also present among primary teachers with one, for example, writing: "*I strongly feel if you put the work into making resources why should someone who made nothing be allowed to use them?"* (P)

Other teachers were happy to share resources with teachers in their own schools, but reluctant to share resources beyond that. As one post-primary teacher explained:

> *As regards sharing resources, I strongly agree with sharing resources with teachers in my own school. I strongly disagree with sharing resources with other schools. The Department, including their expert inspectors, are hopeless when it comes to providing good, properly differentiated teaching resources. I don't think teachers should be expected to share resources thereby letting the Department, and the government, who fail to finance education properly, away with providing inadequate ICT-based teaching material.* (PP)

Another teacher wrote: "*I am very happy to share and borrow resources within my own school, but I don't like giving them to staff in other schools, especially when they took me hours to make and if I don't get anything back in return."* (PP)

Other objections to sharing resources widely stemmed from concern over failure to acknowledge the original creator of the resources in question. One post-primary teacher, for example, commented:

> *I currently use Smart board software to show presentations that I have built for the last 3 years. I've also put many hours into my website. I like to share these but I do like the acknowledgement from others that the notes, etc. were made by me. It annoys me somewhat to find my notes, tests, etc. used with another teachers name across the top. So, the sharing is one-way and has made me less inclined to share I guess. Sharing is vital but you don't want to feel that you're the only one spending hours preparing work!* (PP)

8.4 Professional Development

Comments directly relating to teacher professional development were made by teachers in 145 primary schools (21%), who provided 193 comments (11%) on this topic, which ranked fourth in terms of frequency at primary level. Professional development was the second most frequently commented-upon topic among post-primary teachers, with teachers from 88 post-primary schools (44%) making 107 comments (16%) on ICT-related CPD. Teachers from one third of special schools (n=8) each made one comment relating to this topic.

By far the most common theme in this topic was that of teachers' calling for **more frequent, and/or higher quality, ICT-related professional development**, or expressing the view that there is and has been **insufficient opportunity for teachers to upskill in ways which are appropriate and relevant** to their ICT-related CPD needs.

Several primary, post-primary and special school teachers made general appeals for greater opportunities to engage in ICT-related CPD. The following comment, made by a primary teacher, is typical of this theme:

> *I strongly believe that the Department needs to invest heavily in ICT and also in the training of teachers using ICT in the classroom. ICT is an area that we have not been trained in and our skills need to be updated.* (P)

Another primary teacher wrote:

> *I recently completed a dissertation on CPD within ICT and found that many teachers feel that they need to upskill more in this area. Not enough courses are available and if they are, they are not widely enough advertised.* (P)

Some comments focused on the belief that failure to adequately train teachers in the use of ICT had a direct effect on the frequency and quality of ICT use in schools. One primary teacher, for example, commented:

> *New educational technologies are constantly emerging and it is vital that teachers receive the relevant training to keep up-to-date so that students can maximise the benefit from these learning tools. Teachers need to be taught how to use these tools effectively; they should not be used to reinforce old ways of teaching which is happening in many schools due to the lack of formal CPD.* (P)

Another teacher commented on the impact that a lack of professional development activities in ICT use had in her school:

> *I would know absolutely nothing about the use of ICTs to support teaching and learning had I not done a Masters in teaching and learning (apart from what I would have picked up informally or through optional summer courses). Without CPD and concentrated effort from whole school, a lot of what I learned is getting lost. We are just plodding along picking up things as we go instead of realising how crucial this whole area really is.* (P)

A number of teachers argued that ICT training should be mandatory for all teachers, e.g. "*I think compulsory ICT CDP for primary teachers is necessary and is long overdue!*" (P) Another primary teacher expanded on why she felt this to be important:

> *I feel that upskilling in relation to ICT should be obligatory. To be honest, I feel a bit left behind in my own skills as the technology changes so quickly. I think it is essential that all staff have more than a basic understanding of technology now. Teachers need to embrace the technology that children are using at home. Teachers need to be upskilled annually to keep abreast of the latest resources in ICT.* (P)

Other teachers commented on specific areas in which they felt they needed additional training. A majority of these comments referred to a need for training on the ICT equipment which teachers have access to in the classroom. One primary teacher, for example, commented:

> *I feel that more in-service needs to be put in place in the area of ICT. Lots of money was spent on ICT in schools in the last few years, installing whiteboards and the like. However the training wasn't included in the use of these. Therefore, I feel all this equipment is not being used to its full potential.* (P)

This belief, that ICT resources were underutilised due to a lack of teacher training, was echoed by many teachers who commented on this topic, as typified by the following comment:

> *I have an interactive whiteboard and got no training at all! I think it is such a shame and waste as I would love to be good at it! I need to be shown the basics and then proceed from there… A lot of the teachers feel the same about the whiteboards and very few use them properly.* (P)

Another common area in which teachers called for training was that of basic ICT maintenance and troubleshooting. One primary teacher, for example, commented: *"Troubleshooting ICT problems throughout the school is the biggest problem faced by me in school. A simple troubleshooting course for all teachers would be a great way of avoiding this."* (P) Another teacher commented: "*There was no mention of upskilling teachers on how to fix equipment, etc.* [in the questionnaire]*, which I think is the biggest area of concern."* (P)

Other teachers commented that they required training on issues such as integrating ICT into teaching and learning (e.g. "*I think that teachers should be upskilled on an integrated approach to ICT to enhance teaching and learning."* (P)), assessment (e.g. *"I would like more ICT courses in Assessment of Learning and Assessment for Learning to be made available in local education centres. I haven't come across any of these yet."* (P)) and the creation of resources ("*I would like to attend ICT courses that are very practical and can be used in the classroom the next day. For example: creating interactive flipcharts for use in the classroom. I tried to source a course this year in the local education centre but very few courses were available after school."* (P)). Teachers in special schools commented that they would like specialised CPD on use of ICT with pupils with special educational needs, e.g. "*Specialized CPD for using ICT with children with severe to profound learning disabilities would be beneficial*." (S)

A number of comments referred to the **format which individual respondents would like professional development sessions to take**. Some, for example, commented that they preferred face-to-face training to that provided online. A number of teachers argued that in order to be effective, training should take place in the school, with the school's own equipment. A small number of teachers commented that, as they felt so far behind their colleagues with respect to ICT skills, they required one-to-one rather than group tuition.

Indeed, the skills levels of teachers were addressed in the comments of several respondents in relation to CPD, with the clear message conveyed that a one-size-fits-all approach to the delivery of ICT-related professional development is unsuitable. Teachers variously asked that ICT training sessions for teachers be tailored towards those with basic skills (e.g., "*I feel that I am so far behind*

with my computer skills that it is hard to find basic computer training courses. I have tried to find basic courses as summer courses and in other local venues." (P)), or towards those at an intermediate level (e.g. *"I would like to see more courses available to teachers with moderate or self-taught skills."* (P)) Still others called for training opportunities to be made available to those teachers with more advanced skillsets. As an example, one teacher commented:

> *I would like more advanced courses on things like video/audio production, Microsoft Excel and using ICT in the classroom. However I would like these courses to be strictly advanced and labelled this way in the advertising flyer, as I have gone to ICT courses in the past, which were supposed to be for advanced users, however a significant amount of non-advanced users attended and thus the tone and level of the course was lowered. Subsequently it became less useful for the advanced user.* (P)

Teachers also commented on the frequency with which they believed they should be engaged in ICT-related CPD. Most commonly, teachers argued that as technologies are constantly and rapidly evolving, training for teachers must be regular in order for teachers to keep pace with these developments. A typical comment on this subtheme was made by a post-primary teacher: *"CPD in this area needs to be woven into our academic year and needs to be ongoing rather than sporadic."* (PP)

Some teachers argued that investment should be directed towards properly training a small number of teachers in each school who could then, in turn, train the rest of the staff. Peer mentoring schemes were suggested by some as the best way for ICT skills to be acquired. Others argued that a whole-school approach to CPD would work well, for purposes of consistency and to ensure that all members of staff are on the 'same page' in terms of ICT skills and strategy. One special school teacher highlighted that, particularly in the special school context, 'staff' must extend beyond class teachers: "*Our school has a high SNA to teacher ratio and it is hugely important that any training provided is offered to all staff, not just teachers.*" (S)

While some teachers commented that they believed upskilling in relation to ICT to be their own personal responsibility (e.g. "*I have very limited computer skills and the onus is on me to improve them"* (P), other teachers expressed **dissatisfaction with training in their personal time and at their own personal expense.** The following comment, from a primary teacher, is an example of this common theme:

> *I have been given absolutely no training by the Department of Education. The bit I've done has been on my own time. Shame, shame, shame on those in charge. Imagine the defence forces expecting their pilots to "learn" all about helicopters on their own time, at their own expense. ICT in schools is not even a joke. It's a very sad reflection of the lack of commitment by the Department to in-service training for us "old dogs".* (P)

The following comment also emphasises the view that responsibility for ICT-related CPD should fall to the Department of Education and Skills, rather than to teachers themselves:

> *If the Department wishes to have teachers fully trained in ICT and all its applications then they need to accept the responsibility for it and take action upon it. The onus shouldn't fall on the teacher to organise, attend, participate in and implement the training all on their own.*

The Department has taken so much away from teachers and added so much more on to our role. They could ease the burden or at least the expense and provide and schedule the training for each school therefore taking the pressure off individual teachers. (P)

8.5 Time Pressures

At primary level, teachers from 116 schools (17%) made 153 comments (9%) which related to the impact of time pressures on levels of ICT use in schools. Teachers from 36 post-primary schools (18%) provided 42 comments (6%) on this topic. In the special schools category, two teachers from two schools each provided one comment on the role of time pressures in ICT integration.

The most frequent theme in this topic was the **lack of time available to teachers to plan lessons or prepare resources which involve the use of ICT**. One primary teacher, for example, commented:

The greatest obstacle to use of ICT in my classroom is curricular pressure and lack of time. The earliest I leave school most days is 4.30 and even then I have to take corrections home. I don't have time to learn about ICT or to organise resources for the children's use so I stick to what I can do easily. I resent having to use my personal time in this way but it's the only way I can cope with the demands of the job at the moment. (P)

A newly-qualified primary teacher commented: "*I am in my first year of teaching so there are different things I hope to use relating to ICT in my teaching in the future, when planning and preparation does not take up as much of my time.*" (P)

Similar comments were also made by post-primary teachers, e.g. "*A lot of planning time is needed for the preparation of resources but unfortunately we are under time constraints because of the heavy workload so ICT can often be neglected.*" (P). Similarly: "*Ba mhaith liom tuilleadh achmhainní a chruthú agus a úsáid i mo ranganna ach ní bhíonn an t-am agam.* [I would like to create and use more resources in my classes, but I don't have the time]" (P)

Insufficient time to incorporate ICT into teaching was also reported by special school teachers. One teacher, for example, commented: "*I find the biggest challenge around progressing ICT is having time to engage in CPD, research and preparation*." (S)

More specifically, many teachers referred to **time pressures arising from large class sizes** and, at primary level, **multigrade classes**. One primary teacher, for example, wrote: "*I teach 4 classes and my time is FULLY occupied trying to cater for all their needs. Don't know where I'm expected to fit in ICT in my own life or theirs!*" (P)

One post-primary teacher commented:

To begin with, class sizes are far too big to cater for effective teaching and learning in the classroom regardless. The current pupil teacher ratio stands at 30:1 with a class duration of 40 minutes per lesson approximately. In regards to specific ICT related priority areas, this issue must be addressed. This is and will be a huge factor in hindering ICT progression. (PP)

Many teachers mentioned time constraints arising from **pressure to cover the "overloaded" curriculum/syllabus.** One primary teacher, for example, commented: "*Due to the immense pressure to cover the prescribed curriculum, it is difficult to make ICT a priority area."* (P)

Similarly, typical comments on this theme from post-primary teachers include: *"The pressure teachers are under by parents to get the course covered is another deterrent to ICT"* (PP), and: *"Content of syllabus needs to be reduced in order to use ICT more effectively."* (PP)

Some teachers argued that, unless ICT is specifically included as an area in the primary school curriculum, or unless it is made a compulsory, timetabled subject at post-primary level, then it will not be prioritised by teachers who have so many competing demands on their time.

The perception that incorporating ICT into teaching and learning is a very time-consuming process may be linked, at least in part, to another theme in teachers' comments; that of the **amount of time spent rectifying ICT problems,** e.g. "*It's very hard working in a class when most of the time is spent trying to get all laptops up and running.*" And: "*…in a classroom time is precious and can disappear very fast especially if you are trying to get something to work.*" (P)

8.6 Internet

Teachers from 137 primary schools (20%) made 152 comments (10%) on the topic of Internet provision and use in schools. At post-primary level, teachers from 27 schools (13%) made 35 comments (5%) which related to this topic. No special school teachers commented on this issue.

An overwhelming majority of comments on this topic were expressions of **dissatisfaction with current Internet service provision in schools,** with many teachers arguing that poor Internet service is the single greatest barrier to increasing ICT use in schools. One primary teacher, for example, wrote:

> *I cannot begin to express my frustration at the lack of basic broadband and Internet facilities in our school for the last couple of years. A few years ago we had begun to use ICT successfully in most subjects, but in the last two years, we have basically stopped trying to use the Internet because 99 times out of 100, IT JUST DOES NOT WORK. Having spent hours preparing lessons or searching for resources, it is soul destroying to have great lessons planned, only to find that the Internet is down. We have now gotten out of the habit of incorporating ICT into lessons.* (P)

A number of teachers made direct appeals for this situation to be addressed. One, for example, wrote:

> *I find it extremely frustrating in this so-called technology driven era that we in our school have virtually non-existent broadband!!! No-one in the Department wants to know or help because we are in a minority grouping. Please address this issue. We have very committed and dedicated staff who are battling daily to improve ICT skills and develop a broad and balanced curriculum. How can we implement these wonderful aspirations for ICT progression in our students without consistently good broadband? Against all the odds we are trying to follow an E-plan without the basics in place.* (P)

Expressions of frustration were very common in teachers' comments on this topic. For example, one primary teacher wrote: *"Broadband is totally unreliable in this area. This leads to total frustration on my part and disappointment for children when you attempt to do something and find the Internet is not working.*" (P). When teachers believed that they could not rely on the broadband service in their

schools, they reported less willingness to engage in ICT-related activities, as is highlighted in the following comment:

> *If there are technical problems and issues with connectivity, I tend to avoid IT. There is nothing worse than setting children up to do some work online and then realising that there are issues with connection. It wreaks havoc with classroom planning and management.* (P)

A number of teachers indicated their schools were now paying privately for Internet provision, as that which had originally been provided for their schools was inadequate. One primary teacher, for example, commented:

> *Broadband provision in schools needs serious attention. We are paying for our own at the moment as what we were getting from the Department scheme was completely useless. It is the basis for any progress in ICT and it is disgraceful that the situation is as it is for some schools.* (P)

Some teachers commented that the Internet was frequently down completely in their schools. For example:

> *ICT is a non-event in our school as our broadband service is almost non-existent. It is totally unreliable. It is frustrating to have prepared a lesson only to find the service is down. If more than one teacher attempts to access the Internet it is guaranteed to break down.* (P)

Others commented that slow download speeds were the main problem, as is emphasised in the following comment:

> *In my opinion Broadband speed is preventing our school from progressing in our use of ICT. The 100 Mbps is required and must be fast tracked to every school ASAP. Teachers become reluctant to try anything different using online resources when Internet speed is slow.* (PP)

Similar comments on Internet speed were made by primary teachers. For example:

> *I find my biggest problem regarding ICT in my school is the poor Internet quality. It is extremely slow and most of the time cannot be used as e-books/videos/songs/interactive lesson/images/websites etc. do not load. I tend to use ICT a lot in my teaching and planning, however this means everything must be prepared and saved at home as I could not rely on the Internet in the school - which also means the children's learning suffers as there as many online games/interactive lessons they cannot play during class.* (P)

Using Internet at home to plan and prepare lessons due to an inability to use the school's Internet was echoed by a number of teachers. One primary teacher, for example, commented: "*I use the Internet a lot at home to access resources at home. Unfortunately the broadband is so poor in our school that about 80% of the time I go to use the Internet I cannot gain access.*" (P)

A proportion of teachers who commented on this topic were teachers in rural schools, and believed that they were particularly disadvantaged in terms of broadband provision as a result. The following comment illustrates this:

I feel that the use of ICT is hugely beneficial to the pupils in my school, but being in a rural area our broadband service is frankly appalling. Until further development of Internet services to rural areas happens, many schools will be unable to make the most out of the wonderful resources available, and of the wonderful opportunities ICT can provide for our children. (P)

A second, and much less frequent, theme on this topic relates to **concerns about Internet use.** Issues such as cyberbullying and child safety were mentioned by teachers at both primary and post-primary levels. Typical comments highlighting these concerns include:

Also I teach 4th class, at least half of the class have Facebook accounts and cyberbullying is very real, however I feel I cannot address social media as they are legally too young to have accounts. We need guidance from NCTE. (P)

Similarly:

ICT concerns have arisen for me this year as a result of the emphasis and frequency of cyberbullying. From this sense, I think a lot of Internet usage can bring more hassle on teachers over what can be seen/shared/received through the Internet. For this reason, I am reluctant to allow children to use the Internet for free exploration of a topic. (P)

Another primary teacher wrote: *"I am nervous about using social media/e-learning because of potential child safety issues (I would imagine that I am not the only teacher who feels this)."* (P)

Issues surrounding data protection and acceptable use were also raised by small numbers of primary and post-primary teachers.

8.7 Technical Support and Maintenance

At primary level, teachers from 104 schools (15%) provided 138 comments (10%) on the issues of technical support and ICT maintenance. Teachers from 31 post-primary schools (16%) made 47 comments (7%) on this topic, and three teachers from three special schools (13%) each provided a comment on this topic.

Insufficient technical support was the most frequent theme in this section, with many teachers outlining the problems that arise when technical support is not easily accessible. One primary teacher, for example, wrote: *"Having technical support is my number one priority area at the moment. Broken servers, printers etc. cause big problems and can take days to be fixed by the time support arrives."* (P)

Several teachers argued that the cost of engaging professional support was prohibitive for their schools. One teacher, working in a small school, commented, for example: "*Our small school cannot afford a technical support contract. Individual technicians have messed up our system at times and all assume we can replace instead of repairing."* (P)

In such cases, where cost issues prevent schools from hiring external technical support, many teachers commented that it is left to staff to attempt to fix technical issues themselves; something which they are not equipped to do. As one teacher, for example, explained:

We are professionals and experts in literacy and numeracy teaching, planning of and for assessment. We are not ICT specialists and need significant in-school support to address the increasing technological resources that are available in classrooms. Yes, I agree, ICT is a valuable tool and can enhance the quality of teaching and learning and motivation of our students, but it must be properly resourced and teachers must be supported in this. To hope for the best is not good enough. (P)

Similarly:

There is an urgent need in primary schools to provide technical support with system administration, networking and with maintaining equipment. Most schools are the size of medium/small businesses, yet they do not have a computer technician employed even on a part-time basis. Teachers are not qualified to maintain a large school network effectively with machine maintenance and more importantly software upgrades, networking problems, system admin etc.(P)

Several teachers commented on the **burden placed on individual members of staff (commonly, the ICT coordinating teacher), parents or family members of teachers** who *do* have ICT expertise and are thus relied upon to deal with any ICT issues arising in schools. One post-primary teacher, for example, commented:

I have spent unimaginable hours before, during and after school, including June, July and August repairing, preparing and checking ICT equipment. All for free and in addition to a full timetable. This is most definitely not sustainable and is not the approach to take if eLearning is to become a reality. (PP)

One primary teacher commented that: "*It's important that teachers' use of ICT reduces their workload rather than increase it."* (P)

This issue also arose among primary teachers, with one, for example, writing:

We are also fed up relying on one of the teacher's husbands to try to provide a "Fix" to our ICT problems - he has only so much goodwill. The lack of technical support is a big concern - why should teachers have to spend their weekends trying to get computers and Internet to work?! (P)

As such, several teachers argued that **specific funds should be made available for the purpose of procuring technical support** in schools, e.g.: "*We should be able to select a local agent to assist us in our technical maintenance and I think it should be funded by Government."* (PP) Similarly, a primary teacher commented: "*Funding for ICT technical support. DES expects schools to fund this and then they cut the capitation and withdraw the Minor Works. We have no funding for repairs."* (P)

Others argued that the **Department of Education and Skills should directly provide this technical support to schools.** One primary teacher, for example, wrote:

In Northern Ireland they have proper ICT support for schools, where schools can book an appointment with a dedicated schools technician at no further cost to the school. The

Department in the South needs to do the same thing before spending any more money on new computers. (P)

Other comments included: "*Dept. of Education-supplied technical support teams...not up to the school to employ their own,"* (P) and: *"I also would like to have access to some person who would solve technical problems when they arise - this person would need to understand the use of computers in an educational setting."* (P). Several teachers commented that an **IT technician could be made available to clusters of schools**, while teachers of larger schools commented that their schools needed dedicated, full-time, **on-site technical support** in order to manage their ICT infrastructures.

Another common theme in this topic related to the **cost of maintaining existing ICT equipment**, with a proportion of teachers who commented on this issue calling for financial support to help schools to bear these costs. For example, one post-primary teacher commented:

My greatest fear is that the school budget will not be able to cope with maintenance and replacement of the equipment as it ages and without further support from the DES for upkeep of ICT equipment this important addition to our teaching resources will break down, literally. (PP)

This issue was also common at primary level. One primary teacher, for example, wrote:

I feel that the money given towards ICT in 2009-2010 made a huge difference to classroom methodologies. However it's the upkeep and maintenance of the ICT equipment which poses a huge challenge for a teaching principal. Bulbs need replacing, as do laptops. This is our situation at the moment after nearly four years of use. (P)

8.8 Funding of ICT Resources

Teachers from 99 primary schools (15%) made 120 comments (7%) which made direct reference to the funding of ICT resources (excluding Internet provision). At post-primary level, teachers from 32 schools (16%) provided 35 comments (5%) on this topic. Teachers from four special schools (17%) made five comments (7%) on the topic of funding.

Many of the comments in this topic expressed **general appeals for increased funding for ICT in schools,** or emphasised the inadequacy of current funding available to schools for ICT-related purchases. Typical comments on this theme include: "*Lack of funding is a major reason for the lack of uptake of ICT in schools"* (P), and:

The questions in this survey are revolved around ICT within the school with a general ethos of encouraging greater use of ICT within the school. If the basic computer infrastructure of the school is weak and funding for such minimal, how can this be incorporated? Funding to improve the physical presence of these resources within schools needs to be addressed first, as opposed to focusing on how we can improve use of them within the realm of the school. (PP)

Other teachers specified priority areas they would like funding for, with many schools outlining their current **hardware needs** and others calling for **increased funding for software purchases.**

Small numbers of teachers described **fundraising methods that had been employed to pay for ICT resources,** while others expressed **appreciation for previous ICT grants**.

8.9 ICT Census

Teachers from 85 primary schools (13%) made 98 comments (6%) which provided feedback on the ICT Census itself. At post-primary level, teachers from 41 schools (20%) made 59 comments (9%) on this topic. In the special schools category, this was the second most frequent topic, with teachers from eight schools (33.3%) providing nine comments (12%) on this topic.

The vast majority of these comments were critical of aspects of the ICT Census. Commonly, respondents expressed **dissatisfaction with the length of the survey form** and/or the time taken to complete it. For example, one primary teacher commented: "*This survey is far too long. In fact it's so long, that I believe that it was a futile excise and that the data which will be gathered cannot be relied on.*" (P)

Other teachers argued that the questions covered were **not relevant to their contexts** for one reason or another. As an example, one teacher commented: "*This is not terribly relevant to 2 teacher schools and I found it somewhat idealistic and very time consuming!"* (P). Several teachers made comments on the irrelevance of the questions to teachers in junior schools, e.g." *I teach infants so a lot of the questions were not really relevant."* (P)

Some teachers also **criticised the method of recruitment** of survey respondents. One teacher, for example, wrote: "*Teachers are not valued in any way in this country, even the way this Census was requested to be done twice and the wording and language that accompanied it was denigrating."* (P). Similarly:

> *I was under the illusion that this was an invitation-based survey sent on a random basis to teachers. I resent the mandatory nature of the "invitation". I have filled the portions relevant to ICT use with my class. I have omitted the portions which ask about my personal beliefs and philosophy of education.* (P)

Other respondents also objected to the fact that they felt that not all questions on the survey directly related to ICT issues, e.g. "*I felt this survey was lengthy and didn't solely address ICT issues. A lot of the questions were related to my personal views on teaching which I felt were not related to ICT."* (P) Several teachers indicated that they had not completed all parts of the survey, and explained why. One teacher, for example, commented: "*This survey is a complete joke and waste of time - when schools receive adequate funding to replace old equipment and implement a specific ICT Curriculum I will fill in the unanswered questions."* (P)

Some teachers reported that they had **difficulty answering questions**, as they either did not understand the terminology used, or felt the wording of the questions was ambiguous. A number of teachers criticised the survey as **repetitive** and pointed to overlapping content across questions. Several respondents criticised the layout of the questionnaire and way the questionnaire appeared on the screen. Very infrequently, teachers reported **technical difficulties in completing the survey.**

A theme of potential concern related to a number of teachers' comments that the **response options offered within questions did not allow for adequate representation of their views**. Typical

comments included: "*I have found some of your options did not always suit my answers"* (P), "*I found that some of this survey was difficult to answer as the parameters were restrictive"* (P), and: "*The layout of questions/options in this census does not allow me to give my views accurately."* (PP) As a result, a number of respondents advised caution in the interpretation of their responses, e.g. "*Some of your questions may lead to misleading answers."* Others were critical that open-ended options were not available for all questions for teachers to expand on their responses. One teacher, for example, commented: "*I was disappointed with the format of this questionnaire... There were a number of questions that I would have liked an 'other comments' box to explain my views."* (P)

Some respondents **indicated that they would not complete further surveys of this kind**. Others emphasised that they had done so in **the hope that the survey would lead to positive change** in the area of ICT in schools, e.g. "*This was very labour intensive and I hope it will help us to get a grant"*

Small numbers of teachers said that they had **enjoyed completing the survey**, were **happy that it was being undertaken**, or were **grateful that completing the survey had led them to assess their own progress in relation to ICT**. Some teachers asked for feedback from the survey when the study was completed.

8.10 Websites

At primary level, teachers from 40 schools (6%) made one comment each on the topic of websites. Teachers from nine post-primary schools (5%) each made one comment on this topic, while no special school teacher did so.

The majority of responses on the topic of websites related to teachers' dissatisfaction at the **lack of access to particular websites** in schools. Specific video streaming websites were mentioned by a number of teachers. Many teachers expressed frustration upon encountering 'blocked websites', and several made explicit calls for restrictions on access to these websites to be lifted. For example, one teacher wrote: *"I am losing out on a lot of valuable online resources to assist my teaching as there are too many websites blocked under our security policy, EVEN on the teachers computer!* " (P) Similarly, another primary teacher wrote: "*Many of the great lessons I have prepared at home on my own computer cannot be opened up at school as the websites are blocked*." (P)

Infrequently, comments were made on **intentions or plans to set up school websites or class blogs**.

8.11 Frequency of ICT Use

Comments on this topic simply referred to the frequency with which teachers make use of ICT equipment as part of their teaching practice. Reports of frequent, infrequent and moderate levels of ICT use were made in roughly equal measure by teachers who made such comments.

8.12 Advice and Support

Small numbers of teachers indicated that they need increased guidance from the PDST on ICT development in schools. Others called for specific advice on issues such as Internet safety and guidance as to which devices they should purchase for use in their schools.

8.13 Ways in which ICTs Are Used

Infrequently, teachers at primary and post-primary level used the open-ended question to outline specific ways in which they used ICT equipment and areas of teaching in which they found ICT to be particularly useful.

8.14 ICT Coordinator

A small number of teachers at primary and post-primary level made comments on the role of the ICT coordinating teacher. Some of these teachers were the ICT coordinators themselves, while others referred in their comments to another teacher who holds the post. Themes relating to this topic include **praise for work done by ICT coordinating teachers**, **calls for increased training for ICT coordinators**, **calls for increased time allocation for ICT coordination**, and calls for **ICT coordination to be a post of responsibility in all schools**.

8.15 Other

Comments in the 'Other' category related to a wide range of topics. At primary level (n=59), these included reports on experiences of different software programmes, ICT-related projects in which their schools/classes were engaged, teacher experiences of working in education systems in different countries, and the role of parents in fostering children's ICT skills

At post-primary level (n=34), comments referred to miscellaneous issues such as Junior Cycle Reform and Project Maths.

In the special schools category, teachers made comments (n=11) on issues such as experiences of specific educational websites, and desire to collaborate with local industry.

8.16 Conclusions

A number of topics were mentioned with similar frequency across all three school categories. The role of ICT in teaching and learning, for example, was the second most frequent topic among primary teachers, and the most frequent among teachers in post-primary and special schools. Teachers from roughly equivalent proportions of primary and post-primary schools commented on the issues of technical support and maintenance (15% and 16%), on funding issues (15% and 16%), and on the impact of time pressures on ICT integration (17% and 18%).

However, there were also some clear differences across school categories. Reports of insufficient ICT resources were more prevalent in primary teacher comments (the most frequent topic in this category) than at post-primary level (fourth most frequent) or in the special school category (fifth most frequent). Similarly, dissatisfaction with Internet provision in schools was commented on by teachers from a higher proportion of primary schools (20%) than post-primary schools (5%), perhaps reflecting progress made in the rollout of 100 Mbps Internet to post-primary schools. Professional development was mentioned in comments from teachers in just over a fifth of primary schools (21%), a third of special schools, and 44% of post-primary schools, indicating that this is perhaps an issue of greater interest or concern for post-primary teachers than those in other school categories.

The main themes outlined in this chapter will be further drawn together, and discussed in relation to major themes emerging from other chapters, in the concluding chapter of this report.

Chapter 9: International Data on Access to and Use of ICTs by Teachers and Students in Primary and Post-primary Schools

Ireland has participated in three major international studies in recent years: the OECD-sponsored Programme for International Student Assessment (PISA), which has been administered to representative national samples of 15-year olds in Ireland on five occasions since 2000 (most recently in 2012); the Progress in International Reading Literacy Study (PIRLS), sponsored by the International Association for the Evaluation of Educational Achievement (IEA), which was administered to students in Fourth class in Ireland in in 2011; and the Trends in International Mathematics and Science Study (TIMSS)[45], also sponsored by the IEA, which was administered to the same students in 2011[46]. While the main aim of these studies is to describe student achievement, and track changes in achievement over time, they also provide important information on factors associated with achievement, including the use of ICTs at school, classroom and home levels. In PISA, data of this type are obtained by administering questionnaires to school principals and students, while in in PIRLS and TIMSS, they are obtained through administering questionnaires to principals, teachers, pupils and their parents.

This chapter is divided into three sections. The first describes students' use of ICTs at home and at school, mainly drawing on PISA 2012 data. The second presents teachers' reports of ICT usage at school, and their confidence in using ICTs, mainly drawing on data from PIRLS and TIMSS. In the third section, school principals' perspectives on issues relating to ICTs are considered, drawing on data from all three studies. The chapter can be viewed as validating some of the Census findings (i.e., Chapters 4-8 of this report), and benchmarking them against data provided by other countries.

9.1 Students' Access to and Use of ICT at School and at Home

Fifteen-year olds participating in PISA 2012 were asked about their use of ICTs at home and at school. In Ireland, 61% of students reported that they had access to a desktop computer at school, but just 34% reported that they used one. The remaining five percent of students said that they did not have access (Table 9.1). On average across OECD countries[47], 64% had access to a computer and used it, while 23% had access and did not use it, and 12% did not have access. Fewer students in Ireland (12%) than on average across OECD countries (26%) reported that they had access to a portable laptop or notebook, and used it. Marginally fewer students in Ireland (4%) reported that they had access to a tablet and used it, compared with the corresponding OECD average (6%). Almost one third of students in Ireland (32%) and one fifth across OECD countries (18%) reported that they had access to the Internet at school, but didn't use it, while 7% in Ireland and 11% on average across OECD countries reported that they didn't have access to the Internet at school.

[45] Although TIMSS is offered at both Fourth and Eighth Grade (Second Year) levels, Ireland participated at Grade 4 only in 2011.

[46] Most tables in this chapter include mean scores or percentage scores and standard errors. The standard error is a measure of the extent to which a mean score or percentage score may be expected to vary around the true score. As such, it is a measure of the accuracy of a score derived from a sample. Thus, if we report that 61.4% of students use a computer at school, and the standard error is 1.44 (Table 7.1), we can say with 95% certainty that the true percentage is between 58.6 and 64.2 (i.e., 61.4 ± 1.44*1.96).

[47] Unless otherwise stated, the OECD average, as used in this chapter, is based on data provided by 29 OECD countries in PISA 2012. Students in OECD countries Canada, France, Luxembourg, the UK and the US did not complete the computer-familiarity questionnaire, which an optional at national level. See Table 9.3 for a list of the 29 participating OECD countries.

E-book usage was low among students in Ireland and on average across OECD countries. Just 2% of students in Ireland and 5% on average across OECD countries reported that they used e-books and a further 6% in Ireland and 8% on average across OECD countries reported that they had access to e-books but did not use them.

Table 9.1: Availability and usage of ICT devices by students at school (PISA 2012) – Ireland and OECD average

	Yes, and I Use It		Yes, but I Don't Use It		No	
	%	SE	%	SE	%	SE
Desktop Computer						
Ireland	61.4	1.44	33.5	1.23	5.2	0.54
OECD Average	64.4	0.21	23.3	0.18	12.1	0.17
Portable laptop / notebook						
Ireland	12.1	1.06	20.1	0.89	67.8	1.64
OECD Average	26.2	0.21	16.3	0.17	57.5	0.22
Tablet						
Ireland	3.5	0.40	5.0	0.50	91.5	0.77
OECD Average	5.5	0.13	6.0	0.12	88.5	0.16
Internet Connection						
Ireland	61.4	1.38	31.5	1.11	7.1	0.58
OECD Average	70.7	0.19	18.9	0.16	10.5	0.14
Printer						
Ireland	59.2	1.37	36.1	1.22	4.7	0.44
OECD Average	57.9	0.19	26.5	0.17	15.6	0.15
USB Stick						
Ireland	25.3	1.06	28.2	0.83	46.5	0.97
OECD Average	30.2	0.18	19.7	0.15	50.1	0.19
E-books						
Ireland	2.4	0.27	6.3	0.37	91.3	0.48
OECD Average	4.5	0.11	8.4	0.12	87.1	0.14

Source: PISA 2012 database.

In Ireland, 45% of students reported that they did not use the Internet at all at school, compared with 36% on average across OECD countries (Table 9.2). In contrast, 4% of students in Ireland and 8% on average across OECD countries reported that they used the Internet for more than two hours per day at school. In both Ireland, and on average across OECD countries, Internet usage was more prevalent at home on school days and weekend days than in school. Although 29% of 15-year olds in Ireland reported that they spend more than two hours on the Internet at home on school days, 44% did so on average across OECD countries. These figures rose to 41% in Ireland and 56% on average across OECD countries on weekend days.

Table 9.2: Frequency of Internet usage by students on a typical school day at school, at home on weekdays and at home on weekend days (PISA 2012) – Ireland and OECD average – Percentages of students

	No Time	1-30 Mins	31-60 Mins	1-2 Hours	More than 2 Hours
At School (Weekday)					
Ireland	45.4	30.8	13.6	6.1	4.1
OECD Average	36.1	31.9	15.2	9.3	7.6
At Home (Weekday)					
Ireland	4.4	17.5	21.0	28.7	28.5
OECD Average	5.2	10.1	14.0	26.9	43.8
At Home (Weekend Day)					
Ireland	3.8	11.6	17.1	27.1	40.5
OECD Average	4.4	7.4	10.5	21.4	56.3

Source: PISA 2012 database.

Students were also asked about their usage of computing devices for a range of purposes at school in general, in mathematics classes, and at home. Based on students' responses to several questionnaire items (see below), the OECD constructed indices of ICT usage at school, use of ICTs in maths lessons, and use of ICTs at home on school-related tasks. Students in Ireland had lower scores than the corresponding OECD average scores on all three scales, and had a particularly low score on the scale measuring ICT use at home for school-related tasks (-0.60, or three fifths of a standard deviation below the OECD average of 0.0) (Table 9.3).

Questions contributing to the scale on use of ICTs at school included:

- Browsing the Internet for schoolwork (36.4% in Ireland never did so, compared with an OECD average of 31.7%),
- Downloading, uploading and browsing materials from the school's website (36% of students in Ireland never did so, compared with an OECD average of 32%),
- Using email at school (73% of students in Ireland never did so, compared with an OECD average of 60%)
- Using school computers for group work and communication with other students (65% of students in Ireland never did so, compared with an OECD average of 52%) (Appendix Table A9.1).

OECD countries with high average scores on the index of ICT usage at school included Denmark (0.81), Australia (0.76), and Norway (0.58), while the Netherlands (0.41), Sweden (0.35), New Zealand (0.35) and Finland (0.28) also had scores that were well above the OECD average of 0.0 (Table 9.3). Countries with comparatively low scores included Korea (-0.36), Mexico (-0.39), Turkey (-0.43) and Japan (-0.62). Ireland's score of -0.07 is just below the OECD average of 0.00.

Questions contributing to the scale on use of ICTs in maths lessons are based on the frequency with which students used computers in maths lessons in the previous month. They include:

- Drawing the graph of a function (10% of students in Ireland reported that they did this, compared to 16% on average across OECD countries; 19% of students in Ireland reported that their teachers only did it, compared to an OECD average of 10%)

- Constructing geometric shapes (8% of students in Ireland reported that they did this, compared with an OECD average of 14%; 19% reported of students in Ireland reported that their teachers only did it, compared with an OECD average of 13%)
- Entering data on spreadsheets (10% of students in Ireland reported that they did this, compared with 19% on average across OECD countries; 13% of students in Ireland reported that their teachers only did it, compared with an OECD average of 12%).
- Drawing histograms (7% of students in Ireland reported that they did this, compared to an OECD average of 13%; 13% of students in Ireland reported that their teachers only did this, compared to an OECD average of 11%); and
- Finding out how the graph of a function such as $y = ax^2$, as *a* changes (7% of students in Ireland reporting doing this, compared with an OECD average of 12%; 16% said their teachers only did this, compared to an OECD average of 12%) (Appendix Table A9.2).

Countries with relatively high scores on the scale of use of ICTs in maths lessons included Denmark (0.72), Norway (0.69), and Turkey (0.26) (Table 9.3). Countries with the lowest scores included Poland (-0.24), Finland (-0.33), Korea (-0.36) and Japan (-0.62). It is interesting to note that a number of countries with high scores on use of ICTs at school, including the Netherlands and New Zealand, have relatively low scores on use of ICTs in maths lesson. On the other hand, countries such as Denmark and Norway achieved scores that were well above average on both indices. Ireland's mean score on the use of ICTs in mathematics lessons (-0.15) is below the OECD average.

A third scale describes students' use of ICTs at home for school-related tasks. Items contributing to this scale include:

- Doing homework on the computer – 38% of students in Ireland, and 26% on average across OECD countries reported that they never did this
- Sharing school-related materials with other students – 70% of students in Ireland reported that they never did this, compared with an OECD average of 44%.
- Checking the schools website for announcements – 76% of students in Ireland reported that they never did this, compared with an OECD average of 51%.
- Using email for communication with teachers and submission of homework or other schoolwork – 82% of students in Ireland reported never doing this, compared with an OECD average of 53% (Appendix Table A9.3).

Countries with high scores on the index of students' use of ICTs in school-related activities outside of school included Estonia (0.49), the Netherlands (0.44), Denmark (0.43) and Slovenia (0.38) (Table 9.3). Ireland (-0.60) was among a number of countries with scores that were well below the OECD average on this scale. Others included Finland (-0.76), Korea (-0.49) and Japan (-1.09). Again, it is noteworthy that countries such as Denmark, the Netherlands and Norway have a relatively even profile of scores across the three scales, while others, such as Finland and Turkey, show high scores on some but not on all three. It is also noteworthy that countries such as Japan and Korea have below-average scores on all three scales.

Table 9.3: Indices of ICT usage among students (PISA 2012) – OECD countries

Country	Use of ICTs at School		Use of ICTs in Maths Lessons		ICT Use at Home for School-Related Tasks	
	Mean	SE	Mean	SE	Mean	SE
Australia	0.76	0.01	0.17	0.01	0.22	0.01
Austria	0.10	0.02	0.01	0.02	-0.01	0.02
Belgium	-0.33	0.02	-0.13	0.02	-0.04	0.02
Chile	-0.12	0.03	-0.08	0.02	0.18	0.02
Czech Republic	-0.09	0.02	-0.19	0.02	0.30	0.02
Denmark	0.81	0.01	0.72	0.04	0.43	0.02
Estonia	-0.14	0.02	0.15	0.02	0.49	0.02
Finland	0.28	0.02	-0.33	0.01	-0.76	0.02
Germany	-0.13	0.02	-0.17	0.02	-0.14	0.02
Greece	0.17	0.03	0.01	0.02	0.00	0.02
Hungary	-0.13	0.02	-0.13	0.02	0.10	0.02
Iceland	0.03	0.01	0.04	0.02	-0.26	0.01
Ireland	**-0.07**	**0.02**	**-0.15**	**0.02**	**-0.60**	**0.02**
Israel	-0.35	0.03	-0.03	0.03	0.09	0.04
Italy	-0.38	0.02	0.08	0.02	-0.10	0.01
Japan	-0.62	0.03	-0.19	0.02	-1.09	0.02
Korea	-0.36	0.02	-0.38	0.02	-0.49	0.03
Mexico	-0.39	0.02	0.29	0.01	0.24	0.01
Netherlands	0.41	0.02	-0.09	0.02	0.44	0.02
New Zealand	0.35	0.02	0.04	0.02	0.07	0.02
Norway	0.58	0.02	0.69	0.03	0.15	0.02
Poland	-0.24	0.03	-0.24	0.03	0.15	0.02
Portugal	0.15	0.02	0.13	0.03	0.30	0.02
Slovak Republic	0.05	0.03	-0.04	0.03	0.13	0.02
Slovenia	-0.27	0.02	-0.05	0.01	0.38	0.01
Spain	-0.15	0.02	-0.06	0.02	0.07	0.02
Sweden	0.35	0.03	-0.22	0.02	-0.09	0.03
Switzerland	0.18	0.02	-0.05	0.02	-0.20	0.02
Turkey	-0.43	0.03	0.26	0.03	0.06	0.02
OCED Average	0.00	0.00	0.00	0.00	0.00	0.00

Source: PISA 2012 Database

Although not reported on as a scale, PISA also asked students about the frequency with which they engaged in some general computer-based activities outside of school. The outcomes for frequency of usage across individual items are reported in Appendix Table A9.4. While students in Ireland were close to the average across OECD countries in terms of the frequency with which they participated in social networks, browsed the Internet for fun, and downloaded music, films, games or software, they engaged in the following activities with less frequency:

- Using email – 27% of students in Ireland, compared with an OECD average of 17%, reported that they never or hardly ever used email.
- Reading news on the Internet – 38% of students in Ireland, compared with an OECD average of 20% reported that they hardly ever or never read news on the Internet
- Obtaining practical information from the Internet – 23% of students in Ireland, compared with 15% on average across OECD countries, reported that they never obtained practical information from the Internet.

Hence, students in Ireland are less likely than on average across OECD countries to use the Internet for practical or information purposes.

PISA 2012 also provided data on students' attitudes towards computers. Two scales are reported – one relating to students' perceptions of computers as positive tools, and the other relating to students' perceptions of the negative effects of computers.

Students indicated their level of agreement (strongly agree to strongly disagree) with three statements that contributed to the scale describing students' perceptions of computers as positive tools:

- The computer is a very useful tool for my schoolwork – 34% of students in Ireland strongly agreed, compared with an OECD average of 48%
- Doing my homework using a computer makes it more fun – 22% of students in Ireland and 32% on average across OECD countries strongly agreed
- The Internet is a great resource for obtaining information I can use for my schoolwork – 47% of students in Ireland, and 53% on average across OECD countries strongly agreed. (Appendix Table A9.5)

Students also indicated their level of agreement with three statements that contributed to the scale summarising students' views of the computer as a limited tool for school learning:

- Using the computer for schoolwork is troublesome – 5% of students in Ireland strongly agreed, compared with an OECD average of 8% (Appendix Table A9.5)
- Since anyone can load information on the Internet, in general it is not a suitable tool to use for schoolwork – 6% of students in Ireland and 10% on average across OECD countries strongly agreed
- Information obtained from the Internet is generally too unreliable to be used for school assignments – 5% of students in Ireland strongly agreed, while on average across OECD countries, 8% of students did so.

On the index of computer use as a positive tool for school learning, Chile (0.56), Denmark (0.50) and Norway (0.44) had scores that were well above the OECD average (0.0) (Table 9.4). Countries with scores well below the OECD average included Finland (-0.41), Japan (-0.82) and Korea (-0.92). Ireland's mean score (-0.20) was also below the OECD average, indicating a tendency among students to be less positive about the value of computers for learning, compared with their counterparts on average across OECD countries.

On the index of the computer as a limited tool for school learning, countries with strong negative scores (i.e., countries in which there was a high level of disagreement) included Norway (-0.54), Denmark (-0.44), and Sweden (-0.26) (Table 9.4). Countries with high positive scores (i.e., those indicating a strong level of agreement) included Japan (0.32) and Hungary (0.38). Ireland's mean score of -0.07, suggests a measured scepticism about the value of the computer as a tool for school learning.

Table 9.4: Indices of students' attitudes towards computers (PISA 2012) – OECD countries

Country	Computer as a Positive Tool for School Learning		Computer Limited as a Tool for School Learning	
	Mean	SE	Mean	SE
Australia	0.14	0.01	-0.11	0.01
Austria	0.07	0.02	-0.22	0.02
Belgium	0.01	0.01	-0.05	0.01
Chile	0.56	0.01	0.12	0.02
Czech Republic	0.10	0.02	0.10	0.02
Denmark	0.50	0.02	-0.44	0.02
Estonia	0.18	0.02	-0.20	0.02
Finland	-0.41	0.02	-0.20	0.01
Germany	0.01	0.02	-0.20	0.02
Greece	-0.07	0.02	0.31	0.02
Hungary	-0.15	0.02	0.38	0.02
Iceland	0.14	0.01	-0.22	0.02
Ireland	**-0.20**	**0.02**	**-0.07**	**0.01**
Israel	-0.06	0.02	-0.09	0.02
Italy	-0.16	0.01	0.04	0.01
Japan	-0.82	0.02	0.32	0.01
Korea	-0.92	0.02	-0.15	0.01
Mexico	0.31	0.01	0.46	0.01
Netherlands	-0.06	0.02	0.11	0.02
New Zealand	0.18	0.02	-0.01	0.02
Norway	0.44	0.02	-0.54	0.02
Poland	0.00	0.01	-0.16	0.02
Portugal	0.22	0.01	0.17	0.02
Slovak Republic	-0.02	0.02	0.30	0.02
Slovenia	-0.05	0.02	0.31	0.02
Spain	0.21	0.01	0.12	0.01
Sweden	0.24	0.02	-0.26	0.02
Switzerland	-0.34	0.02	-0.14	0.02
Turkey	0.08	0.02	0.21	0.03
OCED Average	0.00	0.00	0.00	0.00

Source: PIRLS 2011 database

Pupils in Fourth class in PIRLS and TIMSS 2011 were asked about the frequency with which they used computers in three settings: at home, at school, and in other places. Here we consider computer usage at school. In Ireland, 46% of students reported that they used computers once or twice a week or more often, while over 24% reported using a computer once or twice a month, and 30% said they didn't use one at all (Table 9.5). While the figures for Ireland are broadly similar to the PIRLS international average figures, a number of countries show much stronger usage levels, including England (84% of pupils report usage once or twice a week or more often), Northern Ireland (76%), the United States (76%), New Zealand (73%) and Canada (67%). Usage levels, as reported by pupils in Ireland, are well below these levels.

Table 9.5: Percentages of pupils in fourth class using computers with varying degrees of frequency, selected countries in PIRLS 2011 and international average

Country	Every day or almost every day		Once or twice a week		Once or Twice a Month		Never	
	Percent of Pupils	SE	Percent of Pupils	SE	Percent of Pupils	SE	Percent of Pupils	SE
Australia	16.7	1.33	68.6	1.68	10.6	0.81	4.0	0.51
Austria	8.0	0.89	16.6	1.55	18.2	1.22	57.2	2.06
Bulgaria	6.2	1.04	34.4	2.84	12.3	1.30	47.2	2.89
Canada	9.8	0.78	57.1	1.50	22.7	1.11	10.4	0.79
Croatia	5.9	0.60	11.8	1.70	9.1	0.93	73.1	2.20
Czech Republic	6.4	0.61	40.5	3.27	22.6	1.81	30.5	2.54
Denmark	6.5	0.66	37.6	1.75	36.1	1.48	19.8	1.30
Finland	3.2	0.34	30.1	2.55	47.1	2.66	19.5	2.21
France	5.0	0.48	34.2	2.28	26.1	1.80	34.6	2.81
Germany	5.8	0.68	22.3	1.62	22.9	1.31	48.9	2.03
Hong Kong	7.6	0.54	49.3	1.90	19.5	1.09	23.6	1.38
Hungary	6.3	0.71	60.9	2.37	11.0	1.19	21.8	2.42
Ireland	**11.4**	**1.09**	**34.8**	**2.67**	**23.6**	**1.88**	**30.2**	**2.40**
Israel	9.2	0.83	61.9	2.52	12.7	1.25	16.2	1.79
Italy	8.8	0.54	34.0	1.94	17.2	0.99	40.0	2.09
Lithuania	5.5	0.51	14.7	1.25	17.9	1.15	62.0	1.80
Malta	14.9	0.38	50.2	0.64	15.0	0.56	19.9	0.56
Netherlands	16.1	1.82	54.9	2.34	15.3	1.40	13.7	1.65
New Zealand	17.5	1.06	55.8	1.69	18.9	1.29	7.73	0.71
Norway	7.1	1.11	50.9	2.57	25.2	2.06	16.8	1.70
Poland	4.3	0.47	37.5	2.78	15.0	1.22	43.2	2.69
Portugal	8.8	1.76	31.9	2.51	19.1	1.90	40.2	2.68
Romania	9.1	1.01	17.0	1.99	11.8	1.56	62.2	2.96
Russian Fed.	2.8	0.52	26.8	2.12	11.4	1.37	60.0	2.15
Singapore	5.37	0.39	22.7	0.73	40.9	0.71	30.7	0.75
Slovak Republic	3.5	0.32	40.3	2.17	26.1	1.77	30.1	1.85
Slovenia	7.2	0.59	17.6	1.69	20.4	1.07	54.8	2.0
Spain	5.1	0.55	39.4	2.08	16.3	1.30	39.2	1.93
Sweden	6.6	1.08	31.1	2.14	29.0	1.44	33.3	2.55
United States	21.4	1.00	54.5	1.21	14.0	0.78	10.06	0.76
England	6.2	0.66	78.0	1.47	13.5	1.36	2.4	0.42
Northern Ireland	11.1	1.05	65.3	1.70	20.9	1.55	2.7	0.38
International Avg	9.9	0.13	40.8	0.27	15.8	0.17	33.6	0.27

Source: PIRLS 2011 database.

9.2 Teachers' Reports of ICT Usage and Confidence in Using ICTs

This section draws on data from the PIRLS 2011 and TIMSS 2011 teacher questionnaires. Although responses were provided by teachers, they are reported in terms of percentages of pupils, as neither PIRLS nor TIMSS selected fully representative samples of teachers. As noted above, the data refer to Fourth class at primary level.

Table 9.6 shows the percentages of pupils in classes in which a computer(s) was available to pupils to use during reading lessons, according to pupils' teachers. In the case of classes where at least one computer was available to pupils during reading lessons, the table also shows the percentage of pupils with access to at least one computer that was connected to the Internet (i.e., where a computer was available, it was likely to have Internet access). In Ireland, 56% of pupils are in classes

where they have access to at least one computer, and, of these, 96% were in classes where at least one computer was connected to the Internet.

Table 9.7 provides estimates related to the usage of computers in reading lessons. It should be noted that the estimates in the table are based on the responses of teachers who indicated that one or more computers were available for pupil use during reading lessons. In Ireland, this group comprised 56% of pupils taught by teachers of Fourth class.

Teachers completing the PIRLS (and TIMSS) questionnaire were asked to indicate the frequency with which their pupils read stories or other texts on computers, the frequency with which their pupils use software to learn reading skills and strategies, and the frequency with which their pupils use a computer to write stories or other texts. In Ireland, 40% of pupils were taught by teachers who reported that they (the pupils) read stories or other texts on computer during reading lessons at least weekly (Table 9.7). This compares favourably with the PIRLS international average of 33%, and with Canada (35%) and Northern Ireland (34%), but lags behind Portugal (58%) and Australia (50%).

Teachers were also asked about the frequency with which instructional software was used by their pupils to develop reading skills and strategies on the computer. In Ireland, 21% of pupils were taught by teachers who reported that this happened at least weekly (Table 9.7). This is below the international average of 29% and the estimate for Northern Ireland (30%). Other countries in which pupils are engaged more often in this activity than pupils in Ireland include Hong Kong (57%), the United States (56%), Australia (40%), and Austria (37%).

Teachers also reported on the frequency with which their pupils used a computer to write stories or other texts. In Ireland, 19% of pupils were taught by teachers who reported that this happened at least weekly (Table 9.7). This was below the international average of 27% and well below the estimates for Australia (52%), Denmark (43%), Northern Ireland (37%) and Canada (36%). The estimate for Ireland is worrying when one notes that it is based on data provided only by those teachers in whose classrooms at least one computer was available for pupil use during reading lessons.

Table 9.6: Percentages of pupils whose teachers reported that a computer(s) was available for pupil use during reading lessons, and percentages of pupils whose teachers reported that at least one Computer available for student use was linked to the Internet – Selected PIRLS 2011 countries and PIRLS international average

Country	At least one computer available for pupil use in reading lessons		Of computers for pupil use, at least one is linked to the Internet	
	Percent of Pupils	SE	Percent of Pupils	SE
Australia	82.3	2.94	99.8	0.22
Austria	78.5	3.25	82.4	2.90
Bulgaria	17.4	2.49	90.8	5.10
Canada	45.9	2.52	98.6	0.98
Croatia	13.9	2.11	87.1	5.35
Czech Republic	39.5	4.49	96.5	2.12
Denmark	87.0	2.03	99.1	0.67
Finland	64.5	3.09	100.0	0.0
France	11.5	1.97	96.1	3.63
Germany	72.8	2.77	86.2	2.87
Hong Kong	44.7	4.67	97.9	2.13
Hungary	37.7	3.52	81.9	4.84
Ireland	**55.5**	**3.68**	**95.7**	**1.80**
Israel	39.9	4.17	94.0	3.76
Italy	23.6	2.95	67.6	6.16
Lithuania	44.6	3.94	90.1	3.04
Malta	72.9	0.11	97.8	0.04
Netherlands	85.2	2.61	99.4	0.56
New Zealand	86.0	2.18	99.5	0.05
Norway	88.0	2.52	99.6	0.43
Poland	19.5	2.98	87.9	6.25
Portugal	47.1	5.25	87.5	3.79
Romania	25.2	3.36	74.2	7.29
Russian Fed.	29.0	3.58	75.7	5.38
Singapore	63.8	2.37	96.8	1.49
Slovak Republic	36.5	3.48	91.4	3.98
Slovenia	35.8	3.67	92.1	3.76
Spain	20.4	2.94	95.6	2.21
Sweden	73.3	3.81	99.7	0.35
United States	74.3	2.21	98.5	0.72
England	46.9	3.97	100.0	0.00
Northern Ireland	65.1	4.22	100.0	0.00
International Avg.	42.6	0.45	82.2	0.73

Source: PIRLS 2011 database

Table 9.7: Percentages of pupils in Fourth class whose teachers reported that computers were used (by pupils) to read stories or other texts, to develop reading skills and strategies, and to write stories – Selected PIRLS 2011 Countries

Country	Percent of pupils who read stories or other texts on computer during reading lessons		Percent of pupils who use instructional software to develop reading skills and strategies on the computer		Percent of pupils use the computer to write stories or other texts	
	Most Days	Once or Twice a Week	Most Days	Once or Twice a Week	Most Days	Once or Twice a Week
Australia	10.7	39.4	11.4	28.5	15.7	36.0
Austria	1.5	20.2	7.9	29.0	3.1	9.6
Bulgaria	16.2	15.4	0.0	0.0	0.0	14.5
Canada	7.6	27.8	3.3	19.7	7.3	28.8
Croatia	0.0	15.3	0.0	7.3	3.0	9.5
Czech Republic	1.5	9.7	2.9	6.8	5.1	5.1
Denmark	8.3	20.1	7.8	12.0	7.2	35.4
Finland	14.1	2.8	1.7	6.9	3.3	7.4
France	8.7	8.7	0.0	8.9	9.0	18.4
Germany	1.1	14.3	2.8	22.0	0.8	9.4
Hong Kong	27.6	28.4	21.0	35.5	2.6	10.0
Hungary	0.0	15.3	15.2	15.2	4.8	4.8
Ireland	**5.2**	**34.5**	**2.3**	**18.9**	**1.5**	**17.6**
Israel	12.9	39.4	12.6	24.3	12.5	28.2
Italy	0.0	30.3	0.0	19.5	4.5	22.2
Lithuania	1.8	20.8	3.2	13.1	0.6	16.9
Malta	8.8	29.6	3.4	32.2	3.7	33.4
Netherlands	5.6	26.3	10.1	29.2	3.1	20.1
New Zealand	8.3	38.4	7.0	25.4	13.0	43.6
Norway	0.0	16.9	2.1	34.0	1.0	26.0
Poland	4.6	24.2	15.3	15.3	0.0	21.1
Portugal	4.2	53.6	4.1	44.1	7.8	50.8
Romania	3.7	33.4	6.1	22.8	1.6	27.3
Russian Fed.	3.18	37.3	5.1	25.9	3.0	12.7
Singapore	5.4	28.2	3.2	23.6	2.0	17.7
Slovak Republic	5.8	22.7	1.6	11.9	1.6	15.1
Slovenia	3.0	18.0	0.6	16.9	0.6	11.0
Spain	2.0	28.6	0.8	32.3	1.4	27.5
Sweden	4.1	15.3	5.6	24.2	20.3	37.8
United States	10.8	32.8	19.7	36.1	5.2	20.3
England	1.9	20.4	3.0	20.5	5.8	28.4
Northern Ireland	11.7	22.6	8.4	21.8	4.2	32.8
International Avg.	6.0	26.6	5.5	23.3	5.2	22.1

Source: PIRLS 2011 database

Table 9.8 provides estimates of the proportions of pupils in classes with at least one computer for pupil use who were engaged by their teachers in computer-based activities in maths and science lessons once or twice a week or more often[48]. The table shows that 33% of pupils in Ireland were engaged by their teachers in exploring mathematical concepts and principles on the computer. This

[48] Data on availability of computers for pupil use during maths and science lessons are similar to those for reading (i.e., 55-60%% of pupils in Ireland were in maths and science classes with at least one computer available for pupil use; see Mullis, Martin, Foy & Auora, 2012, Exhibit 8.29., p. 404; Martin, Mullis, Foy & Stanco, 2012, Exhibit 8.29, p. 414).

was above the international average of 28%, but was below the estimates for New Zealand (59%), Australia (53%), Northern Ireland (42%) and Portugal (47%).

In classrooms with at least one computer for pupil use in mathematics lessons, a quarter of pupils in Ireland were taught by teachers who engaged them in practising skills and procedures related to mathematics on the computer. This estimate is below the international average of 40%, and well below the estimates for the Netherlands (85%), New Zealand (81%), the United States (61%) and Australia (59%).

Use of the computer by pupils to look up information and ideas is not as prevalent as other computer-based activities in mathematics lessons. In Ireland, 14% of pupils were taught by teachers who engaged them in this activity at least weekly. The international average was 28%. Countries in which relatively large proportions of pupils sought information about mathematics on the computer included the Slovak Republic (47%), New Zealand (40%), and Northern Ireland (37%). Interestingly, no pupils in Japan were engaged by their teachers in looking up information and ideas about mathematics at least once a week.

Several countries had high proportions of pupils engaged in all three mathematics-related activities involving computers, albeit with lower proportions looking up information and ideas. These included New Zealand, the Netherlands and Portugal. Ireland, on the other hand, had a relatively uneven profile, with an above average proportion of pupils exploring concepts and principles on the computer, and below-average proportions practising skills and procedures and looking up ideas and information.

The engagement of students in Ireland in science-related activities that involved the use of a computer was low. Fewer than one in eight pupils (in classrooms with computers for use by pupils) practiced skills and procedures on the computer (9%), conducted scientific procedures or experiments (8.6%), or studied natural simulations (12%) in science classes at least once a week. These estimates are well below the corresponding international averages (29%, 21% and 20% respectively).

Table 9.8: Percentages of pupils in Fourth class whose teachers reported that computer software was used at least weekly for various purposes in mathematics and science classes– Selected TIMSS 2011 countries, and international averages

Country	Maths Classes			Science Classes		
	Students explore mathematical concepts and principles on the computer	Students practise skills and procedures on the computer	Students look up ideas and information on the computer	Students practise skills and procedures on the computer	Students do scientific procedures or experiments on the computer	Students study natural phenomena through simulations on the computer
Australia	53.4	58.7	29.6	17.9	22.8	19.4
Austria	11.6	35.2	14.7	10.3	2.4	1.9
Chile	27.5	39.8	30.5	27.1	16.2	20.6
Croatia	55.0	9.7	2.6	12.8	0.0	0.0
Czech Republic	11.2	36.9	11.9	22.6	8.0	2.9
Denmark	11.0	21.4	9.7	9.4	7.4	5.7
Finland	6.6	15.5	3.1	11.0	2.5	2.6
Germany	10.5	31.4	10.9	6.9	4.4	0.8
Hong Kong	38.9	39.9	28.3	27.9	19.6	21.5
Hungary	8.4	30.8	15.1	17.0	3.3	2.7
Ireland	**32.9**	**25.1**	**14.4**	**9.3**	**8.6**	**11.9**
Italy	31.6	41.5	34.1	32.3	21.3	26.8
Japan	0.0	1.89	0.0	1.8	1.0	1.0
Korea	33.5	28.4	30.7	33.7	35.8	43.3
Lithuania	17.7	31.3	28.0	31.9	6.9	5.6
Malta	47.7	7.5	30.9	10.7	8.2	12.0
Netherlands	41.8	85.4	33.6	9.0	3.4	2.3
New Zealand	59.1	81.1	40.3	13.8	12.4	15.8
Norway	23.2	50.6	11.2	8.7	0.8	6.3
Poland	15.0	20.3	32.5	9.3	5.8	7.9
Portugal	46.9	43.3	40.8	13.9	27.2	24.6
Romania	29.6	36.2	25.9	40.1	32.6	21.6
Russian Fed.	24.2	41.0	32.6	40.8	16.8	16.4
Singapore	25.7	38.5	23.1	33.7	32.8	20.7
Slovak Republic	17.7	31.1	47.3	24.0	4.6	6.2
Slovenia	11.6	29.3	10.5	6.4	3.2	5.6
Spain	15.5	48.1	22.5	31.2	18.7	15.8
Sweden	11.5	45.0	10.3	8.8	2.6	1.8
United States	43.9	60.9	28.5	22.9	15.9	16.0
England	19.0	32.3	13.1	9.1	5.5	9.2
Northern Ireland	41.9	58.0	36.9	15.3	11.6	13.6
International Avg	27.7	40.0	27.5	28.6	20.9	19.8

Source: PIRLS 2011 database

Teachers whose pupils participated in PIRLS 2011 and TIMSS 2011 were also asked about their confidence in using computers in their teaching. In Ireland, 69% of pupils were in classes whose teachers *agreed a lot*[49] that they felt comfortable using computers in their teaching (Table 9.9). This is above the international average of 61%, but several countries have higher proportions of teachers

[49] Teachers responded to this and the other questions in Table 7.9 using a 4-point scale: *agree a lot*, *agree a little*, *disagree a little* and *disagree a lot*.

agreeing a lot, including England (89%), Hong Kong (86%), Northern Ireland (80%), Singapore (82%), and the United States (78%).

Teachers were also asked to indicate their agreement with a statement to the effect that they had ready access to computer staff in the school if they have technical problems. In Ireland, 35% of pupils were taught by teachers who *agreed a lot* with this statement. This is below the international average of 43%, and is well below the corresponding estimates for a number of countries including Hong Kong (80%), Singapore (71%), Northern Ireland (57%) and New Zealand (47%).[50]

Teachers were also asked to indicate their agreement with a statement to the effect that they received adequate support for integrating computers into their teaching activities. In Ireland, 35% of were in classes whose teachers agreed *a lot* with this statement, compared with an international average of 41%. Countries with higher proportions than Ireland included Singapore (62%), Hong Kong (59%) Northern Ireland (58%), and Australia (51%).[51]

A number of countries had high average scores across all three aspects considered. These included Australia, Denmark, England, the Netherlands, New Zealand, Hong Kong, Norway and the United States. In these countries, relatively large numbers of pupils are in classes in which at least one computer is available for pupil use and, within such classes, at least 40% of pupils are taught by teachers who perceive themselves to be competent using computers in their teaching, who have access to technical support when it is needed, and who perceive themselves to receive support for integrating computers into teaching activities. What international studies such as PIRLS and TIMSS do not do is provide further detail that would help to establish why teachers in these countries feel they are better supported than their counterparts in Ireland.

Ireland stands out as a country in which a relatively large proportion of pupils are in classes whose teachers feel comfortable using computers in their teaching, but where access to technical support and to support for integrating computers into teaching activities is more limited.

[50] Only countries in which at least 50% of pupils are in reading classes with at least one computer for student use are listed here (see Table 9.6).
[51] Again, only countries in which at least 50% of pupils are in reading classes with at least one computer for student use are referred to here.

Table 9.9: Percentages of pupils in Fourth grade whose teachers agreed a lot that they felt comfortable using computers in their teaching, that they had ready access to computer staff in their school, and that they received adequate support for integrating computers into teaching activities – Selected PIRLS 2011 countries, and international average

Country	I feel comfortable using computers in my teaching – Agree a lot		When I have technical problems, I have ready access to computer staff in my school – Agree a lot		I receive adequate support for integrating computers into teaching activities – Agree a lot	
	Percent of Pupils	SE	Percent of Students	SE	Percent of Students	SE
Australia	74.6	3.34	47.1	8.36	51.0	4.13
Austria	39.0	3.47	36.3	3.69	24.8	2.73
Bulgaria	48.3	5.11	56.8	4.08	55.9	4.79
Canada	64.3	2.95	30.6	3.07	28.6	2.22
Croatia	54.6	4.44	62.3	4.56	63.5	4.53
Czech Republic	51.0	4.86	66.6	4.22	48.2	4.78
Denmark	73.0	2.99	36.9	3.74	33.3	2.94
Finland	56.3	3.90	27.7	3.47	19.3	2.89
France	31.4	4.22	5.34	2.0	3.2	1.43
Germany	37.2	4.18	24.8	3.38	15.9	2.98
Hong Kong	85.5	2.95	79.9	4.05	58.7	4.24
Hungary	36.1	4.65	55.0	5.28	60.6	4.35
Ireland	**68.8**	**3.47**	**33.5**	**3.47**	**34.9**	**3.64**
Israel	68.2	5.60	56.0	5.91	55.1	5.95
Italy	32.6	5.62	18.9	3.58	12.2	4.04
Lithuania	47.1	3.46	42.6	3.52	50.1	3.73
Malta	83.0	0.10	26.6	0.02	33.0	0.13
Netherlands	72.4	3.01	61.1	3.55	38.9	3.41
New Zealand	72.9	2.46	47.3	3.13	44.1	3.41
Norway	57.5	5.08	39.5	4.90	33.1	4.54
Poland	46.1	4.03	42.8	4.13	62.6	4.21
Portugal	54.9	4.47	13.4	2.87	13.1	5.10
Romania	41.3	5.58	39.7	5.52	40.9	5.13
Russian Fed.	41.0	4.26	66.3	4.01	58.1	3.84
Singapore	82.1	2.11	71.2	2.20	61.9	2.61
Slovak Republic	54.1	3.53	44.1	3.32	44.5	3.82
Slovenia	42.3	3.92	43.9	3.92	44.2	3.72
Spain	43.9	5.65	34.1	4.74	35.0	5.28
Sweden	45.5	4.31	11.7	3.02	14.6	2.79
United States	77.5	2.38	45.6	2.44	44.6	2.65
England	88.5	2.59	38.9	4.17	47.4	4.27
Northern Ireland	79.5	3.29	57.2	4.63	58.2	4.02
International Avg	60.9	0.67	42.7	0.65	41.4	0.64

Source: PIRLS 2011 database.

9.3 ICTs and School Policy

Most of the indicators in this section are based on responses provided by school principals in PISA 2012, and in PIRLS and TIMSS 2011. Many of the questions to which principals responded related to school policy issues such as provision of computers and other ICTs, and the extent to which potential problems (e.g., shortages of ICTs) were perceived to impact on teaching and learning.

The first indicator in Table 9.10 is the ratio of computers to students. Data for this ratio were obtained on the PISA 2012 School Questionnaire by asking school principals to give the total number of students in the modal grade (Third year in Ireland) and the number of computers available to these students for educational purposes. In Ireland the ratio is 0.64. This means that, on average, there is 0.64 of a computer available for each student, or 6.4 computers per 10 students. The ratio for Ireland is similar to the International Average ratio of 0.68. Across countries, ratios range from 1.53 in Australia to 0.14 in Turkey. Ratios that are greater than one (e.g., 1.53 in Australia) may have occurred because principals in large schools factored in computers that may also have been available to students outside the modal grade (e.g., computers in a computer room accessible to all students in the school).

The second indicator in Table 9.10 was developed by the OECD using the responses provided by students on availability of various ICTs at school for their use, including computers, tablets, printers, USB sticks and e-books at school (see Table 9.1). Responses were scaled to an OECD mean of 0 and a standard deviation of 1. A negative score indicates that students in a country reported that fewer resources were available to them, relative to their counterparts in other OECD countries, rather than a shortage of ICTs in an absolute sense. The mean score for Ireland was -0.38, which is more than one-third of a standard deviation below the OECD average. A number of countries with high scores on many of the PISA ICT indicators, such as Denmark and the Netherlands, record low scores on the availability of ICTs at school index, perhaps because equal weighting was given to less-widely available resources such as e-books or USB sticks as well as to widely available ones such as computers. It is noteworthy that the mean score of Japan (-0.39) is similar to that of Ireland.

The third indicator in Table 9.10 concerns the proportion of computers in a school (for student use at the modal grade level) that are connected to the Internet. In Ireland, all computers available for student use in Third year were, according to school principals, connected to the Internet.

Table 9.10: Indices of computer-student ratio and availability of ICTs at schools, and proportion of school computers with Internet Access (PISA, 2012) – OECD Countries and OECD Country Average

Country	Ratio of Computers to Students		Availability of ICTs at School		Proportion of School Computers with Internet Access	
	Mean	SE	Mean	SE	Mean	SE
Australia	1.53	0.05	0.76	0.01	1.00	0.00
Austria	1.47	0.16	0.10	0.02	0.99	0.01
Belgium	0.72	0.03	-0.33	0.02	0.97	0.01
Canada	0.84	0.03	-0.12	0.03	1.00	0.00
Chile	0.49	0.03	-0.09	0.02	0.95	0.01
Czech Republic	0.92	0.04	0.81	0.01	0.99	0.01
Denmark	0.83	0.04	-0.14	0.02	0.99	0.01
Estonia	0.69	0.05	0.28	0.02	1.00	0.00
Finland	0.46	0.16	-0.13	0.02	1.00	0.00
France	0.60	0.03	0.17	0.03	0.96	0.01
Germany	0.65	0.03	-0.13	0.02	0.98	0.01
Greece	0.24	0.03	0.03	0.01	0.99	0.01
Hungary	0.64	0.04	-0.07	0.02	0.99	0.01
Iceland	0.63	0.04	-0.35	0.03	1.00	0.00
Ireland	**0.64**	**0.02**	**-0.38**	**0.02**	**1.00**	**0.00**
Israel	0.38	0.02	-0.62	0.03	0.91	0.01
Italy	0.48	0.04	-0.36	0.02	0.96	0.01
Japan	0.56	0.07	-0.39	0.02	0.97	0.01
Korea	0.40	0.01	0.41	0.02	0.97	0.01
Luxembourg	0.87	0.03	0.35	0.02	1.00	0.00
Mexico	0.28	0.00	0.58	0.02	0.73	0.01
Netherlands	0.68	0.04	-0.24	0.03	1.00	0.00
New Zealand	1.10	0.02	0.15	0.02	0.99	0.00
Norway	0.79	0.01	0.05	0.03	0.99	0.01
Poland	0.36	0.04	-0.27	0.02	0.98	0.01
Portugal	0.46	0.03	-0.15	0.02	0.97	0.01
Slovak Republic	0.77	0.00	0.35	0.03	0.99	0.00
Slovenia	0.62	0.03	0.18	0.02	1.00	0.00
Spain	0.67	0.04	-0.43	0.03	0.99	0.01
Sweden	0.63	0.04	0.76	0.01	0.99	0.00
Switzerland	0.68	0.03	0.10	0.02	0.99	0.00
Turkey	0.14	0.01	-0.33	0.02	0.96	0.01
United Kingdom	1.02	0.05	-0.12	0.03	0.99	0.00
United States	0.95	0.03	-0.09	0.02	0.94	0.01
OCED Average	0.68	0.01	0.00	0.00	0.97	0.00

*Ratio of number of computers to number of students in modal grade for 15-year olds (Third year in Ireland)

Source: PISA 2012 Database

PIRLS asked school principals to indicate the extent to which a shortage or inadequacy of various resources impacted on teaching and learning. Table 9.11 provides data on the extent to which a shortage of technologically-competent staff is deemed to impact negatively on teaching and learning. In Ireland, 3.3% of students were in school in which such a shortage was deemed to affect teaching and learning *a lot*. The compares favourably with an international average of 13%. Twenty-three percent of students in Ireland were in classrooms in which a shortage of technological staff was deemed to affect learning *to some extent*, compared to an international average of 24%. These data seem to suggest that a shortage of technologically-competent staff is perceived to have a moderate effect on teaching and learning in Ireland, though, inevitably, this is related to conceptions of teaching and learning and the extent to which ICTs are viewed as having positive effects on pupils' learning. Among countries where a shortage of technologically-competent staff is deemed to have a less negative effect than in Ireland are Denmark (9% are in schools where the principal agrees *a lot* or to *some extent*), Norway (12%), England (13%), the Czech Republic (18%) and the Netherlands (19%).

Table 9.12, also drawn from PIRLS, presents data on the extent to which school principals perceived that a shortage or inadequacy of computer software for reading impacted negatively on teaching and learning. The table shows that 37% of pupils in Ireland were in schools whose principal teacher agreed a lot or to some extent that a shortage of computer software had a negative effect on learning. This is slightly below the international average of 39%. Countries in which fewer students were in school in which a shortage of computer software was deemed to affect learning a lot or to some extent include England (18%), Australia (20%), Norway (21%) and Sweden (22%). Thus, it seems that, in countries where there is fairly high usage of computers in reading classes (see Table 9.7), there is also relatively high satisfaction with the available software and vice versa.

Finally, Table 9.13 provides data on aspects of computer availability and principals' perceptions of the effects of a shortage or inadequacy of computers on teaching and learning. Based on data provided by school principals, 35% of pupils in Ireland are in schools in which there is a computer available for 1-2 pupils in Fourth grade. Ireland falls below the international average of 41% on this indicator. Countries with more computers include England (89% of pupils are in schools where there is one computer for each 1-2 pupils), Northern Ireland (77%), the United States (67%), the Czech Republic (66%) and Australia (65%).

In Ireland, 13% of pupils are in schools whose school principals consider that a shortage or inadequacy of computers affects learning a lot. This is below the international average of 17%. Countries in which there are more computers available to pupils than in Ireland are less likely to view a shortage or inadequacy of computers as problematic. Thus, in Australia, for example, just 6% of pupils are in schools where the principal deems that a shortage or inadequacy of computers affects learning a lot.

Table 9.11: Percentages of pupils in fourth grade in schools whose principals reported that a shortage of technologically competent staff affected learning a lot or to some extent – Selected PIRLS 2011 countries, and international average

Country	Shortage of Technologically Competent Staff Affects Learning a Lot		Shortage of Technologically Competent Staff Affects Learning to Some Extent	
	Percent of Pupils	SE	Percent of Students	SE
Australia	3.0	1.14	26.7	2.49
Austria	6.5	1.81	27.7	4.25
Bulgaria	5.8	1.95	14.5	3.05
Canada	5.5	1.09	25.6	2.09
Croatia	5.1	1.91	12.4	3.16
Czech Republic	2.8	1.37	14.9	3.07
Denmark	1.8	0.79	7.6	1.86
Finland	6.9	2.34	25.7	4.19
France	20.7	3.67	27.6	4.41
Germany	9.1	2.04	22.8	2.92
Hong Kong	20.8	3.86	48.8	3.50
Hungary	9.3	2.80	21.9	3.80
Ireland	**3.3**	**1.47**	**22.5**	**2.26**
Israel	19.7	3.10	20.8	3.65
Italy	8.6	1.94	49.7	4.20
Lithuania	9.6	2.45	19.9	3.18
Malta	7.1	0.06	28.9	0.11
Netherlands	3.7	1.89	15.4	3.37
New Zealand	1.7	1.01	24.7	3.40
Norway	0.0	0.0	11.5	3.07
Poland	2.0	1.13	7.7	2.23
Portugal	3.2	1.42	42.0	5.21
Romania	13.8	3.32	23.7	3.87
Russian Federation	14.0	2.82	30.7	3.43
Singapore	8.4	0.02	30.2	0.01
Slovak Republic	1.3	0.77	35.1	3.47
Spain	4.0	1.23	17.9	2.71
Sweden	7.6	2.71	29.9	4.96
United States	5.9	1.30	20.6	2.41
England	4.2	2.46	8.8	2.40
Northern Ireland	4.4	2.01	18.8	3.53
International Avg.	13.0	0.34	23.8	0.46

Source: PIRLS 2011 database

Table 9.12: Percentages of pupils in fourth grade in schools whose principals reported that a shortage or inadequacy of computer software affected learning a lot or to some extent – Selected PIRLS 2011 countries, and international average

Country	Shortage of Computer Software for Reading Affects Learning a Lot		Shortage or of Computer Software for Reading Affects Learning To Some Extent	
	Percent of Pupils	SE	Percent of Students	SE
Australia	2.6	1.09	17.5	3.01
Austria	4.02	1.85	19.3	3.32
Bulgaria	35.7	4.16	34.2	4.19
Canada	6.3	1.26	26.7	2.21
Croatia	16.6	3.18	28.1	3.97
Czech Republic	8.5	2.59	29.1	4.12
Denmark	2.1	0.93	17.8	2.65
Finland	6.0	2.13	17.7	3.72
France	21.7	3.53	29.9	3.82
Germany	8.3	2.14	17.6	3.22
Hong Kong	5.2	1.97	33.5	4.20
Hungary	7.8	2.31	32.9	4.20
Ireland	**9.0**	**2.68**	**28.1**	**3.38**
Israel	23.3	3.28	30.2	3.65
Italy	6.0	1.65	44.7	3.27
Lithuania	16.7	3.42	29.5	4.29
Malta	2.9	0.95	31.2	0.11
Netherlands	2.9	1.90	17.1	3.54
New Zealand	1.3	0.89	18.3	3.16
Norway	0.0	---	21.0	4.09
Poland	18.6	3.12	28.6	3.68
Portugal	11.8	3.04	40.4	5.32
Romania	23.2	3.36	31.8	4.24
Russian Federation	10.0	2.44	44.0	3.72
Singapore	5.4	0.0	23.5	0.02
Slovak Republic	20.2	3.10	37.9	4.24
Spain	6.7	1.77	23.2	2.79
Sweden	2.4	1.07	19.3	3.84
United States	7.5	1.72	19.7	2.39
England	4.1	2.26	13.5	2.79
Northern Ireland	5.3	2.05	21.6	4.33
International Avg.	13.3	0.35	25.9	0.47

Source: PIRLS 2011 database

Table 9.13: Percentages of pupils in Fourth grade in schools whose school principals reported that a computer was available for 1-2 students, and percentages of pupils whose school principals deemed that a shortage of computers affected learning a lot – Selected PIRLS 2011 countries and international average

Country	Schools in Which There is One Computer for 1-2 Students		Extent to Which Shortage of Computers Affects Learning a Lot	
	Percent of Students	SE	Percent of Students	SE
Australia	65	3.7	5.6	1.47
Austria	11	2.4	6.7	3.11
Bulgaria	40	3.8	3.1	1.90
Canada	76	2.0	10.9	1.98
Croatia	12	2.4	7.4	2.37
Czech Republic	66	3.5	3.9	1.51
Denmark	87	2.2	7.1	1.73
Finland	55	4.3	6.2	2.28
France	34	4.2	24.3	3.70
Germany	21	2.5	5.7	1.83
Hong Kong	55	4.4	29.1	3.82
Hungary	53	3.9	11.5	2.98
Ireland	**35**	**3.8**	**13.2**	**3.20**
Israel	29	4.0	29.1	3.82
Italy	20	3.0	10.8	2.40
Lithuania	29	3.2	24.3	3.48
Malta	15	0.1	3.2	8.3
Netherlands	41	5.1	1.4	1.40
New Zealand	59	3.8	7.1	1.94
Norway	58	5.1	4.4	2.03
Poland	31	3.0	18.6	2.95
Portugal	15	3.2	15.5	3.14
Romania	42	3.7	15.4	3.03
Russian Federation	28	3.0	28.5	3.50
Singapore	51	0.0	11.1	0.02
Slovak Republic	81	2.5	5.0	1.64
Spain	50	3.2	7.2	2.27
Sweden	29	3.6	27.1	3.90
United States	67	2.9	9.0	1.64
England	89	3.0	5.7	2.69
Northern Ireland	77	4.3	9.6	3.24
International Avg. 41 0.5	16.6	0.38		

*Source: Mullis et al., (2012). Exhibit 5.8: Schools with Computers Available for Instruction
**Sources: PIRLS 2011 Database, Item ACBG10AG

9.4 Conclusion

Ireland's participation in recent international surveys of education achievement at primary and post-primary levels has provided useful comparative data on computer infrastructure and computer usage by both teachers and students, though the administration of questionnaires to school principals, classroom teachers, and students. These studies differ from EU ESSIE (European School Network and University of Liège, 2013) (see Chapter 1) in that their main function is to assess trends in educational achievement, while the measurement of ICT infrastructure and usage is a secondary

function. Nevertheless, they provide reliable data on ICT-related issues on a cyclical basis (every three to five years, depending on the study).

In Ireland, one-third of 15-year olds in the OECD-PISA study in 2012 who had Internet access at school reported that the never used it, compared with an OECD average of 19%. In Ireland, more students than on average across OECD countries observed their teachers demonstrating mathematical procedures such as graphing functions and entering data on a spreadsheet than on average across OECD countries, while fewer students in Ireland carried out these procedures themselves on a computer. This finding is consistent with the ESSIE study, which found that teachers in Ireland made frequent usage ICTs to prepare and present lesson content, but provided students with fewer opportunities to learn using computers, compared with other EU countries. PISA 2012 Students in Ireland also reported comparatively low levels of ICT usage at home for school-related tasks.

Among students in Fourth class in Ireland who participated in the PIRLS 2011 study, 44% were in classes in which no computer was available during reading lessons. Where at least one computer was available, students in Ireland participated in such activities as reading stories or other texts on computer, using instructional software to develop reading skills and strategies, and writing stories and other texts, with the same frequency as students on average across PIRLS countries. However, students in a number of countries, including Australia, Denmark, the Netherlands, Northern Ireland and Sweden carried out these activities with greater frequency than students in Ireland. In TIMSS 2011, fewer students in Ireland than on average across TIMSS countries were taught by teachers who had them carry out such activities as practising mathematics skills and procedures on the computer and looking up mathematical ideas and information on the computer. Similarly, in science lessons, fewer students in Ireland than on average across TIMSS countries were asked to practise skills and procedures on the computer, do experiments on the computer or study natural phenomena through computer simulations. These findings are broadly in line with those emerging from the 2013 Census, which suggests that students in Ireland have relatively low levels of engagement with ICTs in instructional contexts.

Considering the outcomes reported in Chapter 9 across countries, it is clear that a cluster of countries, including Australia, Denmark, England, Northern Ireland, Norway, Sweden and the United States are ahead of Ireland, both in terms of student access to ICT infrastructure, and in terms of student usage of ICT in lessons and for homework activities. While students in these countries do not necessarily outperform students in Ireland in terms of achievement in reading literacy, mathematics and science in international assessments (for example, Norway does particularly poorly in PIRLS), they may be better positioned than Ireland in terms of preparing students for the future. On the other hand, it has to be acknowledged that Asian countries whose students consistently post high average achievement results in international assessment, do not rank well on many of the ICT indicators in those studies. However, with assessment in general, and PISA and PIRLS in particular, moving to computer-based assessment in the near future, it is important for students in Ireland to be well-prepared for this.

Chapter 10: Conclusions

The purpose of this chapter is to draw some broad conclusions from the 2013 ICT Census of Schools that might contribute to establishing a National Digital Strategy for Schools – a Strategy that is consistent with developments in technology and pedagogy internationally, and with national priorities. This includes key deliverables for education and e-learning in the National Digital Strategy (Department of Communication, Energy and Natural Resources, 2013), and key skills identified in revised curricula at primary and post-primary levels (e.g., DES, 2012a). It is assumed that:

- the Strategy will have a lifetime of 6 years
- its implementation will be evaluated on an ongoing basis, and
- it will be revised from time to time to keep pace with new technological developments and insights from research.

The chapter includes three broad themes that mirror those in Chapter 2 of this report: *ICT Infrastructure, Learning, Teaching and Assessment through the Use of ICTs*, and *Teacher Professional Learning*. A fourth theme, *Research, Policy and Leadership* is added. Within these broad themes, ten subthemes are addressed, as outlined in Table 10.1.

Table 10.1 Themes and subthemes addressed in conclusions

Broad Theme	Subtheme
ICT Infrastructure	Internet Connectivity Access to Computing Devices and Other Technologies Technical Support and Maintenance Purchasing and Procurement
Learning, Teaching and Assessment Using ICTs	Use of ICTs in Teaching and Learning Developing 21st Century Skills Using ICTs Assessment and ICTs
Teacher Professional Learning	Specifying Teacher Professional Knowledge Supporting Teacher Professional Learning
Research, Policy and Leadership	Research as a Driver of Policy and Practice School Leadership and Planning

It should be noted that these themes and subthemes are not presented in order of importance. This is because all of them can be deemed important, and each one should be addressed with equal emphasis in the Strategy. For example, the implementation of a new technological initiative, such as high-speed broadband, without adequate technical support, pedagogic support for teachers, and research to identify strengths, weaknesses and effects, would seem to have a limited chance of success (see UNESCO, 2008a, 2008b, 2011).

10.1 ICT Infrastructure

As noted in Chapter 2, the development of a robust infrastructure that provides teachers and students with the resources they need is an essential component in the integration of ICT into schools. Infrastructure includes resources such as computer hardware, data and networks, information resources, interoperable software and technical support. This section focuses on four specific issues that have been prominent in both the literature review and the results of the 2013 ICT Census of Schools – Internet connectivity, access to computing devices and other technologies, technical support and maintenance, and purchasing and procurement.

10.1.1 Internet Connectivity

The review of the literature noted that a school's broadband bandwidth increasingly determines online content, functionality and applications that students and teachers will be able to use effectively in the classroom. This implies that all network applications and traffic, as well as technologies for more efficient use of bandwidth, should be considered in the architecture and design of school networks. A related and increasingly important issue that requires attention (due to the increased access and use of mobile devices) is the development of robust wireless networks in schools.

Data from the EU ESSIE study (European School Network and University of Liège, 2013) indicate that broadband speeds in primary schools in Ireland are well below the EU average, though they are close to or exceed EU average levels at post-primary level. In the 2013 Census, between 58% and 64% of principals in primary, post-primary and special schools indicated that high-quality broadband internet connectivity was a high priority for their school. Also, about 40-50% of principals indicated that making improvements to the existing 'fixed' school network was a high priority. Similar proportions prioritised a high-quality school-wide wireless network. Principals in primary and special schools also rated insufficient access to high-quality broadband as being among the top five obstacles to using ICTs to support teaching and learning at school level. Comments offered by teachers frequently referred to slow broadband speed, with some teachers stating that they avoid using the Internet if download speeds are slow or inconsistent.

The national rollout of 100 Mbps Internet connectivity to all post-primary schools is a welcome move, but, as noted in Chapter 2, as the broadband requirements associated with many applications continue to rise, 100 Mbps may soon be inadequate. Indeed, according to a recent report by CISCO (2013), speeds as high as 10 Gbps per 1000 students may be necessary within the next five years. At approximately 10,000 Mbps, this is 100 times the current national rollout.

The Digital Strategy for Schools should seek to estimate the broadband needs of schools of varying size and location, including primary and special schools, with a view to ensuring that all schools will have adequate broadband speeds to meet their needs during the lifetime of the Strategy.

Clearly, bringing high-speed broadband to all schools is an important policy priority. However, it is also important to ensure that school broadband networks, whether fixed or wireless, operate in a way that maximises the benefits of available broadband width.[52] Hence, the Strategy should also

[52] This is being considered by the Department of Communications, Energy and Natural Resources (DCENR) and ICT Planning Unit through Switch On workshops actioned under the National Digital Strategy.

deal with how schools can continue to be supported in distributing available bandwidth to maximum effect, in a context in which greater numbers and a greater variety of teacher and student devices will be in use, access to cloud computing will increase, and networks may have to accommodate increased broadband speeds over time.

10.1.2 Access to Computing Devices and Other Technologies

The 2013 Census indicates that some progress has been made in acquiring ICTs in schools in recent years. The ratios of students to computing devices (4.6 to 1 at primary level, 3.7 to 1 at post-primary level, and 1.7 to 1 in special schools) in 2013 are lower than in 2005. However, the ratios of students to computing devices available for student use are less favourable (11.1 at primary level, 8.8 at post-primary level, and 3.3 in special schools). This points to a lack of devices for student use in schools on an ongoing basis during teaching and learning. Although data from PISA 2012 show that the ratio of students to computing devices in Ireland is close to the OECD average (see Chapter 9), Ireland lags well behind countries such as Australia, Austria, the United States and the United Kingdom, all of which outperformed Ireland on the PISA 2012 assessment of computer-based problem solving (OECD, 2014). A similar pattern is apparent at primary level, where, according to the PIRLS 2011 study, just over one half of students in Fourth classes in Ireland were in classrooms in which at least one computing device was available for student use during reading lessons, compared with over 80% in Australia, Denmark, the Netherlands, Norway and New Zealand. The shortages of computers for regular, ongoing use by students in Irish classrooms has been highlighted as an issue of priority for some time, with, for example, both the *ICT in Schools* report (DES, 2008) and *Investing Effectively in ICT in Schools* (DES, 2008) strongly advising policy makers to support computer usage by students in their own classrooms.

The ESSIE study (European Schoolnet and University of Liège, 2013) showed that Ireland had the lowest ratio of students to interactive whiteboards in primary schools (Fourth class), and the lowest ratio of students to digital projectors in post-primary schools (Second year) among EU countries. Thus, there is strong evidence that schools and teachers are relatively well-resourced to use ICTs in preparing for and presenting lessons (with funding for this being provided in recent years), but students are poorly-resourced in terms of having access to and using computing devices, especially in classroom settings. This in turn implies a focus on ICTs to support didactic as opposed to constructivist and hands-on teaching and learning activities. While constructivist and hands-on teaching can and does occur where students have limited access to computing devices, putting the devices into students hands can be expected to increase opportunities for active learning.

Shortages of computing devices in Irish classrooms are also coming to light in a policy context in which the practice of using progressively smaller, more portable computing devices, including Bring-Your-Own-Device (BYOD) products is growing internationally. In the 2013 Census, just 8% of principals at primary level and 2% at post-primary level indicated that students were allowed to use their own devices (tablets, smart phones, and digital cameras) at school. Nevertheless, the broader use of portable devices, and particularly students' own devices, has the potential to allow schools to shift spending from more expensive PCs to a combination of fixed and portable devices.

The Digital Strategy for Schools should set national targets for the ratio of students to computing devices, with an overall aim of one-to-one computing. This is in keeping with international trends whereby those countries with the most advanced levels of infrastructure are aiming for one-to-one

student-computer ratios for all students or subsets of students. Schools should be supported in deciding on the most appropriate blend of fixed computers, school-owned portable devices and student-owned devices, taking into account changing curriculum priorities and expectations, the location and socioeconomic context of schools, as well as concerns that schools and parents may have about Internet safety when student-owned devices are in use. The Strategy should also seek to ensure that all teachers have access to computing devices that will support their professional activities, both at school and at home.

The Strategy should address the issue of ageing computing devices. The 2013 Census indicates that 40% of computing devices in primary and special schools and 20% in post-primary schools are more than six years old. Principals of special schools rate ageing computers as the most serious obstacle to using ICTs to support teaching and learning, while their counterparts in primary schools rate it as the third most serious obstacle. It ranks fifth (of 18) among principals of post-primary schools.

The 2013 Census indicates that, while some technologies such as interactive whiteboards are widely available in schools, others, such as visualizers (document cameras) and multi-function devices are absent in over 20% of schools in each sector. Again, the Strategy needs to consider how schools can be supported in prioritising the acquisition of relevant technological devices, taking into account their needs in different subject areas as well as the needs of their students.

The Strategy should also consider recent advances in cloud computing (described in Chapter 2 of this report), and their relevance for schools, since schools could save on procurement and maintenance of local servers by sourcing software and web applications that are cloud-based. Cloud computing could host a range of services including digital textbooks, digital libraries, simulations, virtual learning environments, text processing, audio/video capture, programming platforms, and a host of administrative functions, with teachers and students accessing relevant data at school and at home. However, privacy and security issues need to be rigorously addressed as part of the Digital Strategy in relation to the use of cloud computing.

10.1.3 Technical Support and Maintenance

In the 2013 Census, school principals in primary and post-primary schools identified insufficient levels of technical support as the second greatest obstacle to integrating ICTs into teaching and learning at school level. Principals of special schools rated it as the third greatest obstacle. In their comments, some principals called for centralised technical support for schools, while others called for IT technicians to be assigned to schools or clusters of schools. Teachers at all levels (primary, post-primary and special schools) rated technical support as being among their top three ICT-related priorities.

As noted in Chapter 1, several recent reports, including *ICT in Schools* (DES, 2008), *Investing Effectively in Information and Communications Technology in Schools (DES, 2008)*, and *Smart Schools = Smart Economy* (ICT in Schools Joint Advisory Group to the Minister of Education, 2009) highlighted in clear terms an urgent need to address technical support in schools. *Investing Effectively* put forward a detailed costing for the provision of technical support to schools over a seven-year period that included a centralised technical support desk accessible to all schools, the provision of 2-5 days of call-out credits to schools, based on school size, and the provision of a technical support/proxy server to large schools. *Smart Schools = Smart Economy* called on the (then) Department of Education and Science to provide a technical support service that would allow

for the aggregation of individual school needs countrywide, and suggested that a national solution be prepared by 2012. Based on the response of school principals and class teachers in the 2013 Census, it is clear that most of these proposals have not been implemented.

In light of the above reports and in line with current international trends, the Digital Strategy for Schools should put forward clear and specific proposals and clear targets for an integrated, system-wide approach to technical support and maintenance. Without such an approach, schools are highly unlikely to successfully integrate ICTs into teaching, learning and assessment on an ongoing and sustained basis.

10.1.4 Purchasing and Procurement

Several countries worldwide have begun to link infrastructure investments to explicit requirements around training and professional development, maintenance and technical support as well as technology management at national and/or programme level. Similarly in Ireland, in 2009, *Smart Schools = Smart Economy* made a compelling case for devising procurement frameworks that would provide schools with the benefits of bulk buying, built-in maintenance and some standardisation in equipment across schools. Some progress has been made in this regard with the publication on the PDST Technology in Education website of frameworks for short-throw digital projectors, long-throw (portable) digital projectors, school PCs, notebooks, colour laser printers, and mono laser printers. The frameworks reflect a consideration of the specifications that schools require for different ICT tools.

In the 2013 Census, over half of school principals in post-primary schools and about one-third in primary and special schools indicated that they had used the framework for school PCs and had found it to be useful. However, almost one in five primary and special school principals and 15% of post-primary principals reported that they were unaware of the framework. Broadly similar proportions were unaware of the printer and digital projector frameworks.

The Digital Strategy for Schools should underline the importance of using procurement frameworks so the advantages of bulk buying and multi-year support contracts can be leveraged, and some level of standardisation in ICT resources across schools can be achieved. The Strategy should also examine how procurement frameworks could be modified or broadened so that teacher professional learning and technological management is linked to investment in infrastructure, whether at school or national levels.

10.2 Learning, Teaching and Assessment Using ICTs

In this section, the focus shifts from infrastructure to the use of ICTs in teaching, learning and assessment. There is also a consideration of what have come to be known as 21st century skills, and how the development of such skills can be promoted through ICT usage.

10.2.1 Use of ICTs in Teaching and Learning

Low average levels of ICT usage by students in Ireland (documented in the Census and in other studies) can be attributed to a range of factors, not just those relating to infrastructure noted earlier, but also including the following obstacles identified by school principals and classroom teachers in the 2013 Census:

- Insufficient time for planning and preparation

- Insufficient levels of technical support
- Pressure to cover a prescribed curriculum
- Insufficient teacher knowledge on how to use ICTs effectively
- Blocked access to relevant websites.[53]

It was noted in Chapter 2 that the literature indicates a relationship between teachers' philosophies of teaching and learning, their pedagogical practices, and their use of ICT. Further, it was argued that pedagogies associated with ICT usage were those that emphasise high levels of understanding of key concepts within subject areas and the ability to apply such concepts to solve real-world problems. Teachers in the 2013 Census were strongly supportive of constructivist-based views of teaching and learning, with, for example, over 90% at each level indicating agreement that their role as a teacher is to facilitate students' own enquiry, and that students should be allowed to think of solutions to practical problems themselves before the teacher shows them. However, at least 70% of teachers at each level indicated similar levels of agreement with the view that instruction should be built around problems with clear, correct answers and around ideas that students can grasp quickly, while about 60% of teachers at each level agreed that a quiet classroom is generally needed for effective learning. This is consistent with the finding for teachers in Ireland in the OECD Teaching and Learning International Survey (TALIS). In that study, teachers at Junior Cycle in Ireland strongly endorsed constructivist beliefs about teaching, but also indicated a stronger preference for structuring practices (defined as practices that aim to ensure that learning is well-structured), than teachers in the other 23 participating countries (Gilleece et al., 2008). Further evidence of teachers' adherence to traditional or more structured teaching methods is evident in Table 7.5 in this report, where teachers at all levels reported engaging frequently (in at least three quarters of lessons) in activities such as checking homework, checking students' understanding of subject matter through questioning, and checking students' exercise/copy books. More interactive or open-ended activities such as having students working in small groups to come up with a joint solution to a problem or task, or engaging students in project work that takes at least a week to complete, were engaged in much less frequently.

If teachers are traditional in their pedagogical practices, then the technology will be used in traditional ways. This argument already receives support in the findings on infrastructure, where schools were relatively well-resourced with respect to interactive whiteboards and data projectors, compared to other ICT equipment such as portable student devices. Consequently, the design of teacher professional learning programmes cannot centre on the use of the technology in isolation. Teachers need to understand the use of digital technologies embedded within new pedagogical practices. The design of successful teacher professional learning programmes necessitates an understanding of the complex interaction of changing teachers' beliefs and practices as well as the introduction and use of digital technologies.

The 2013 Census also points to varying levels of self-reported skills among Irish teachers in completing ICT-related activities. Teachers reported moderate to high average levels of proficiency

[53] Working with HEAnet, the PDST Technology in Education will offer dual filtering solutions to schools. Teachers will be assigned a certain IP range, and students will be allocated a different range, and each range will have its own filtering level.

in producing simple documents using word processing software, communicating via email, using the Internet to find educational resources, downloading and editing curriculum resources, and creating a presentation incorporating video or audio. However, their average skill levels varied between basic and moderate on participating in an online social network or forum, using digital video recording, using social networking for educational purposes and using other Web 2.0 tools such as blogs and wikis. These data suggest that many teachers' are likely to lack the confidence to implement ICTs effectively in ways that engage and challenge students.

Teachers' confidence levels in using ICTs in teaching and learning may also be a problem. This was underlined in the Census by school principals, with, for example, principals of post-primary schools ranking low teacher confidence in using ICTs as the fourth most serious obstacle to using ICTs to support teaching and learning (just behind low levels of teacher knowledge). Low confidence levels may discourage teachers from trying out new ideas in the classroom, and from engaging in online professional development activities that would further enhance their knowledge.

While some of the impetus for incorporating ICTs into teaching and learning will come from curriculum change (for example, it is envisaged that ICTs will play a significant role in the new Junior Cycle programme and in revised subjects at Senior Cycle) as well as changes in assessment (see below), the Digital Strategy for Schools should emphasise how ICTs can be incorporated into each curriculum area, and how they can serve to establish links across aspects of the curriculum. The Strategy should also address how approaches to developing literacy and numeracy across the curriculum, in line with the *National Strategy to Improve Literacy and Numeracy Among Children and Young People 2011-2020* (DES, 2011), can be supported through the use of ICTs in the revised syllabi.

10.2.2 Developing 21st Century Skills Using ICTs

Reference has been made in this report and elsewhere to key skills or competences – creativity, innovation, collaboration, critical thinking, communication, problem solving, self-regulation and the effective use of ICTs. These skills are becoming progressively more important as we move towards a more globalised and technology-driven economy (Binkley et al., 2012, Partnership for the 21st Century, 2003, 2005). Moreover, students must be able to use them across a range of applied or real-life contexts as they develop as engaged thinkers, global citizens and active learners in collaborative social environments. The *Framework for the Junior Cycle* (DES, 2012a) enumerates a set of eight key skills (literacy, numeracy, managing myself, staying well, communication, being creative, working with others, and managing information and thinking), and envisages a key role for ICTs in achieving each skill. The NCCA (2009) has issued a key skills framework for Senior Cycle that includes creative and critical thinking, information processing, communicating, being personally effective, and working with others. Key skills can also expect to feature in curriculum revision at primary level. As noted in Chapter 2, the achievement of "21st century skills" is contingent on embracing new approaches to teaching, learning and assessment, within a context in which ICTs play a key role.

There is evidence that students in Ireland lack key 21st century skills. In PISA 2012, 15-year olds in Ireland achieved a mean score on a computer-based assessment of creative problem solving that was not significantly different from the corresponding OECD average and a ranking of 22nd among 44 participating countries (OECD, 2014). This contrasts with their performance on paper-based tests of reading literacy, mathematics and science, where they achieved mean scores that were significantly

above the corresponding OECD averages. The key challenge in this respect would appear to be translating aims and objectives in curricular frameworks into teaching and learning activities that allow for the development of these kinds of skills consistently over time

Teachers can support the development '21st century' or 'knowledge creating' and 'knowledge deepening' skills as well as more basic technology literacy (UNESCO, 2008a) through a range of pedagogies, which leverage a range of ICTs. Teachers may benefit from opportunities to consider and reflect on the different theoretical and pedagogical models underpinning these ideas and, crucially, how these can be translated in to their own teaching, learning and assessment. The UNESCO (2011) documentation is useful for helping to visualise / concretise what that next step can be as at each level as a detailed overview has been outlined which could be useful when designing learning environments / developing coursework outlines / mapping existing coursework. If teachers have a clear understanding of what students should achieve between and within subjects, and prioritise goals, there is a better chance of achieving those goals, and the broader and more effective use of ICTs should follow. As noted above, teachers in the 2013 Census in all school categories were generally positive about the value of constructivist, student-centred approaches to teaching and learning, with the vast majority viewing their role as facilitating student enquiry and allowing students to think of solutions to practical problems before teacher intervention, even if they also favoured teaching and learning activities that were quite structured. These data suggest that teachers may be positively disposed towards shifting from more traditional approaches to teaching and learning to those that support the development of 21st century skills in classroom environments in which ICTs play an increasingly prominent role.

At post-primary level, the introduction of the new Junior Cycle and faster access to the Internet in schools, combined with appropriate professional learning opportunities for teachers, could provide a context in which significant progress can be made in integrating ICTs into teaching, learning and assessment in the next three to five years. The development of new curricula in English, Irish and mathematics at primary level also provides a valuable opportunity to specify what we expect students to learn, and how ICTs can be more effectively integrated into teaching, learning and assessment at that level.

The Digital Strategy for Schools should provide a clear outline of how ICTs can promote the achievement of goals relating to 21st century learning skills both within curriculum/subject areas, and across the curriculum. Following the taxonomy developed by UNESCO (2008, 2008b, 2011), the Strategy should make a clear distinction between those ICT-based activities that are likely to lead to knowledge acquisition, and those that are more likely to promote 21st century skills through knowledge deepening and knowledge creation.

10.2.3 Assessment and ICTs

As noted in Chapter 2, the specification of 21st century goals within and across curriculum areas and a shift in focus from knowledge acquisition to knowledge deepening and knowledge creation has implications for assessment. It is no longer sufficient to focus on assessing a narrow range of skills for summative purposes. The next generation of assessments needs to measure those 21st century skills that are deemed to be essential for students' further lives. Moreover, the focus of assessment needs to shift from summative assessment (such as end-of-year tests or exams) to formative assessment, which teachers can draw on continuously to improve students' learning, thereby

ensuring that feedback on results is an integral part of the assessment process. Students' assessment of their own and each other's work will also play a key role. Self-assessment, peer-assessment and adaptive comparative judgement can all be facilitated through the use of ICT.

To date, some progress has been made in developing assessment tools that are congruent with 21st century competencies. For example, in the OECD PISA study, students were assessed on computer-based tests of digital reading and mathematics in 2009 and 2012, and on computer-based problem solving as well in 2012. In 2015, PISA will move away from paper-based assessment altogether and incorporate computer-based assessments in science, reading, mathematics, and collaborative problem-solving. Some of the science assessment includes simulations, which require students to engage interactively with the test. To date, 15-year olds in Ireland have performed above the OECD average on digital reading, while their performance on computer-based mathematics and problem solving has not been significantly different from the OECD average.

Whereas PISA mainly focuses on summative assessment, Binkley et al. (2012), in their landmark paper on technology-supported assessment, specify how 21st century skills, including complex problem solving, communication, teamwork, creativity and innovation, can be assessed using technology. To this end, the US National Technology Plan (NEPT, 2011) describes a range of computer-based assessments that are designed to provide students and teachers with information about progress in learning key concepts within and across subject areas. Such assessments ask students to design products or experiments, manipulate parameters, run tests, record data, and graph their results. According to the Plan,

> It also is possible to directly assess problem-solving skills, make visible sequences of actions taken by learners in simulated environments, model complex reasoning tasks, and do it all within the contexts of relevant societal issues and problems that people care about in everyday life (p. 27).

The 2013 Census suggests that teachers in Ireland have been slow to embrace ICT-driven assessment tools. For example, over 80% of teachers in post-primary and special schools, and 90% in primary schools, reported that their students never gathered evidence of learning using an e-portfolio approach. Similarly, 80% of teachers in primary and post-primary schools, and 70% in special schools reported that they never administered a test digitally. Teachers' lack of engagement with digital assessment arises for a range of reasons including lack of access to relevant tests, lack of infrastructure in schools, and the emphasis on paper-based assessments in examinations.

The Digital Strategy for Schools should provide guidance on the range of electronic assessments that are already available. Particular attention should be paid to formative assessments that provide teachers and students with feedback that can guide future learning in their classes, while also informing instructional decisions at school level. The Strategy should also highlight the potential of integrated teaching, learning and assessment systems that focus on relevant 21st century skills.

10.3 Teacher Professional Learning

Teacher professional learning is a key driver of the integration of ICTs in teaching, learning and assessment. This section looks at two key aspects: the nature of teacher professional knowledge, and approaches to promoting teacher professional learning.

10.3.1 Specifying Teacher Professional Knowledge

As outlined in Chapter 2, the UNESCO Competency Framework for Teachers provides a useful overview of the knowledge and skills that teachers should acquire, and the learning experiences that students should be provided with, as efforts to integrate ICTs into teaching, learning and assessment move forward. The framework includes six components (understanding ICTs in education, curriculum and assessment, pedagogy, ICT, organization and administration, and teacher professional learning), and three broad approaches (technology literacy, knowledge deepening and knowledge creation) (Table 10.2).

Table 10.2 UNESCO ICT Competency Framework for Teachers

Aspect/Approach	Technology Literacy	Knowledge Deepening	Knowledge Creation
Understanding ICT in Education	Policy awareness	Policy understanding	Policy innovation
Curriculum and Assessment	Basic knowledge	Knowledge application	Knowledge society skills
Pedagogy	Integrate technology	Complex problem solving	Self-management
ICT	Basic tools	Complex tools	Pervasive tools
Organisation and Administration	Standard classroom	Collaborative groups	Learning organisations
Teacher Professional Learning	Digital literacy	Manage and guide	Teacher as model learner

Source: UNESCO (2011), p. 3.

The model illustrates the complexity of implementing ICTs effectively in teaching and learning. As noted in Chapter 2, the key teacher competencies associated with each approach include:

- *Technology literacy* – basic digital literacy skills and digital citizenship, and the ability to select and use appropriate educational tutorials, games, drill-and-practice software, and web content to complement standard curriculum objectives, assessment approaches, unit plans, and didactic teaching methods.
- *Knowledge deepening* – ability to manage information, structure problem tasks, and integrate open-ended software tools and subject-specific applications with student-centred teaching methods and collaborative projects in support of students' in-depth understanding.
- *Knowledge creation* – ability to design ICT-based learning resources and environments, use ICT to support the development of knowledge creation and the critical thinking skills of students, support students' continuous, reflective learning, and create knowledge communities for students and colleagues. They will be able to play a leading role with colleagues in creating and implementing a vision of their schools as a community based on innovation and continuous learning, enriched by ICT.

Based on the outcomes of the 2013 Census, as well as data on ICT usage from international studies such as ESSIE, PISA and PIRLS reviewed in this report, it can be concluded that, in general, a large majority of teachers in Ireland currently focus mostly or exclusively on the *technology literacy* approach, and that, within that approach, there is wide variation, with some teachers using ICTs for lesson preparation and presentation, and others successfully engaging students in ICT activities that support and, in some cases, extend more traditional approaches to teaching and learning.

Within its lifetime, the Digital Strategy for Schools should seek to consolidate the technology literacy approach, while also supporting teachers to move towards the knowledge deepening and knowledge creation approaches. If the Strategy sets out to achieve this, it will need to spell out implications for:

- Teacher professional learning (see next subsection)
- Curriculum development – with some support coming from curriculum changes that are already in the pipeline at primary level, and at Junior and Senior cycles
- The organisation of teaching and learning in classrooms
- The nature of assessment, including formative and summative assessment, that focuses on complex problem-solving and other 21st century skills
- The range of ICTs/technological tools and their purposes, including those best suited to the knowledge deepening and knowledge creation approaches.

In this context, the Strategy should serve as an important reference source for those involved in curriculum development and the preparation and development of teachers ahead of implementing new curricula and syllabi.

10.3.2 Supporting Teacher Professional Learning

As noted in Chapter 2, professional learning is a key driver in developing teachers' professional knowledge as it relates to the use of ICTs in teaching, learning and assessment. School principals in the 2013 Census in post-primary and special schools highlighted insufficient teacher knowledge on how to use ICT effectively in teaching and learning as a key obstacle to using ICT, while principals in post-primary schools also pointed to low levels of confidence among teachers in using ICTs. Principals in all three school categories identified how to use ICT as a teaching and learning tool across the curriculum (including its application to specific subject areas) as their top priority for teacher professional learning, while principals in special schools also identified the use of ICTs to support student with special educational needs as important. Interestingly, school principals in all three school categories also identified bringing in an external tutor to the school as the preferred approach to organising ICT-related professional development, presumably since this provides opportunities for working within a familiar context and using the school's own equipment. Principals accorded lower levels of priority to approaches such as online CPD for individual teachers or for teachers as a school group, or to informal provision of CPD on a peer-to-peer basis. According to teachers responding to the Census, the most common focus of their own ICT CPD in the previous two years related to use of the school's ICT equipment (e.g., interactive whiteboards, digital projectors and laptops), though a majority at primary and post-primary levels also indicated that they had availed of CPD on ICT as a teaching and learning tool across the curriculum, including specific subject areas (i.e., the topic to which principals accorded highest priority going forward).

However, what is particularly concerning is that the Census also indicated that Irish teachers are by and large traditional in their pedagogical practices. Consequently, the technology for the most part is being used in predominantly traditional ways. The design of successful teacher professional learning programmes necessitates an understanding of the complex interaction of changing teachers' beliefs and practices as well as the introduction and use of digital technologies. As stated earlier, the design of teacher professional learning programmes cannot centre on the use of the technology in isolation. Teachers in today's classroom must not only be prepared to use technology; they must also know how to use technology to support student learning. Teachers need to understand the use of digital technologies embedded within new pedagogical practices. As international research (e.g., Shear et al., 2011a) has indicated, a most effective way of doing this is by embedding the professional learning experiences within the teacher's own classroom practice and engaging them in a process of ongoing action and reflection on what being digital in teaching, learning and assessment means.

In addition to the teachers' traditional pedagogical orientation, there is also evidence indicating that students in Ireland not only lack key 21st century skills (OECD, 2014) but they also do not use digital technologies in school (see Chapter 9) As noted in Chapter 2, the achievement of "21st century skills" is contingent on embracing new approaches to teaching, learning and assessment, within a context in which ICTs play a key role. However, teachers rarely have access to specific guidance on what exactly this means and how to do it in their classrooms. They need guidance on how they can analyse and deepen the learning opportunities in their classrooms and, in particular, the learning activities they design offer students. A programme of professional learning needs to be designed that helps teachers to move from a very traditional instructional environment to one that begins to embed strong uses of digital technologies by themselves and their students as well as other elements of 21st century teaching and learning.

We believe that engaging in a collaborative job-embedded professional learning programme with teachers across their school which focuses on designing learning tasks / activities that demand the use of 21st century skills would help teachers to examine and change their own practices, in particular as they relate to innovative uses of digital technologies to support their own and their students' learning and the development of 21st century skills (Butler & Leahy, 2010b, 2011).

Job embedded professional learning would also tackle some of the obstacles which were identified by school principals and classroom teachers in the 2013 Census that could be attributed to low average levels of ICT usage by students:

- Insufficient time for planning and preparation
- Insufficient teacher knowledge on how to use ICTs effectively
- Low confidence levels in using ICT for teaching and learning

There needs to be a clear rationale underpinning teacher professional learning to inform how different modules build on others. Otherwise, it is rudderless and can lead to maintenance of the status quo and a continuing reinforcement of existing beliefs and practices. Without a questioning of basic assumptions about learning and teaching, it is not possible to determine what is valued or important in a particular culture. "Interactive computer simulations, digital and open educational resources, and sophisticated data-gathering and analysis tools are only a few of the resources that enable teachers to provide previously unimaginable opportunities for conceptual understanding" (UNESCO, 2008a, p.1). It is therefore critically important to consider how these digital tools can change classroom practice and the roles of teachers and students.

The design of teacher professional development is also very important. For example, there would appear to be a need for careful consideration of the extent to which teacher professional learning may need to be tailored to the contexts of specific schools and groups of teachers and learners. As outlined in Chapter 2, there has been a tendency to develop portals and online communities. [54] In many respects, the principle of "build it, and they will come" seems to be firmly in place, based on the belief that, sooner or later, schools and teachers will adopt them and benefit from them (OECD,

[54] The Scoilnet portal (www.scoilnet.ie) is a significant resource that is available to teachers in Ireland. Themes and articles pages are developed by practising teachers, and there is a facility to share and modify resources. Use of Sco8ilnet is part of all PDST summer courses.

2010, p.15). However, the idea of build it and they will come is not a stable rationale to inform a professional development policy. What types of resources are on these portals and more importantly what model of teaching and learning are they supporting? Are they designed for all teachers in mind or are they organised into meaningful categories geared at more specific needs and topics? Who develops the resources and is there the facility for teachers to change and adapt them and repost them for others to use? Do teachers discuss how they use these resources and offer support to each other? Are communities of practice encouraged and supported on these portals? While there may be collaboration and sharing within these emerging communities of practice, there needs to be a questioning of the learning rationale/foundation underpinning these communities. Are they built on traditional understandings of learning? Or, if the participating teachers are moving into the knowledge deepening and knowledge creation stages (which require significant transformation of understandings of learning), how are they supported? The answers to these questions will be influenced by the policy decisions that are taken, what is driving these decisions and how funding is subsequently allocated. Similarly, there needs to be a connection between infrastructural development and teacher professional learning to ensure that this funding is leveraged to its potential. "Without coordinated, integrated plans to support implementation, equipment may remain underused by teachers, students and administrators" (Bakia et al., 2001, p.19).

The US National Education Technology Plan (NEPT, 2010) is an example which outlines a view of teaching as *connected teaching* – that is, teachers "are supported individually and in teams by technology that connects them to data, content, resources, expertise, and learning experiences that can empower and inspire them to provide effective teaching for all learners" (p. 39). Approaches to professional learning advocated in this plan include teachers:

- Participating in online learning communities that permit coordination of teams of educators within a school, between a school and homes, and among schools, museums, community centres and other settings that can support a student's learning.
- Creating their own online learning communities consisting of their students and their students' peers, and other educators in their schools, libraries and after-school programmes.
- Collaborating with their peers and accessing world-class experts to improve student learning.
- Tapping into a vast array of opportunities to personalise learning, drawing on simulations and models, virtual and reality environments that enable students to explore and make meaning in complex situations.
- Supporting students in taking courses online, when schools are unable to provide such courses
- Taking more control over their own professional development and assuming responsibility for determining their own learning goals.
- Using their own teaching as a source of information to inform professional growth through examining, revising, and reflecting on instruction.

These US-based views of the role that ICT can play in supporting teachers' development throughout their careers are broadly consistent with recent (Irish) Teaching Council documents (e.g., Teaching Council, 2011a, 2011b), which prioritise the role of ICT in initial and continuing teacher development, and recognise the growing role of new technologies and social media in how young people learn.

The Digital Strategy for Schools should promote a view of teacher professional learning that:

- Reinforces the concept of a continuum of professional learning extending from preservice through induction, mid-career and beyond
- Enables preservice teachers to experience technology-supported learning, assessment and instruction in all their courses
- Supports the establishment of ICT standards for teachers
- Enables teachers to engage in planning their own ICT-related professional development and evaluating their own competence in using ICTs in teaching, learning and assessment
- Supports teachers in moving from technology literacy through knowledge deepening and knowledge creation
- Supports the development of online learning modules that address the needs of individual teachers and groups of teachers (for example, subject departments) with differing sets of competencies
- Ensures that teacher professional learning is an integral component of all new ICT initiatives, such as the provision of high-speed broadband to schools.

In short, what is needed is a connected approach to professional learning that is "collaborative, coherent, and continuous" (NETP, 2010, p.10).

10.4 Research, Policy and Leadership

This section deals with two further drivers of change in the use of ICTs in education – research as a driver of policy and practice, and school leadership and planning.

10.4.1 Research as a Driver of Policy and Practice

A significant factor impeding the integration of ICTs in teaching, learning and assessment is the lack of research information on the effects of the various ICT initiatives that have been implemented in recent years, both centrally, through funding by the Department of Education and Skills, and by other organisations and individuals. This lack of knowledge makes it difficult to convince teachers and others, who may not be aware of the benefits of ICTs in teaching and learning. It may also impede school leaders seeking to encourage staff to innovate and change traditional teaching practices. Although large majorities of school principals across all school categories in the 2013 Census indicated that ICTs had impacted positively on the range of methodologies used by teachers, and on students' levels of interest and engagement, and that improvements were observed in literacy and numeracy across the curriculum (Table 5.4), there is no research evidence to back this up.

In Chapter 2, attention was drawn to the Schools Integration Project (SIP), an initiative implemented in the early 2000s, which supported innovative activities relating both to technology and to learning using ICTs through a combination of public and private funding. It was noted that the evaluative component of SIP was weak, and that this worked against justifying the extension and upscaling of the most successful SIP projects. Elsewhere, efforts to evaluate projects have not always been well-planned. For example, no baseline data on the uses or effects of ICTs on teaching and learning were gathered in the 78 pilot schools involved in the 100 Mbps Connectivity Demonstration Programme (DES, 2012b), nor was a suitable comparison group of schools selected, making it more difficult to

identify programme effects at a later stage. Effects of the 100 Mbps initiative are currently being evaluated by the ESRI.

At the same time, international research (e.g., OECD, 2010) has pointed to the value of a systemic approach to the implementation of new initiatives. Such an approach creates a feedback loop that will contribute to refinement of existing policy and to future policy development. According to Johannessen and Pedro (2010), a systemic approach has four key axes:

- *A pedagogical axis*, which is largely about how technology can contribute to improved learning outcomes and learning strategies among learners.
- *A knowledge axis* that highlights the important role knowledge plays in the innovation process, based on the view that a strong underlying knowledge base increases innovation capacity.
- *A technological axis* that reflects the role of infrastructure in the innovation.
- *A policy axis* that emphasises the need to approach innovation in a systemic manner, linking the innovation to policy making and policy choices needed to facilitate the innovation, its impact and knowledge base.

In relation to research and innovation, the Digital Strategy for Schools should:

- Emphasise the value of conducting pilot studies prior to full-scale implementation of new initiatives, so that potential gaps in implementation can be identified in advance and addressed.
- Emphasise a rigorous research-based approach to implementing all publicly-funded initiatives and disseminate and act on findings.
- Support the provision of competitive grants for implementation of innovative and evidence-based programmes that are not initiated centrally, but meet ICT policy priorities, and ensure that such programmes are carefully evaluated, with a view to upscaling the most successful ones
- Ensure that project evaluations examine the effects of innovations on teacher knowledge and teacher professional learning, as well as on learning outcomes.
- Disseminate information about the effects of integrating ICTs in teaching and learning
- Support colleges of education and other organisations in establishing an orientation towards research among school leaders and teachers.
- Engage with the international community to improve the collective understanding of how best to implement ICT in education and of how best to support teachers and students in acquiring the skills necessary to teach and learn with technology.

The importance of initiating this type of approach to research is fundamental as it is only by shifting our focus to collecting data on how and when technology is used for teaching, learning and assessment that we will be able to determine the difference it makes and use that knowledge to make informed policy decisions that will improve our education system.

10.4.2 School Leadership and Planning

The literature reviewed in Chapter 2 referred to the key role of school principals in promoting the use of ICT in teaching and learning. Further, buy-in from school leadership was identified as a critical ingredient of successful ICT-based initiatives, along with thoughtful planning, relevant teacher development, and support from teachers and students. The NCTE (2009) handbook, *Planning and*

Implementing e-Learning in Your School: A Handbook for Principals and ICT Co-ordinating Teachers, is further testimony to the key role that school principals can play in interpreting national policy and facilitating change at school level.

The analysis of the 2013 Census data provides an overview of the role played by school principals in schools in Ireland. Principals rated 18 ICT-related activities in terms of the priority they allocated to them for improving teaching and learning. Across all school categories, principals allocated highest priority to infrastructure-related activities, including accessing high-quality broadband Internet connectivity, accessing ICT-related equipment, improving the capability and speed of the existing fixed school network, and ensuring a high-quality school-wide wireless network. Principals also allocated a high priority to addressing Internet safety issues. In contrast, lower priority was assigned to teacher use of ICTs for teaching, learning and assessment, including access to a range of online tools and applications, use of ICT to develop higher-order thinking, and access to curriculum-related online content. This indicates a need to address the balance between acquiring improved infrastructure and ensuring Internet safety on the one hand, and supporting teachers to make the best use of available ICT in the service of teaching, learning and assessment, on the other. However, as long as inadequate infrastructure continues to be a widespread issue, it will remain difficult to address teaching, learning and assessment.

While principals across all school categories allocated the highest priority for CPD to using ICT as a teaching and learning tool across the curriculum, some had a narrow view of what this entails. For example, the use of more advanced ICT skills (including blogging, website design, computer programming and other applications), and the use ICT to support assessment for learning, were accorded relatively low priority. It may be that principals are not fully aware of the potential of Web 2.0 applications to support both student and teacher learning, including assessment for learning. Principals' preference for more traditional CPD involving an external facilitator, compared with more interactive, web-based and informal approaches, also suggests a lack of familiarity with the potential of these less-traditional approaches.

An area where school principals have significant input centres on the decision on whether or not to appoint an ICT co-ordinator, though this also relates to other school-level priorities, and to the availability of posts of responsibility. It is nonetheless a matter of concern that one quarter of post-primary schools, and about 40% of primary and special schools do not have a designated ICT co-ordinating teacher to support implementation of school-wide policy on integrating ICT in teaching and learning. It is also a matter of concern that ICT/e-learning is not a regular agenda item for staff meetings for about half of schools.

The Digital Strategy for Schools should ensure that school principals continue to support and lead on the use of ICT in teaching, learning and assessment in schools. The Strategy should:

- Highlight the key role of the principal and other school leaders in formulating and implementing ICT policy at school level, and in supporting teachers and students in their use of ICT.
- Provide specifically-focused CPD for principals on how ICT can enhance teaching, learning and assessment at school level, ensuring a good balance between providing and maintaining infrastructure, and supporting teaching and learning.

- Encourage principals to explore non-traditional approaches to providing opportunities for teacher professional learning, in a context in which teachers are expected to take greater responsibility for their own professional learning.
- Outline how school co-ordinators can support teachers and students in using ICT in teaching, learning and assessment.
- Ensure that school principals and ICT co-ordinators play a key role in implementing and evaluating the effects at school level of all new publicly-funded ICT initiatives, including those focusing on teaching, learning and assessment.

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